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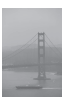


AATS—Promoting Scholarship in Thoracic and Cardiovascular Surgery

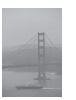
Founded in 1917, the American Association for Thoracic Surgery (AATS) is an international organization consisting of over 1,200 of the world's foremost cardiothoracic surgeons representing 35 countries. Surgeons must have a proven record of distinction within the cardiothoracic surgical field and have made meritorious contributions to the extant knowledge base about cardiothoracic disease and its surgical treatment to be considered for membership. The Annual Meeting, research grants and awards, educational symposia and courses, and the AATS official journal, *The Journal of Thoracic and Cardiovascular Surgery*, all strengthen its commitment to science, education and research.

Statement of Need

Cardiovascular disease and cancer are the leading causes of mortality and morbidity around the globe. Major advances in these conditions continue to be made at a rapid pace. Improvements in diagnostic techniques as well as interventional approaches to treatment, both surgical and percutaneous, challenge the clinical practitioner to remain current. Increasingly sophisticated technology to accomplish these aims is being developed and introduced into clinical practice. Exciting advances in basic and clinical science offer opportunities for participation in scientific studies and clinical trials. All of these elements create a significant educational need for the practicing cardiothoracic surgeon. The AATS Annual Meeting fills this need through a combination of lectures, original scientific presentations and discussion forums.

Educational Objectives

At the conclusion of the AATS Annual Meeting, through comprehensive lectures and discussions, participants will be able to:

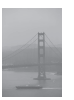


- ❏ Assess the latest techniques and current research specifically related to Adult Cardiac Surgery, General Thoracic Surgery and Congenital Heart Disease.
- ❏ Analyze the pros and cons of each paper presented to gain an overall perspective of their current practices.
- ❏ Select appropriate surgical procedures and other interventions for their own patients based upon results presented.
- ❏ Integrate state-of-the art knowledge into their current practices.
- ❏ Identify the basic science developments and emerging technologies and techniques across the spectrum of cardiothoracic surgery.

Target Audience

The AATS Annual Meeting is specifically designed to meet the educational needs of:

- ❏ Cardiothoracic Surgeons
- ❏ Physicians in related specialties including Cardiothoracic Anesthesia, Critical Care, Cardiology, Pulmonology, Radiology, Gastroenterology, Thoracic Oncology and Vascular Surgery
- ❏ Critical Care Teams including Anesthesiologists, Critical Care Nurses, Hospitalists, and Interventionalists
- ❏ Fellows and Residents in Cardiothoracic and General Surgical training programs
- ❏ Allied Health Professionals involved in the care of cardiothoracic surgical patients including Nurses, Nurse Practitioners, Perfusionists, Physician Assistants, and Surgical Assistants
- ❏ Medical students with an interest in cardiothoracic surgery



Disclosure Policy

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For further information on the Accreditation Council for Continuing Medical Education (ACCME) Standards of Commercial Support, please visit www.accme.org.

Accreditation Information

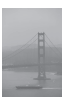
Continuing Medical Education (CME) Accreditation

The American Association for Thoracic Surgery is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The American Association for Thoracic Surgery designates this live activity for a maximum of 37 *AMA PRA Category 1 Credits*™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

American Academy for Nurse Practitioners (AANP) Accreditation

This program is approved for 16.25 contact hours of continuing education by the American Academy of Nurse Practitioners. Program ID 1203132



This program was planned in accordance with AANP CE Standards and Policies and AANP Commercial Support Standards.

American Academy of Physician Assistants (AAPA) Accreditation

This program has been reviewed and is approved for a maximum of 37 hours of AAPA Category I CME credit by the Physician Assistant Review Panel. Physician assistants should claim only those hours actually spent participating in the CME activity.

This program was planned in accordance with AAPA's CME Standards for Live Programs and for Commercial Support of Live Programs.

American Board of Cardiovascular Perfusion (ABCP) Accreditation

The American Board of Cardiovascular Perfusion designates this educational activity for a maximum of 38.6 Category 1 CEUs.

The American Association for Thoracic Surgery designates the following credit hours:

Saturday, April 28, 2012 – up to 7.75 hours

- ❏ Adult Cardiac Skills, up to 4 hours
- ❏ Congenital Skills, up to 3.5 hours
- ❏ General Thoracic Skills, up to 3.75 hours
- ❏ Allied Health Personnel, up to 7 hours
- ❏ Developing the Academic Surgeon, up to 4 hours
- ❏ Surgical Robots/Technology Bazaar, up to 3.75 hours

Sunday, April 29, 2012 – up to 8.5 hours

- ❑ Adult Cardiac Surgery, up to 8.25 hours
- ❑ Cardiothoracic Critical Care, up to 7.5 hours
- ❑ Congenital Heart Disease, up to 8.5 hours
- ❑ General Thoracic Surgery, up to 8 hours
- ❑ C. Walton Lillehei Resident Forum, up to 2 hours

Monday, April 30, 2012 – up to 6.25 hours

- ❑ Plenary Scientific Session, Basic Science Lecture, Presidential Address, up to 3.75 hours
- ❑ Adult Cardiac Surgery Simultaneous Session, up to 2.5 hours
- ❑ Congenital Heart Disease Simultaneous Session, up to 2.5 hours
- ❑ General Thoracic Surgery Simultaneous Session, up to 2.5 hours

Tuesday, May 1, 2012 – up to 7.5 hours

- ❑ Adult Cardiac Surgery Forum, up to 1.75 hours
- ❑ General Thoracic Surgery Forum, up to 1.75 hours
- ❑ Plenary Scientific Session, up to 2.5
- ❑ Honored Speaker Lecture, up to 1 hour
- ❑ Adult Cardiac Surgery Simultaneous Session, up to 2.25 hours
- ❑ Congenital Heart Disease Simultaneous Session, up to 2.25 hours
- ❑ General Thoracic Surgery Simultaneous Session, up to 2.25 hours

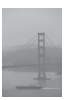
Wednesday, May 2, 2012 – up to 7 hours

- ❏ Emerging Technologies and Techniques Forum, up to 2 hours
- ❏ Controversies in Cardiothoracic Surgery, up to 1 hour
- ❏ Adult Cardiac Debates, up to 1 hour
- ❏ Congenital Debates, up to 1 hour
- ❏ General Thoracic Debates, up to 1 hour
- ❏ Transcatheter Therapy and Collaboration, up to 3 hours

For further information on the Accreditation Council for Continuing Medical Education (ACCME) standards of commercial support, **please visit www.accme.org**.

CME/CE Kiosks/Letter of Attendance

Attendees may obtain CME (Continuing Medical Education) and CE credits and Letter of Attendance at the CME/CE Pavilion located in the lobby on Level 1 of the Convention Center across from Registration. The CME/CE Pavilion computers will allow attendees to manage their CME/CE credits and Letter of Attendance for the Annual Meeting and/or email their information to their personal email address. At the end of the Annual Meeting, attendees may print their CME/CE certificate and/or Letter of Attendance. Following the Annual Meeting, attendees may access their CME/CE information and/or Letter of Attendance at http://ceu.experient-inc.com/aat121. Please note that this website will be available and active following the Annual Meeting.



Author Index

(Note: Authors are listed by last name, first name and final ID)

*AATS Member

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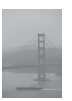
*AATS Member



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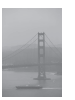
*AATS Member



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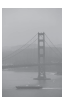

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*AATS Member

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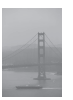

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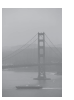

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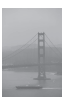

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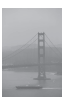

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Disclosure List

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David H. Adams▪	Faculty Member is an inventor with royalties from Edwards Lifesciences, is an inventor with royalties from Medtronic and Unpaid Position, National Co-PI, US Medtronic CoreValve Pivotal Trial.
Charles R. Bridges•	Faculty Member is Consultant for Zymogenetics and Baxter Biosurgery.

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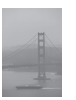

Christopher Caldarone•	Faculty Member is a major stockholder in CellAegis.
Yolonda Colson	Faculty Member is a Participant in Women's Leadership Initiative Focus Group for Ethicon-Endosurgery, Inc.
Ralph J. Damiano, Jr.•◆▪	Faculty Member is a Consultant for ArtiCure and Medtronic. Faculty Member receives Grant/Research Support from Edwards.
Thomas D'Amico*	Faculty Member is a Consultant for Scanlan.
Steven DeMeester	Faculty Member is a Consultant for C2 Therapeutics. Faculty Member receives Grant/Research Support from Bard/Davol and Novadeaq. Faculty Member is on the Speaker's Bureau for Gore and Davol.
Richard Dobson	Faculty Member receives salary support for research fellowship from Actelion.
James I. Fann▪	Faculty Member is a Consultant for Neomend.
Anthony Furnary	Faculty Member is a Consultant for Edwards LifeSciences, Glumetrics, Inc., and Medtronic. Faculty Member is on the Speaker's Bureau for Lifescan. Faculty Member is an expert witness on Aprotinin for the Bayer Corporation.
A. Marc Gillinov	Faculty Member is a Consultant for Edwards LifeSciences, Onyx Lifesciences and AtriCure. Faculty Member receives Grant/Research Support from St. Jude Medical and Medtronic.

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Michael Liptay	Faculty Member is on the Speaker's Bureau for Covidien. He is a Consultant for Baxter and Progel.
James Luketich	Faculty Member receives Grant/Research support for his University from Accuray, Covidien, GlaxoSmithKline and Torex. Faculty members receives honoraria for lectures from Stryker Endoscopy and Accuray.
Michael Maddaus*	Faculty Member is a Consultant for Ethicon.
M. Blair Marshall*	Faculty Member receives Grant/Research Support from TSFRE (Principle Investigator). Faculty Member Primary patent holder for Suture Training device.
Tomislav Mihaljevic•	Faculty Member is Consultant for Intuitive Surgical, Edwards and Abbott.
D. Craig Miller	Faculty Member receives Grant/Research Support from NHLBI, National Institutes of Health HL67025. Faculty Member is a Consultant for Medtronic Heart Valve Division, Abbott Vascular MitraClip and Medtronic CardioVascular Division, Inc. Faculty Member is on the Executive Committee (without compensation) for PARTNER U.S. Trial - Percutaneous AVR, Edwards Lifesciences, LLP. Faculty Member is Stanford Center Principle Investigator for the PARTNER Trial: Placement of Aortic Transcatheter Valves Trial, Edwards Lifesciences, LLP.

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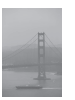

Claudio Muneretto	Faculty Member is a Consultant for ESTECH.
Soon Park	Faculty Member is a Consultant and receives Grant/Research Support from Thoratec.
Gaetono Rocco	Faculty member is on the Speaker's Bureau for Covidien, Baxter, and Synthes. Faculty member is a Consultant and receives Grant/Research support from Covidien.
Joseph Sabik	Faculty Member is on the Speaker's Bureau for Medtronic and Edwards. Faculty Member is on the Valve Exchange Advisory Board.
Walter Scott	Faculty Member is a shareholder in Johnson and Johnson and Celgene.
Joseph B. Shrager•	Faculty Member is a Consultant for GlaxoSmithKline and Maquet, Inc. Faculty members Founders stock options in Cortene, Inc.
Craig Smith•◆	Faculty member is a Trial Participant for Edwards Lifesciences.
Joshua R. Sonett•◆	Faculty member is a member of the Speakers Bureau for Covidien and Lilly.
Thoralf M. Sundt, III•◆	Faculty Member is speaking at a meeting for B Braun and St. Jude Medical.
Wilson Szeto	Faculty Member receives Grant/ Research support from Edwards LifeSciences and Medtronic Vascular.
Andrew Taylor	Faculty Member receives Grant/ Research support from Siemens (PhD student support).

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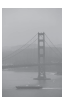

Vinod H. Thourani▪	Faculty Member receives Grant/ Research support from Edwards Lifesciences. Faculty Member is on the Advisory Board and Speaker's Bureau of Sorin Medical and St. Jude Medical.
Glen Van Arsdell	Faculty Member is an Consultant for Boston Scientific, Medtronic and CellAegis.
Kazuhiro Yasufuku	Faculty Member receives Grant/ Research Support from Olympus Medical Systems.
Thomas Yeh	Faculty Member is a major stockholder in BMNM, Drooy, GDX, INTC, MSFT.
Joseph Zwischenberger	Faculty Member receives royalties from patented catheter. Faculty Member receives Grant/ Research Support from the NIH (Hyperthermia grant) and receives Grant/Research support from MC3(Hyperthermia grant).

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The following faculty members have nothing to disclose with regard to commercial support. The following faculty members do not plan on discussing unlabeled/investigational uses of a commercial product.

Niv Ad*
Syed Ali
Nasser Altorki
Rizwan Attia
Emile A. Bacha•▪◆
Vinayak Bapat
Joseph Bavaria
Ziv Beckerman
Edward Bergeron
Friedhelm Beyersdorf
Castigliano Bhamidipati
Faiz Bhora
Sabine Bleiziffer
Steven Bolling
Pramod Bonde
Lorenzo Boni
Ayesha Bryant
Erin Buckley
Harold Burkhart
Brian Buxton
Thierry-Pierre Carrel
Alan Casson
Efstratios Charitos
Anson Cheung
Yeong-Hoon Choi
Marcelo Cypel
Otto Dapunt
Gail Darling
Tirone David
Michele De Bonis
Abe DeAnda
Joseph A. Dearani◆
William DeCampli
Pedro del Nido
Chadrick Denlinger
Augusto D'Onofrio
Pedro dos Santos
Yves d'Udekem
Richard Finley
Christian Etz
Charles Fraser
Richard Freeman
Domenico Galetta
J. William Gaynor
Alessandro Giardini
Denis Gilmore
Donald Glower
Marcello Gomide

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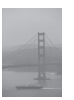

David Greenhouse
Kristine Guleserian
Frank Hanley
David Harris
Philip Hayward
Jennifer Hirsch
Chuong Hoang
Sophie Hofferberth
Ho Young Hwang
Frederic Jacques
David R. Jones•
Julissa Jurado
Kirk Kanter
A. Pieter Kappetein
Tara Karamlou
Jelena Kasnar-Samprec
Minoo Kavarana
Mohamed Khereba
Arman Kilic
James Kirklin
Paul Kirshbom*
Nicholas Kouchoukos
Mark Krasna
Irving L. Kron•
Paul Krulansky
Alexander Krupnick
Hirotsugu Kurobe
John-Peder Kvitting
Damien LaPar
Harold L. Lazar•
Melissa Lee
Antoon Lerut
Bin Li
Moishe Liberman
Jules Lin
Gabriel Loor
Roberto Lorusso
Jennifer Lynch
Joren Madsen
Giuseppe Marulli
Marie McDonnell
David C. McGiffin
Olaf Mercier
Daniel Mulloy
Meena Nathan
Dao Nguyen
Chukwumere Nwogu
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Richard Ohye
David Overman
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Christian Pizarro
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Michael Robich
Mark D. Rodefeld*
Bruce Rosengard
Jack Roth
Adam Saltman
Shunji Sano•
Hartzell V. Schaff•◆
Allan Schwartz
Boris Sepesi
Ashish Sharma
Lori Soni
Erica Sood
Allan S. Stewart*
David J. Sugarbaker•◆
Patricia Thistlethwaite
Yoshiya Toyoda*
Paul Van Schil
Ori Wald
Jian Wang
Walter Weder
Tracey Weigel*
Dennis Wigle
Y. Joseph Woo*
Ronald Woods
Cameron Wright
Alon Yellin
Tae-Jin Yun
Andreas Zierer

The following faculty members have nothing to disclose with regard to commercial support. The following faculty members plan on discussing unlabeled/investigational uses of a commercial and will disclose this to the audience.

Abbas Ardehali	Inhaled nitric oxide and epoprostenol.
Jae Suk Baek	Off-label use of a polytetrafluoroethylene membrane as a valve substitute.
Alfred Kocher	Affiliation will be disclosed during presentation.
Steven Manoukian	Our manuscript relates to an investigational product, cangrelor.
V. Mohan Reddy•	Cormatrix in pediatric vasculature.
Thomas Waddell•	Steen solution, Vitrolife.
Alon Yellin	Off label use of chemotherapeutic agents in the pleural space.

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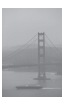

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Michael Argenziano◆	Faculty member is a consultant for Estech.
R. Duane Davis	Faculty Member is a Consultant for St. Jude, BCBS, LifeTrac and Allmed. Facutly member receives Grant/Research Support from Vitrolife.
Ranjit John	Faculty Member receives Grant/Research Support an and is a Consultant for Thoratec (Heartware).
Peter Mossop	Faculty Member receives royalties on a Dissection Stent from Cook Medical, Inc.
V. Mohan Reddy•	Faculty Member receives partial support of research costs and materials from Cormatrix.
AATS Staff	AATS Staff have nothing to disclose with regard to commercial support.

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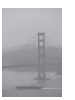


ABMS Competencies Key


Medical Knowledge


Interpersonal and Communication Skills


Patient Care


Practice-Based Learning and Improvement


Professionalism


Systems-Based Practice

This activity has been developed in recognition of the American Board of Medical Specialties Six Core Competencies. This activity will increase your competency in the areas of Patient Care, Medical Knowledge, Systems-Based Practice, Practice-Based Learning and Improvement, and Professionalism. The AATS has designated the primary competency each session will address.

Program Information

SATURDAY MORNING
April 28, 2012

8:00 a.m. – 12:00 p.m.

Medical Knowledge

ADULT CARDIAC SKILLS

Ballroom Level 3
Moscone West Convention Center

Chair: David D. Yuh
Yale University School of Medicine

MOC COMPETENCY – Medical Knowledge

Over the last decade, technological and procedural advances have led to changes in the clinical practice of cardiothoracic surgery. Many of these changes have resulted in improved clinical outcomes; however, dissemination of the technical skills integral to these advances throughout the cardiothoracic surgical community remains challenging. These practice gaps may be mitigated by providing the cardiothoracic community with an overview of established and evolving technical advances in adult cardiac surgical clinical practice. This course is designed to provide such an overview, identifying areas of both general consensus and controversy. It will highlight indications and techniques for established advanced operations, including valve-sparing aortic root replacement, aortic root enlargement, septal myectomy, and complex mitral valve repair. This course will also address evolving topics such as the rational selection of specific lesion sets used in radiofrequency ablation for atrial fibrillation, techniques for thoracoscopic and hybrid ablation for atrial fibrillation, minimally-invasive/robot-assisted mitral repair, and percutaneous aortic valve replacement.

Course Objectives

At the conclusion of this course, the participants will be able to:

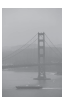
- ❏ Understand proper execution and appropriate application of established and new adult cardiac surgical techniques.
- ❏ Recognize key technical considerations for the performance of less-invasive cardiac operations, including small-incision and robot-assisted procedures.
- ❏ Critically analyze outcomes data associated with "best-practice" application of established and emerging adult cardiac surgical techniques.

SESSION I – Ischemic Heart Disease

8:00 a.m. – 8:15 a.m.	**Off-Pump Coronary Artery Bypass Grafting: Advanced Techniques and Helpful Hints** John D. Puskas *Emory University*
8:15 a.m. – 8:30 a.m.	**Post-Infarct Ventricular Septal Defect Repair: Techniques for Success** Tirone E. David *University of Toronto*
8:30 a.m. – 8:45 a.m.	**All Arterial Coronary Revascularization: What Are the Best Options?** Joseph F. Sabik *Cleveland Clinic*
8:45 a.m. – 8:55 a.m.	**DISCUSSION**

SESSION II – Valvular Disease, Part I

8:55 a.m. – 9:10 a.m.	**Aortic Root Enlargement Operations: When and How?** Lars G. Svensson *Cleveland Clinic*



9:10 a.m. – 9:25 a.m.	**Valve-Sparing Aortic Root Replacement: Technical Tips and Pitfalls** Duke E. Cameron *The Johns Hopkins Hospital*
9:25 a.m. – 9:40 a.m.	**Less Invasive Reoperations for Aortic and Mitral Valve Disease: Approaches and Techniques** Lawrence H. Cohn *Brigham and Women's Hospital*
9:40 a.m. – 9:50 a.m.	**DISCUSSION**
9:50 a.m. – 10:05 a.m.	**BREAK**

SESSION III – Valvular Disease, Part II

10:05 a.m. – 10:20 a.m.	**Mitral Repair for Complex Myxomatous Disease: Basic Principles** James S. Gammie *University of Maryland*
10:20 a.m. – 10:35 a.m.	**Techniques for Ischemic Mitral Valve Disease: An Update** D. Craig Miller *Stanford University*
10:35 a.m. – 10:50 a.m.	**Robotic and Mini-Mitral Repair: Technical Pearls** Tomislav Mihaljevic *Cleveland Clinic*
10:50 a.m. – 11:05 a.m.	**Percutaneous Aortic Valve Replacement: Patient Selection and Technical Considerations** Vinod H. Thourani *Emory University*
11:05 a.m. – 11:15 a.m.	**DISCUSSION**

SESSION IV – Specialty Operations

11:15 a.m. – 11:25 a.m.	**Ablation Operations for Atrial Fibrillation: Which Lesions Should I Use?** Michael Argenziano *Columbia University*
11:25 a.m. – 11:35 a.m.	**Thoracoscopic and Hybrid RF Ablation for Atrial Fibrillation: Advantages and Technique** John H. Sirak *Ohio State University Medical Center*
11:35 a.m. – 11:50 a.m.	**Septal Myectomy: "How I Do It"** Hartzell V. Schaff *Mayo Clinic*
11:50 a.m. – 12:00 p.m.	**DISCUSSION**
12:00 p.m.	**ADJOURN**

SATURDAY MORNING
April 28, 2012

8:00 a.m. – 12:00 p.m.

Medical Knowledge

CONGENITAL SKILLS

Room 2001-2005
Moscone West Convention Center

Chair: Joseph A. Dearani
Mayo Clinic

MOC COMPETENCY – Medical Knowledge

The theme for much of this course is obstruction of the left ventricular outflow tract. There is more than one procedure and the indications for one procedure vs. another can be controversial. The operations can be complex and morbidity and mortality can be high. The learning objective for these talks is to clarify the best operation for a given type of obstruction, and to discuss the lessons learned for operative technique and postoperative care.

Two presentations address procedures that are being performed with increasing frequency. Valve sparing root replacement (VSRR) will be discussed along with the modified one-patch technique for repair of complete atrioventricular septal defect.

The final talk covers technical approaches to the relatively common problem of transposition with abnormal coronary artery patterns.

Course Objectives

At the conclusion of this course, participants will be able to:

- ❏ List the pearls and pitfalls of procedures that address obstruction of the left ventricular outflow tract.
- ❏ Describe other operations the congenital heart surgeon frequently encounters.

8:00 a.m. – 8:15 a.m.	**Konno Procedure (AVR, Mechanical, and Ross)** Constantine Mavroudis *Cleveland Clinic*
8:15 a.m. – 8:25 a.m.	**DISCUSSION**
8:25 a.m. – 8:40 a.m.	**Modified Konno (Aortic Valve Preservation)** Glen Van Arsdell *Hospital for Sick Children*
8:40 a.m. – 8:50 a.m.	**DISCUSSION**
8:50 a.m. – 9:05 a.m.	**Septal Myectomy** Joseph A. Dearani *Mayo Clinic*
9:05 a.m. – 9:15 a.m.	**DISCUSSION**
9:15 a.m. – 9:30 a.m.	**DKS vs. Enlargement BVF** Emile A. Bacha *Children's Hospital of New York/Columbia University*
9:30 a.m. – 9:40 a.m.	**DISCUSSION**
9:40 a.m. – 10:20 a.m.	**BREAK**
10:20 a.m. – 10:35 a.m.	**LVOT Obstruction in AV Canal Defect** John W. Brown *Indiana University School of Medicine*
10:35 a.m. – 10:45 a.m.	**DISCUSSION**
10:45 a.m. – 11:00 a.m.	**VSRR in Congenital Heart Disease** Christian Pizarro *Nemours Cardiac Center, Alfred I. duPont Hospital for Children*
11:00 a.m. – 11:10 a.m.	**DISCUSSION**

11:10 a.m. – 11:25 a.m.	**Arterial Switch with Abnormal Coronaries** Francois Lacour-Gayet *Montefiore Medical Center*
11:25 a.m. – 11:35 a.m.	**DISCUSSION**
11:35 a.m. – 11:50 a.m.	**Modified 1 Patch Technique AV Canal** Carl L. Backer *Children's Memorial Hospital*
11:50 a.m. – 12:00 p.m.	**DISCUSSION**
12:00 p.m.	**ADJOURN**

SATURDAY MORNING
April 28, 2012

8:00 a.m. – 12:00 p.m.

Patient Care

GENERAL THORACIC SKILLS

Room 2007-2011
Moscone West Convention Center

Chair: Michael T. Jaklitsch
Brigham and Women's Hospital

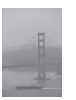
MOC COMPETENCY – Patient Care

General Thoracic surgeons are learning and performing many new surgical procedures. It is not unusual to advance to a point in doing these operations where one has mastered the individual steps, but the time to do the operation is longer than in experienced hands. This course will teach how to do the new operations in a reliably safe and easy way. In this regard, it is targeted to participants who have tried these operations but who are seeking to learn from an expert how to do it better. Spatial relationships of incisions and targets dictates ease of operation more than any other variables. Fine-tuning knowledge of incision location, operative steps, and time saving techniques will be covered specifically.

Course Objectives

At the conclusion of this course, the participants will be able to:

- ❏ Identify changes in technique that other surgeons have used to improve the technical ability to perform unusual thoracic surgery procedures.
- ❏ Develop a contact list of other surgeons with experience with unusual thoracic operations to be used as a resource in improving surgical approaches to individual patients.
- ❏ Create a local community plan to aid in natural disasters.
- ❏ Identify patients that may benefit from newer thoracic surgical techniques.



SESSION I – Surgical Lessons from Combat

8:00 a.m. – 8:15 a.m.	**Thoracic Surgical Skills from Combat Experience** Matthew Bacchetta *Columbia University*
8:15 a.m. – 8:25 a.m.	**DISCUSSION**
8:25 a.m. – 8:40 a.m.	**What a Thoracic Surgeon Needs to Know During Natural Disasters** Michael Phillips *Freeman Heart & Vascular Institute*
8:40 a.m. – 8:50 a.m.	**DISCUSSION**
8:50 a.m. – 9:05 a.m.	**Surgical Innovation Skills** Carlos M. Mery *Texas Children's Hospital*
9:05 a.m. – 9:15 a.m.	**DISCUSSION**

SESSION II – Quick and Easy: Improving Common Procedures

9:15 a.m. – 9:30 a.m.	**The Easy Way to Do a VATS Lobectomy** Robert J. McKenna, Jr. *Cedars Sinai Medical Center*
9:30 a.m. – 9:45 a.m.	**Segmentectomy Made Simple** Matthew J. Schuchert *University of Pittsburgh*
9:45 a.m. – 10:00 a.m.	**Wound VACS in Thoracic Surgery** David C. Rice *MD Anderson Cancer Center*
10:00 a.m. – 10:15 a.m.	**DISCUSSION**
10:15 a.m. – 10:30 a.m.	**BREAK**

SESSION III – Advanced Surgical Skills

10:30 a.m. – 10:45 a.m.	**Vertebrectomy and Reconstructions** Walter J. Scott *Fox Chase Cancer Center*
10:45 a.m. – 11:00 a.m.	**Creation of Artificial Ribs** Jon Wee *Brigham and Women's Hospital*
11:00 a.m. – 11:15 a.m.	**Laparoscopic Clamshell Partial Fundoplication** Rodney J. Landreneau *University of Pittsburgh*
11:15 a.m. – 11:30 a.m.	**Diaphragm Pacing** Christopher Ducko *Brigham and Women's Hospital*
11:30 a.m. – 11:45 a.m.	**Laparoscopic Diaphragmatic Plication** Jonathan D'Cunha *University of Minnesota*
11:45 a.m. – 12:00 p.m.	**DISCUSSION**
12:00 p.m.	**ADJOURN**

SATURDAY
April 28, 2012

8:00 a.m. – 5:00 p.m.

Medical Knowledge

ALLIED HEALTH PERSONNEL SYMPOSIUM

Room 3016-3018
Moscone West Convention Center

Chair: Daniel J. Goldstein
Montefiore Medical Center

MOC COMPETENCY – Medical Knowledge

The symposium, in its second year, is designed specifically to cover new developments, major topics and controversial issues that allied health personnel, including nurses, nurse practitioners, perfusionists, and physician assistants, deal with on a daily basis as they provide care to patients in the perioperative setting.

These didactic presentations, case studies and panel discussions, led by nationally recognized leaders, are designed to provide the best evidence-based recommendations. The symposium will specifically address new pharmacologic approaches for the patient requiring anticoagulation therapy, alternatives to the mangament of patients with heparin-induced thrombocytopenia, an overview of platelet inhibitors, perioperative management of pleural and pericardial effusions, atrial fibrillation, postpneumonectomy patient and transfusions among other important topics.

Course Objectives

At the conclusion of this course, the participants will be able to:

- ❏ Describe the current options for anticoagualation, management of the patient with HIT and preparation for surgery for the patient receiving platelet inhibitors.

- ❑ Implement the best management strategies for the patient with perioperative effusions, atrial fibrillation, two of the most common challenges in cardiothoracic surgery. Integrate blood conservation therapies to daily practice.
- ❑ Detail the limitations, benefits and challenges of off pump CABG, minimally invasive mitral surgery and total artificial heart technology
- ❑ Describe the current status of new techniques like TEVAR and TAVI and their impact on everyday cardiothoracic practices.

8:00 a.m. – 8:10 a.m.	**Welcome and Introduction** Daniel J. Goldstein *Montefiore Medical Center*

SESSION I – "Blood Is Thicker Than Water"

	Moderator: Nicholas Mellas, CCP *Montefiore Medical Center*
8:10 a.m. – 8:30 a.m.	**Oral Direct Thrombin Inhibitor – An Alternative to Warfarin** Wayne L. Chandler *Methodist Hospital*
8:30 a.m. – 8:50 a.m.	**Cardiac Surgery in the Patient with HIT: What Are the Options?** Gabriel Aldea *University of Washington*
8:50 a.m. – 9:10 a.m.	**Platelet Inhibitors: Type, Testing, and Timing of Surgery** Charles R. Bridges *Sanger Heart & Vascular Institute*
9:10 a.m. – 9:20 a.m.	**DISCUSSION**

SESSION II – Perioperative Considerations: Blood, Tubes, and Rhythm

	Moderator: Michael Gardocki, PA *Montefiore Medical Center*
9:20 a.m. – 9:40 a.m.	**Management of Postoperative Pleural and Pericardial Effusions** Kevin Greason *Mayo Clinic*
9:40 a.m. – 10:00 a.m.	**Perioperative Atrial Fibrillation: Prophylaxis and Treatment** Ralph Damiano *Washington University School of Medicine*
10:00 a.m. – 10:20 a.m.	**Transfusion and Blood Conservation** Kenneth Shann *Montefiore Medical Center*
10:20 a.m. – 10:30 a.m.	**DISCUSSION**
10:30 a.m. – 11:00 a.m.	**BREAK**

SESSION III – Thoracic and Congenital Cardiac Disease

	Moderator: Julie Gennarino, PA *UCSF Medical Center*
11:00 a.m. – 11:20 a.m.	**You Smoke, You Get Lung Cancer, You Die: Can Screening Change this Paradigm?** Robert J. McKenna, Jr. *Cedars-Sinai Medical Center*
11:20 a.m. – 11:40 a.m.	**Care of the Postpneumonectomy Patient** Raja Flores *Mount Sinai Medical Center*
11:40 a.m. – 12:00 p.m.	**Adult Congenital Disease** Samuel Weinstein *Montefiore Medical Center*
12:00 p.m. – 1:00 p.m.	**LUNCH**

SESSION IV – Pros and Cons

	Moderator: Daniel J. Goldstein *Montefiore Medical Center*
1:00 p.m. – 1:40 p.m.	**OPCAB Is Better than Conventional CABG**
1:00 p.m. – 1:15 p.m.	**Pro:** John D. Puskas *Emory University*
1:15 p.m. – 1:30 p.m.	**Con:** Harold Lazar *Boston Medical Center*
1:30 p.m. – 1:40 p.m.	**DISCUSSION**
1:40 p.m. – 2:20 p.m.	**Mini-MVR Is Better than Conventional MVR**
1:40 p.m. – 1:55 p.m.	**Pro:** Joseph Lamelas *Mount Sinai Medical Center*
1:55 p.m. – 2:10 p.m.	**Con:** Anelechi Anyanwu , MSc *Mount Sinai Medical Center*
2:10 p.m. – 2:20 p.m.	**DISCUSSION**
2:20 p.m. – 3:00 p.m.	**Do We Really Need an Artificial Heart?**
2:20 p.m. – 2:35 p.m.	**Pro:** Francisco Arabia *Mayo Clinic*
2:35 p.m. – 2:50 p.m.	**Con:** John V. Conte *The Johns Hopkins Hospital*
2:50 p.m. – 3:00 p.m.	**DISCUSSION**
3:00 p.m. – 3:30 p.m.	**BREAK**

SESSION V – Cardiothoracic Potpourri

	Moderator: Edward Ranzenbach, PA *UC Davis Medical*
3:30 p.m. – 3:55 p.m.	**TEVAR, TAVI, OPCAB: Is the Pump (and Perfusionist) Becoming Obsolete?** Michael J. Mack *Baylor Health Care System*
3:55 p.m. – 4:20 p.m.	**The Challenges in Surgical Education: Autonomy, Accountability, and Assessment** Edward D. Verrier *University of Washington*
4:20 p.m. – 4:45 p.m.	**Ventricular Assist Devices for Permanent Therapy: Current Status and Future Prospects** Francis D. Pagani *University of Michigan*
4:45 p.m. – 4:55 p.m.	**DISCUSSION**
4:55 p.m. – 5:00 p.m.	**CLOSING REMARKS**
5:00 p.m.	**ADJOURN**

SATURDAY AFTERNOON
April 28, 2012

1:00 p.m. – 5:10 p.m.

Professionalism

DEVELOPING THE ACADEMIC SURGEON SYMPOSIUM
Room 2007-2011
Moscone West Convention Center

Chair: John S. Ikonomidis
Medical University of South Carolina

MOC COMPETENCY – Professionalism

This symposium will provide the information that academic physicians need to navigate the specific professional facets of an academic career. Attendees will learn how to apply and negotiate for their first job, become effective surgical assistants, use simulation techniques for education, apply creativity in the conceptualization and performance of surgical procedures, incorporate basic principles to write fundable grant applications, and track and report clinical results.

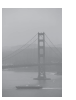
Course Objectives

At the conclusion of this course, the participants will be able to:

- ❏ Apply and negotiate for their first job.
- ❏ Become effective surgical assistants and use simulation techniques for education.
- ❏ Apply creativity in the conceptualization and performance of surgical procedures.
- ❏ Understand the current funding climate, the principles of writing fundable grant applications and tracking and reporting clinical results.

1:00 p.m. – 1:10 p.m.	**Introduction** John S. Ikonomidis *Medical University of South Carolina*
1:10 p.m. – 1:30 p.m.	**Your First Job: What Do You Want? How Do You Get It?** David J. Sugarbaker *Brigham and Women's Hospital*
1:30 p.m. – 1:50 p.m.	**Defining and Developing Your Clinical Niche** W. Randolph Chitwood, Jr. *East Carolina University*
1:50 p.m. – 2:10 p.m.	**Educating Through Effective Surgical Assistance** D. Craig Miller *Stanford University*
2:10 p.m. – 2:30 p.m.	**Using Simulation as a Teaching Tool** Edward D. Verrier *University of Washington*
2:30 p.m. – 2:50 p.m.	**Creativity in Surgery** Tirone E. David *University of Toronto*
2:50 p.m. – 3:10 p.m.	**DISCUSSION**
3:10 p.m. – 3:30 p.m.	**BREAK**
3:30 p.m. – 3:50 p.m.	**The Current Climate in Research Funding** David H. Harpole, Jr. *Duke University*
3:50 p.m. – 4:10 p.m.	**The Nuances of Successful Grant Preparation** Frank W. Sellke *Brown University*

4:10 p.m. – 4:30 p.m.	**Basic Science Research in a Busy Clinical Practice** David R. Jones *University of Virginia*
4:30 p.m. – 4:50 p.m.	**Tracking and Reporting Your Clinical Results** Robert J. Cerfolio *University of Alabama*
4:50 p.m. – 5:10 p.m.	**DISCUSSION**
5:10 p.m.	**ADJOURN**



SATURDAY AFTERNOON
April 28, 2012

1:00 p.m. – 4:45 p.m..

Patient Care

SURGICAL ROBOTS/TECHNOLOGY BAZAAR

Room 2001-2005
Moscone West Convention Center

Chair: Dennis L. Fowler
Columbia University

MOC COMPETENCY – Patient Care

Current surgical robotics technology has changed little in the past decade, yet there is great need for more intelligent technology. Presentations in this symposium will discuss current cardiothoracic surgery results using surgical robots and the following potential enhancements to surgical robots and other surgical technology:

- Enhanced robotic technology focused on better access and automation of tasks.
- The use of modern computation capabilities for patient care.
- Enhanced non-robotic technology. Presenters will include visionaries, engineers, and surgeons engaged in developing new technology for surgery.

Course Objectives

At the conclusion of this course, the participants will be able to:

❏ Describe the clinical results using currently available surgical robots in cardiothoracic surgery.

❏ Detail the limitations associated with currently available surgical robots.

❏ Discuss the potential surgical technology solutions for technical problems in surgery.

1:00 p.m. – 1:05 p.m.	**Welcome** Dennis L. Fowler *Columbia University*
1:05 p.m. – 1:15 p.m.	**Background and Current Limitations of Surgical Robotics** Dennis L. Fowler *Columbia University*
1:15 p.m. – 1:45 p.m.	**The Future of Surgical Robotics** Richard M. Satava *University of Washington.*
1:45 p.m. – 2:15 p.m.	**The Rounding Robot and TeleSurgery** Yulun Wang *InTouch Health* **This session is not accredited*
2:15 p.m. – 2:45 p.m.	**Nonrobotic New Surgical Technology** Lee Swanstrom *The Oregon Clinic*
2:45 p.m. – 3:15 p.m.	**Current Results of Robotic Thoracic Surgery** Franca Melfi *University of Pisa*
3:15 p.m. – 3:45 p.m.	**Current Results of Robotic Cardiac Surgery** W. Randolph Chitwood, Jr. *East Carolina University*
3:45 p.m. – 4:15 p.m.	**Hospital Robotics** Michael R. Treat *Robotic Systems & Technologies, Inc.* **This session is not accredited*
4:15 p.m. – 4:45 p.m.	**DISCUSSION**
4:45 p.m.	**ADJOURN**

SUNDAY
April 29, 2012

7:55 a.m. – 5:00 p.m.

Patient Care

AATS/STS ADULT CARDIAC SURGERY SYMPOSIUM

Room 3000-3012
Moscone West Convention Center

Chair: Michael Argenziano
Columbia University

MOC COMPETENCY – Patient Care

This symposium will address important new developments and updates in the broad field of adult cardiac surgery, particularly in the areas of aortic and mitral valve disease and therapies, as well as the treatment of thoracic aortic disease, coronary artery disease, and acute and chronic heart failure. Participants will gain a better understanding of the currently available results of percutaneous coronary and valvular therapies, the appropriateness of these interventions, and other novel approaches such as robotic revascularization. Participants will also hear presentations on the optimal management of postcardiotomy cardiogenic shock, the role of stent grafting techniques in chronic and acute aortic disease, and the results and indications for ventricular remodeling operations.

Finally, a review of available mechanical support systems for chronic heart failure, as well as a status update on stem cell therapy research, will be presented. Panel discussions will follow each session to allow time for questions and answers.

Course Objectives

At the conclusion of this course, the participants will be able to:

- ❑ Appropriately choose and utilize all diagnostic modalities to accurately and completely diagnose patients with valvular heart disease and coronary artery disease and justify the use of each imaging modality.
- ❑ Describe the long-term results of various techniques for surgical coronary revascularization and how they compare to percutaneous stenting, in addition to fully understanding long-term patency of various coronary bypass conduits so that surgeons may appropriately and justifiably tailor individual operations for individual patients.
- ❑ Apply evidence-based guidelines to the treatment of patients with aortic valve disease. Specifically, apply the knowledge gained from ongoing clinical trials involving trans-catheter valve therapy to patients with aortic stenosis so that they may more appropriately choose optimal therapy.
- ❑ Select appropriate treatment options and timing of interventions for all patients with aortic aneurysms and dissections. Determine when to intervene on pathologies of the aortic arch and when to utilize endovascular stent graft technologies in light of what is presently known about long-term results of such therapies.
- ❑ Describe the rationale and appropriate clinical indications for ventricular remodeling operations.
- ❑ Gain an appreciation for the indications, techniques, and results of both acute postcardiotomy mechanical support as well as long term LVAD therapy.

7:55 a.m. – 8:00 a.m.	**Welcome and Course Overview** Michael Argenziano *Columbia University*

SESSION I – Aortic Valve

8:00 a.m. – 8:25 a.m.	**Aortic Valve Repair: Techniques and Results** Allan S. Stewart *Columbia University*
8:25 a.m. – 8:45 a.m.	**Debate: TAVI Is Superior to Surgical AVR** Paul Teirstein *Scripps Clinic*
8:45 a.m. – 9:05 a.m.	**Debate: TAVI Has a Limited Role in the Treatment of AS** D. Craig Miller *Stanford University*
9:05 a.m. – 9:25 a.m.	**DISCUSSION**
9:25 a.m. – 9:50 a.m.	**BREAK**

SESSION II – Mitral Valve

9:50 a.m. – 10:10 a.m.	**Update on Clinical and Regulatory Status of Percutaneous Mitral Repair Devices** William Gray *Columbia University*
10:10 a.m. – 10:30 a.m.	**Why Surgical Mitral Repair Remains the Gold Standard** A. Marc Gillinov *Cleveland Clinic*
10:30 a.m. – 10:50 a.m.	**Optimal Treatment of Functional MR** Steven F. Bolling *University of Michigan*
10:50 a.m. – 11:00 a.m.	**DISCUSSION**

SESSION III – Ischemic Heart Disease

11:00 a.m. – 11:20 a.m.	**Update on PCI Trials: What Does the Data Show?** Mathew Williams *Columbia University*
11:20 a.m. – 11:40 a.m.	**Application of Appropriateness Criteria in Clinical Care of CAD** Peter K. Smith *Duke University*
11:40 a.m. – 12:00 p.m.	**Robotic and Hybrid Coronary Revascularization: Ready for Prime Time?** Johannes Bonatti *University of Maryland*
12:00 p.m. – 1:30 p.m.	**LUNCH SYMPOSIUM** **Managing Sleep and Fatigue in Today's Healthcare Environment: Tricks of the Trade** Scott A. Shappell *Clemson University*

SESSION IV – Thoracic Aortic Disease

1:30 p.m. – 1:55 p.m.	**Aortic Arch Surgery: Techniques and Results** Leonard N. Girardi *Cornell University*
1:55 p.m. – 2:20 p.m.	**TEVAR for Aneurysmal Disease** Grayson H. Wheatley, III *Arizona Heart Institute*

2:20 p.m. – 2:45 p.m.	**Current Approaches for the Treatment of Aortic Dissections** G. Michael Deeb *University of Michigan*
2:45 p.m. – 3:00 p.m.	**DISCUSSION**
3:00 p.m. – 3:30 p.m.	**BREAK**

SESSION V – Heart Failure

3:30 p.m. – 3:50 p.m.	**Ventricular Remodeling Operations: Is There a Need?** Lorenzo Menicanti *IRCCS Istituto Policlinico San Donato*
3:50 p.m. – 4:10 p.m.	**Current Status of Implantable VADs** John V. Conte *The Johns Hopkins Hospital*
4:10 p.m. – 4:30 p.m.	**Postcardiotomy Support: Indications, Techniques, and Results** Daniel Goldstein *Montefiore Medical Center*
4:30 p.m. – 4:50 p.m.	**Stem Cell Therapy for Heart Failure: Is Anything on the Horizon?** Robert E. Michler *Montefiore Medical Center*
4:50 p.m. – 5:00 p.m.	**DISCUSSION**
5:00 p.m.	**ADJOURN TO WELCOME RECEPTION IN EXHIBIT HALL**

SUNDAY
April 29, 2012

8:00 a.m. – 4:30 p.m.

Patient Care

AATS/STS CARDIOTHORACIC CRITICAL CARE SYMPOSIUM

Room 3016-3018
Moscone West Convention Center

Chairs: Nevin M. Katz
Johns Hopkins University

Michael S. Mulligan
University of Washington Medical Center

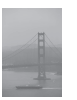
MOC COMPETENCY – Patient Care

Emphasis will be placed on the unique specialty aspects of Cardiovascular-Thoracic (CT) Critical Care including ECMO, pharmacologic and mechanical hemodynamic support, respiratory failure, renal failure, and palliative care. Fundamental areas of critical care will be presented in a case related format in order to practically relate them to specific clinical applications. A VAD hemodynamic simulation will allow participants to share issues and concerns that have arisen at their own institutions. A lunch symposium, featuring Scott A. Shappell, will focus on Sleep Deprivation and Professional Performance.

Course Objectives

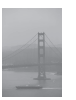
At the conclusion of this course, the participants will be able to:

- ❏ Evaluate the pharmacologic and mechanical support approach to postoperative hemodynamic impairment.
- ❏ Assess the latest clinical approaches to acute lung injury and ARDS.
- ❏ Understand the latest management of pulmonary hypertension.
- ❏ Evaluate how current ventricular assist devices and ECMO technology are employed in CT surgical patients.
- ❏ Assess how renal replacement therapy is employed for acute renal failure after cardiac surgery.



8:00 a.m. – 8:10 a.m.	**Welcome and Opening Remarks** Michael S. Mulligan *University of Washington Medical Center*
8:10 a.m. – 8:30 a.m.	**Cardiothoracic Critical Care – The Ongoing Evolution** Nevin M. Katz *Johns Hopkins University*
8:30 a.m. – 9:00 a.m.	**Balancing Pharmacologic and Mechanical Support** Robert L. Kormos *University of Pittsburgh*
9:00 a.m. – 9:30 a.m.	**Respiratory Failure: Latest Approaches to ARDS** Jonathan Haft *University of Michigan*
9:30 a.m. – 10:00 a.m.	**BREAK**
10:00 a.m. – 10:30 a.m.	**Renal Failure: Latest Technology** Ravindra L. Mehta *University of California, San Diego*
10:30 a.m. – 11:00 a.m.	**Beyond Checklists: High-Performing ICUs as Clinical Microsystems** Juan A. Sanchez *University of Connecticut Health Center*
11:00 a.m. – 12:00 p.m.	**VAD Hemodynamic Simulation** Lyle D. Joyce *University of Minnesota* Nevin M. Katz *Johns Hopkins University*

12:00 p.m. – 1:30 p.m.	**LUNCH SYMPOSIUM** **Managing Sleep and Fatigue in Today's Healthcare Environment: Tricks of the Trade** Scott A. Shappell *Clemson University*
1:30 p.m. – 1:45 p.m.	**BREAK**
1:45 p.m. – 2:15 p.m.	**Pulmonary Hypertension: Latest ICU Management** Peter Von Homeyer *University of Washington*
2:15 p.m. – 3:15 p.m.	**Case Scenarios** **Moderator:** Michael S. Mulligan *University of Washington Medical Center* **Team Leader:** Aaron M. Cheng *Harborview Medical Center* **Faculty Panel**
3:15 p.m. – 3:30 p.m.	**BREAK**
3:30 p.m. – 4:00 p.m.	**Palliative Care in the CT ICU** J. Randall Curtis *Harborview Medical Center*
4:00 p.m. – 4:30 p.m.	**ECMO: Update on Technology and Protocols** Shaf Keshavjee *University of Toronto*
4:30 p.m.	**ADJOURN**
5:00 p.m.	**ADJOURN TO WELCOME RECEPTION IN EXHIBIT HALL**



SUNDAY
April 29, 2012

7:55 a.m. – 5:00 p.m.

Patient Care

AATS/STS/EACTS CONGENITAL HEART DISEASE SYMPOSIUM

Room 2001-2003
Moscone West Convention Center

Chairs: Emile A. Bacha
Children's Hospital of New York/ Columbia University

Juan V. Comas
Pediatric Heart Institute, Hospital Universitario "12 de Octubre" Madrid

MOC COMPETENCY – Patient Care

Participants will be provided data to assist them in understanding techniques for the management of neonates with congenital heart disease, such as HLHS, decision-making between single ventricle and two-ventricle repair, perioperative management of premature neonates with a focus on cardiopulmonary bypass. Additional topics include ICU systems and environment and discussions regarding the best caregivers and providers and the ideal staffing at the bedside.

Course Objectives

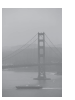
At the conclusion of this course, the participants will be able to:

- ❏ Describe modern-day approaches to HLHS management, including the role of hybrid techniques.
- ❏ Better manage specific problems seen in the premature and/or low-birth weight neonatal population.
- ❏ Approach and modify systems issues that relate to the management of cardiac neonates.
- ❏ Gain insight into biventricular vs. univentricular approaches to neonates with small left-sided structures.

7:55 a.m. – 8:00 a.m.	**Welcome and Course Overview** Emile A. Bacha *Children's Hospital of New York/Columbia University*

SESSION I – Neonatal Cardiac Surgery: HLHS

	Moderators: Pascal Vouhé *Hôpital Necker Enfants-Malades* Charles Fraser *Texas Children's Hospital*
8:00 a.m. – 8:15 a.m.	**In Favor of Hybrid Stage I** Mark E. Galantowicz *Nationwide Children's Hospital*
8:15 a.m. – 8:20 a.m.	**DISCUSSION**
8:20 a.m. – 8:35 a.m.	**In Favor of Stage I/RV-PA Conduit** David J. Barron *Birmingham Children's Hospital*
8:35 a.m. – 8:40 a.m.	**DISCUSSION**
8:40 a.m. – 8:55 a.m.	**In Favor of Stage I/BT Shunt** J. William Gaynor *Children's Hospital of Philadelphia*
8:55 a.m. – 9:00 a.m.	**DISCUSSION**
9:00 a.m. – 9:15 a.m.	**Differential Approach to HLHS Management** Emile A. Bacha *Children's Hospital of New York/Columbia University*
9:15 a.m. – 9:45 a.m.	**DISCUSSION**
9:45 a.m. – 10:00 a.m.	**BREAK**

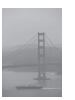


SESSION II – Specific Problems in Neonatal Cardiac Surgery

	Moderators: Juan V. Comas *Pediatric Heart Institute, Madrid* V. Mohan Reddy *Stanford University*
10:00 a.m. – 10:15 a.m.	**Low Weight and Very Low Weight Neonates: When to Delay Surgery** V. Mohan Reddy *Stanford University*
10:15 a.m. – 10:20 a.m.	**DISCUSSION**
10:20 a.m. – 10:35 a.m.	**Pitfalls in Repair of Conotruncal Anomalies** Pascal Vouhé *Hôpital Necker Enfants-Malades*
10:35 a.m. – 10:40 a.m.	**DISCUSSION**
10:40 a.m. – 10:55 a.m.	**Arch Problems in Neonates** Stephen M. Langley *Oregon Health and Science University*
10:55 a.m. – 11:00 a.m.	**DISCUSSION**
11:00 a.m. – 11:20 a.m.	**The Arterial Switch Operation Over the Last Several Decades** Jan M. Quaegebeur *Columbia University*
11:20 a.m. – 12:00 p.m.	**DISCUSSION**
12:00 p.m. – 1:30 p.m.	**LUNCH SYMPOSIUM** **Managing Sleep and Fatigue in Today's Healthcare Environment: Tricks of the Trade** Scott A. Shappell *Clemson University*

SESSION III – Systems Issues in Neonatal Cardiac Surgery and CPB

	Moderators: David J. Barron *Birmingham Children's Hospital* J. William Gaynor *Children's Hospital of Philadelphia*
1:30 p.m. – 1:45 p.m.	**Neonatal Cardiac Care: A Neonatologist's Perspective** Ganga Krishnamurthy *Children's Hospital of New York*
1:45 p.m. – 1:50 p.m.	**DISCUSSION**
1:50 p.m. – 2:05 p.m.	**Neonatal Cardiopulmonary Bypass** Philippe Pouard *Unité' Anesthésie-Réanimation, Service de Chirurgie Cardiaque Pédiatrique*
2:05 p.m. – 2:10 p.m.	**DISCUSSION**
2:10 p.m. – 2:25 p.m.	**Mechanical Assist in Neonates** David L.S. Morales *Baylor College of Medicine*
2:25 p.m. – 2:30 p.m.	**DISCUSSION**
2:30 p.m. – 2:45 p.m.	**Ideal Staffing for Perioperative Care in Neonatal Cardiac Surgery** Duncan Macrae *Royal Brompton and Harefield NHS Foundation Trust*
2:45 p.m. – 3:15 p.m.	**DISCUSSION**
3:15 p.m. – 3:30 p.m.	**BREAK**



SESSION IV – Single vs. Biventricular Repair in Borderline Left Heart: What Is The Evidence?

	Moderators: Emile A. Bacha *Children's Hospital of New York/ Columbia University* Shakeel Qureshi *Evelina Children's Hospital*
3.:30 p.m. – 3:45 p.m.	**Predicting BV Repair in the Fetal Borderline Left Heart** Wayne Tworetzky *Children's Hospital Boston*
3:45 p.m. – 3:50 p.m.	**DISCUSSION**
3:50 p.m. – 4:05 p.m.	**The Hybrid Stage I as a Staged Approach to Biventricular Repair** Shakeel Qureshi *Evelina Children's Hospital*
4:05 p.m. – 4:10 p.m.	**DISCUSSION**
4:10 p.m. – 4:25 p.m.	**Pushing the Limits in Favor of a BV Circulation** Pedro J. del Nido *Children's Hospital Boston*
4:25 p.m. – 4:30 p.m.	**DISCUSSION**
4:30 p.m. – 4:45 p.m.	**Unbalanced AVC: When Is It Time to Bail?** David M. Overman *The Children's Heart Clinic at Children's Hospitals and Clinics of Minnesota*
4:45 p.m. – 5:00 p.m.	**DISCUSSION**
5:00 p.m.	**ADJOURN TO WELCOME RECEPTION IN EXHIBIT HALL**

SUNDAY
April 29, 2012

7:55 a.m. – 5:00 p.m.

Medical Knowledge

AATS/STS GENERAL THORACIC SURGERY SYMPOSIUM

Room 2007-2011
Moscone West Convention Center

Chair: Joshua R. Sonett
Columbia University

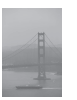
MOC COMPETENCY – Medical Knowledge

This symposium will provide an update on current and future treatments in thymic diseases, esophageal cancer, tracheal surgery, lung failure, and lung cancer. Treatment of thymic tumors and masses will be extensively covered including imaging techniques, integrating the latest staging and pathologic classifications, and the initial surgical decision making and treatment approach in thymic malignancies. Endoscopic treatment of esophageal malignancy and airway disease will be presented with an update on decision making and techniques in surgical resection of tracheal and esophageal malignancies. Exciting new opportunities in tracheal transplant will be debated. Progressive treatment of end stage lung failure, with endobronchial, diaphragmatic, and lung transplant will also be discussed in conjunction with progress in ECMO.

Course Objectives

At the conclusion of this course, the participants will be able to:

- ❏ Integrate and adapt multimodality assessment in the diagnosis, treatment, and evaluation of patients with mediastinal masses and thymic malignancies.
- ❏ Coordinate and implement newer techniques in the treatment and staging of patients with esophageal cancer.



- ❑ Demonstrate a broad understanding of the most recent techniques and approaches to lung failure.
- ❑ Adapt new evaluation methods and techniques for both early and advanced lung cancer patients.

7:55 a.m. – 8:00 a.m.	**Introduction** Joshua R. Sonett *Columbia University* **Moderators:** Joshua R. Sonett *Columbia University* Mitchell J. Magee *Medical City Dallas Hospital*

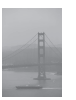
SESSION I – Mediastinal Focus on Thymic Malignancy

8:00 a.m. – 8:20 a.m.	**Imaging of Anterior Mediastinal Masses: A Paradigm Shift?** Edith M. Marom *MD Anderson Cancer Center*
8:20 a.m. – 8:40 a.m.	**Mediastinal Tumors Evaluation, Staging, and Surgical Decisions** Garrett L. Walsh *MD Anderson Cancer Center*
8:40 a.m. – 9:00 a.m.	**Surgical Approach to Thymic Malignancies: Minimally or Maximally Invasive?** Jens C. Ruckert *Charite CCM*

9:00 a.m. – 9:20 a.m.	**Induction Therapy and Surgery for Locally Advanced Thymic Malignancies** Cameron D. Wright *Massachusetts General Hospital*
9:20 a.m. – 9:30 a.m.	**DISCUSSION**
9:30 a.m. – 10:00 a.m.	**BREAK**

SESSION II – Esophageal and Airway Disease: Mini to Maxi

10:00 a.m. – 10:20 a.m.	**Endoscopic Treatment and Surveillance of Esophageal Cancer: GI Perspective** Charles Lightdale *Columbia University*
10:20 a.m. – 10:40 a.m.	**Surgical Approach to Early Esophageal Cancer: T1a to T2 What to Do?** Raphael Bueno *Brigham and Women's Hospital*
10:40 a.m. – 10:50 a.m.	**DISCUSSION**
10:50 a.m. – 11:05 a.m.	**Endoscopic Airway Treatment: New Technologies: What, When, Where, and Future Possibilities** Douglas E. Wood *University of Washington Medical Center*
11:05 a.m. – 11:20 a.m.	**Tracheal Resection Surgery: Tips, Tricks, and Limitations** Douglas J. Mathisen *Massachusetts General Hospital*



SESSION III – The Future of Tracheal Surgery: Evolving Techniques

11:20 a.m. – 11:35 a.m.	**Tracheal-Bronchial Replacement Therapy: Allotransplantation with Heterotopic Revascularization** Dirk Van Raemdonck *University Hospital Gasthuiberg*
11:35 a.m. – 11:50 a.m.	**Tracheal-Bronchial Replacement Therapy with Stem Cells: Universal Application?** Paolo Macchiarini *University Hospital Careggi*
11:50 a.m. – 12:00 p.m.	**DISCUSSION**
12:00 p.m. – 1:30 p.m.	**LUNCH SYMPOSIUM** **Managing Sleep and Fatigue in Today's Healthcare Environment: Tricks of the Trade** Scott A. Shappell *Clemson University*

SESSION IV – Lung Failure

1:30 p.m. – 1:50 p.m.	**Lung Volume Reduction Surgery and Endobronchial Therapy for Emphysema: Is It Still Viable?** Malcolm M. DeCamp *Northwestern Memorial Hospital*
1:50 p.m. – 2:10 p.m.	**Non-Pulmonary Lung Failure: Pacing, Plication, Nerve Grafting** Rafael S. Andrade *University of Minnesota*
2:10 p.m. – 2:30 p.m.	**ECMO and Beyond: Replacing the Ventilator?** Joseph B. Zwischenberger *University of Kentucky*

2:30 p.m. – 2:50 p.m.	**Lung Transplantation: Where We Are and Where We Are Going** Shaf Keshavjee *University of Toronto*
2:50 p.m. – 3:00 p.m.	**DISCUSSION**
3:00 p.m. – 3:30 p.m.	**BREAK**

SESSION IV – Rapid Communication Update in Lung Cancer Evaluation and Techniques

3:30 p.m. – 3:45 p.m.	**Management of GGO and Other Lesions Found on Screening CT Scan** David R. Jones *University of Virginia*
3:45 p.m. – 4:00 p.m.	**Management of Multifocal Lung Cancer** Paul De Leyn *University Hospitals Leuven*
4:00 p.m. – 4:15 p.m.	**Minimally Invasive Surgery of Locally Advanced Lung Cancer** Thomas A. D'Amico *Duke University*
4:15 p.m. – 4:30 p.m.	**Minimally Invasive Sleeve Resections** Robert J. McKenna, Jr. *Cedars-Sinai Medical Center*
4:30 p.m. – 4:45 p.m.	**Implications of Molecular and Chemosensitivity Testing: What Drug for What Marker—Are We There?** Harvey I. Pass *New York University*
4:45 p.m. – 5:00 p.m.	**DISCUSSION**
5:00 p.m.	**ADJOURN TO WELCOME RECEPTION IN EXHIBIT HALL**

SUNDAY, APRIL 29, 2012

C. WALTON LILLEHEI RESIDENT FORUM SESSION

2008, Moscone West Convention Center

3:00 p.m. – 5:00 p.m. **15th Annual C. Walton Lillehei Resident Forum**

(7 minute presentation, 8 minute discussion)

Moderators: Marc R. Moon
Washington University of St. Louis
Thomas Waddell
University of Toronto

L1. CD11c+ Dendritic Cells Mediate Lung Ischemia-Reperfusion Injury Through an IL-23-Dependent Mechanism

Matthew L. Stone, Ashish K. Sharma, Lucas G. Fernandez, Vanessa A. Hajzus, Daniel P. Mulloy, Victor E. Laubach, Irving L. Kron+
Department of Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Daniel Kreisel

L2. Ex Vivo Reconditioning of Non-Heart-Beating Donor Lungs in a Preclinical Porcine Model: Delayed Perfusion Results in Superior Lung Function

Daniel P. Mulloy, Matthew L. Stone, Ivan K. Crosby+, Damien J. LaPar, Christine L. Lau+, Victor E. Laubach, Irving L. Kron+
Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: David P. Mason

+AATS Member

L3. Knockdown of Secretory Phospholipase A2 Reduces Lung Cancer Growth In Vitro and In Vivo

Jessica A. Yu[1], David Mauchley[1], Howard Li[2], Xianzhong Meng[1], Raphael A. Nemenoff[2], David A. Fullerton[+1], Michael J. Weyant[1]

1. Department of Surgery, University of Colorado School of Medicine, Aurora, CO, United States. 2. Department of Medicine, University of Colorado School of Medicine, Aurora, CO, United States.

Invited Discussant: David S. Schrump

L4. A Stem Cell Ligand Induced by Cigarette Smoke Enhances the Malignant Phenotype of Lung Cancer Cells

Robert T. Ripley, Clinton D. Kemp, Aarti Mathur, Julie A. Hong, Mary Zhang, Mahadev Rao, David S. Schrump[+]

Surgery Branch, National Cancer Institute, Bethesda, MD, United States.

Invited Discussant: Dao M. Nguyen

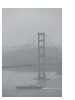
L5. Mesothelin Promotes Mesothelioma Cell Invasion and MMP-9 Secretion in an Orthotopic Mouse Model and in Malignant Pleural Mesothelioma (MPM) Patients: A Potential Mechanism for MPM Regional Aggressiveness

Elliot L. Servais[1,2], Christos Colovos[1,2], Luis Rodriguez[1,2], Adam J. Bograd[1,2], Jun-ichi Nitadori[1], Camelia Sima[3], Michel Sadelain[2,4], Valerie W. Rusch[+1], Prasad S. Adusumilli[1,]

1. Division of Thoracic Surgery, Memorial Sloan-Kettering Cancer Center, New York, NY, United States. 2. Center for Cell Engineering, Memorial Sloan-Kettering Cancer Center, New York, NY, United States. 3. Department of Epidemiology & Biostatistics, Memorial Sloan-Kettering Cancer Center, New York, NY, United States. 4. Department of Medicine, Memorial Sloan-Kettering Cancer Center, New York, NY, United States.

Invited Discussant: Raphael Bueno

[+]AATS Member



L6. Ischemia-Reperfusion Causes a Dynamic Microrna Interstitial Signature: Relation to Membrane Type-1 Matrix Metalloproteinase Activity and Regional Contractility

Shaina R. Eckhouse[1], Christina B. Logdon[1], J. Marshall Oelsen[1], Elizabeth C. O'Quinn[1], Robert E. Stroud[1], Jeffrey A. Jones[1,2], Rupak Mukherjee[1], John S. Ikonomidis[+1], Francis G. Spinale[+3,4]

1. Division of Cardiothoracic Surgery, Medical University of South Carolina, Charleston, SC, United States. 2. Ralph H. Johnson Veterans Affairs Medical Center, Charleston, SC, United States. 3. Division of Cell Biology and Anatomy, University of South Carolina School of Medicine, Columbia, SC, United States. 4. William Jennings Bryan Dorn Veterans Affairs Medical Center, Columbia, SC, United States.

Invited Discussant: Paul W. Fedak

L7. Metformin Alters the Insulin Signaling Pathway in Ischemic Cardiac Tissue in a Swine Model of Metabolic Syndrome

Nassrene Y. Elmadhun, Antonio D. Lassaletta, Louis M. Chu, Frank W. Sellke[+]

Division of Cardiothoracic Surgery Cardiovascular Research Center, Warren Alpert Medical School, Brown University, Providence, RI, United States.

Invited Discussant: Harold L. Lazar

L8. Sirtuin 6 Is a Critical Determinant of Endothelial Function in Mice

Lawrence E. Greiten[+1,2], Carolyn Roos[1], Fritz-Patrick Jahns[1,3], Jordan D. Miller[+1,2]

1. Department of Physiology and Biomedical Engineering, Mayo Clinic, Rochester, MN, United States. 2. General Surgery, Mayo Clinic, Rochester, MN, United States. 3. Kings College, London, United Kingdom.

Invited Discussant: Joseph D. Schmoker

5:00 p.m. **ADJOURN TO WELCOME RECEPTION IN EXHIBIT HALL**

[+]AATS Member

MONDAY, APRIL 30, 2012

7:30 a.m. **Business Session**
(*AATS Members Only*)
Ballroom Level 3, Moscone West Convention Center

7:45 a.m. **PLENARY SCIENTIFIC SESSION**
Ballroom Level 3 , Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Craig R. Smith
Thoralf M. Sundt, III

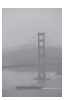
1. Long-Term Mechanical Circulatory Support (Destination Therapy): On Track to Compete with Heart Transplantation?
James K. Kirklin+[1], David C. Naftel[1], Francis D. Pagani+[2], Robert L. Kormos+[3], Lynne Stevenson[4], James B. Young[5]
1. Cardiothoracic Surgery, University of Alabama at Birmingham, Birmingham, AL, United States. 2. Cardiac Surgery, University of Michigan, Ann Arbor, MI, United States. 3. Cardiothoracic Surgery, University of Pittsburgh, Pittsburgh, PA, United States. 4. Cardiovascular Medicine, Brigham and Women's Medical Center, Boston, MA, United States. 5. Cardiovascular Disease, Cleveland Clinic Foundation, Cleveland, OH, United States.

Invited Discussant: Soon J. Park

2. Experience with 50 Ex Vivo Lung Perfusions in Clinical Lung Transplantation
Marcelo Cypel, Jonathan Yeung, Tiago Machuca, Manyin Chen, Lianne Singer, Kazuhiro Yasufuku+, Marc de Perrot+, Andrew F. Pierre+, Thomas K. Waddell+, Shaf Keshavjee+
Thoracic Surgery, University of Toronto, Toronto, ON, Canada.

Invited Discussant: R. Duane Davis

+AATS Member



3. The Natural and Unnatural History of the Systemic Right Ventricle in Adult Survivors of Atrial Switch for Complete Transposition of the Great Arteries and Congenitally Corrected Transposition of the Great Arteries

Richard Dobson[1,2], Niki Walker[1], Mark Danton[+1], Hamish Walker[1]
1. Scottish Adult Congenital Cardiac Service, Golden Jubilee National Hospital, Glasgow, Dunbartonshire, United Kingdom. 2. College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, United Kingdom.

Invited Discussant: Shunji Sano

4. Right Atrial Lesions Do Not Confer an Efficacy Benefit When Added to a Full Left Atrial Lesion Set in the Treatment of Atrial Fibrillation—but May Increase Procedural Morbidity

Lori Soni, Sophie R. Cedola, Jacob Cogan, Jeffrey Jiang, Alexandra J. Ross, Lewis Hwang, Jonathan A. Yang, Edward Chan, Halit Yerebakan, Hiroo Takayama, Faisal H. Cheema, Michael Argenziano[+]
Cardiothoracic Surgery, New York Columbia Presbyterian, New York, NY, United States.

Invited Discussant: Ralph J. Damiano, Jr.

9:05 a.m. **AWARD PRESENTATIONS**

9:20 a.m. **INTERMISSION – VISIT EXHIBITS/COFFEE BREAK**
Exhibit Hall/Moscone West Convention Center

10:00 a.m. **BASIC SCIENCE LECTURE**

"Will a Robot Take Your Job?"
John E. Bares
Carnegie Robotics LLC

Introduced By: Craig R. Smith

[+]AATS Member

10:40 a.m. **PLENARY SCIENTIFIC SESSION**

Moderators: Hartzell V. Schaff
Thoralf M. Sundt, III

5. Mitral Valve Repair or Replacement for Ischemic Mitral Regurgitation? The Italian Study on the Treatment of Ischemic Mitral Regurgitation (ISTIMIR)

Roberto Lorusso[1], Sandro Gelsomino[2], Giuseppe De Cicco[1], Fabiana Luca[2], Antonio Messina[3], Gianni Troise[3], Valentino Borghetti[4], Alessandro Pardini[4], Filiberto Serraino[5], Attilio Renzulli[5], Davide Pacini[6], Roberto DiBartolomeo[6], Alessandro Parolari[7], Francesco Alamanni[7], Philippe Caimmi[8], Ezio Micalizzi[8], Antonio Miceli[9], Mattia Glauber[9], Ugolino Livi[+10], Fabio Ius[10], Giovanni Mariscalco[11], Cesare Beghi[11], Francesco Nicolini[12], Tiziano Gherli[12], Paolo Ferrazzi[13], Carlo Fino[13], Michele Di Mauro[14], Antonio Calafiore[14]

1. Cardiac Surgery, Community Hospital, Brescia, Italy. 2. Cardiac Surgery, Careggi Hospital, Florence, Italy. 3. Cardiac Surgery, Poliambulanza Hospital Brescia, Brescia, Italy. 4. Cardiac Surgery, Terni Hospital, Terni, Italy. 5. Cardiac Surgery, Germaneto Hospital, Catanzaro, Italy. 6. Cardiac Surgery, S. Orsola Hospital, Bologna, Italy. 7. Cardiac Surgery, Monzino Hospital, Milan, Italy. 8. Cardiac Surgery, Community Hospital, Novara, Italy. 9. Cardiac Surgery, Pasquinucci Hospital, Massa, Italy. 10. Cardiac Surgery, Community Hospital, Udine, Italy. 11. Cardiac Surgery, Community Hospital, Varese, Italy. 12. Cardiac Surgery, Community Hospital, Parma, Italy. 13. Cardiac Surgery, Community Hospital, Bergamo, Italy. 14. Cardiac Surgery, Community Hospital, Catania, Italy.

Invited Discussant: Irving L. Kron

[+]AATS Member

6. Pulmonary Resections Performed at Cardiothoracic Surgery Teaching Hospitals Have Superior Outcomes

Castigliano M. Bhamidipati, George J. Stukenborg, Christine L. Lau+, Benjamin D. Kozower+, David R. Jones+

Division of Thoracic and Cardiovascular Surgery, Department of Surgery, University of Virginia School of Medicine, Charlottesville, VA, United States.

Invited Discussant: Mark J. Krasna

11:25 a.m. **PRESIDENTIAL ADDRESS**

"To Model Excellence"
Craig R. Smith
Columbia University

Introduced By: Hartzell V. Schaff

12:15 p.m. **ADJOURN FOR LUNCH – VISIT EXHIBITS**
Exhibit Hall, Moscone West Convention Center

+AATS Member

2:00 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

(8 minute presentation, 12 minute discussion)

Moderators: Friedhelm Beyersdorf
Joseph Sabik

7. Sutureless Aortic Valve Replacement as an Alternative Treatment for Patients Belonging to the "Grey Zone" Between Transcatheter Aortic Valve Implantation and Conventional Surgery: A Propensity Matched, Multicenter Analysis

Augusto D'Onofrio[1], Antonio Messina[2], Roberto Lorusso[3], Ottavio R. Alfieri[+4], Melissa Fusari[5], Paolo Rubino[6], Mauro Rinaldi[7], Roberto Di Bartolomeo[8], Mattia Glauber[9], Giovanni Troise[2], Gino Gerosa[+1]

1. Division of Cardiac Surgery, University of Padova, Padova, Italy. 2. Division of Cardiac Surgery, Poliambulanza Hospital, Brescia, Italy. 3. Division of Cardiac Surgery, Community Hospital, Brescia, Italy. 4. Department of Cardiac Surgery, San Raffaele University Hospital, Milan, Italy. 5. Department of Cardiovascular Sciences, Centro Cardiologico Monzino, IRCCS, University of Milan, Milan, Italy. 6. Invasive Cardiology Laboratory, Cardiology Division, Montevergine Clinic, Mercogliano, Italy. 7. Division of Cardiac Surgery, University of Turin, Turin, Italy. 8. Division of Cardiac Surgery, University of Bologna, Bologna, Italy. 9. Department of Adult Cardiac Surgery, G. Pasquinucci Heart Hospital, Massa, Italy.

Invited Discussant: Thierry-Pierre Carrel

8. Transcatheter Heart Valves as a Valve-in-Valve Implantation in Patients with Degenerated Aortic Bioprostheses

Vinayak Bapat[1], Rizwan Q. Attia[1], Hassan Y. Tehrani[1], Martyn Thomas[2], Simon Redwood[2], Jane Hancock[2], Kirsty Macgillivary[2], Karen Wilson[2], Christopher Young[1]

1. Cardiothoracic Surgery, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom. 2. Cardiology, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom.

Invited Discussant: Anson Cheung

[+]AATS Member

9. The CURE-AF Trial: A Prospective, Multicenter Trial of Irrigated Radiofrequency Ablation for the Treatment of Persistent Atrial Fibrillation During Concomitant Cardiac Surgery

Ralph J. Damiano, Jr.[+1], Vinay Badhwar[+2], Michael Acker[+3], Ramesh Veeragandham[4], Thoralf M. Sundt, III[+5]

1.Washington University School of Medicine. 2.University of Pittsburgh Medical Center. 3.Hospital of the University of Pennsylvania. 4.John Muir Medical Center. 5.Massachusetts General Hospital.

Invited Discussant: Niv Ad

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**

Exhibit Hall, Moscone West Convention Center

3:35 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

Ballroom Level 3, Moscone West Convention Center

Moderators: Friedhelm Beyersdorf
Joseph Sabik

10. Selective Antegrade Cerebral Perfusion and Mild (28–30°C) Systemic Hypothermic Circulatory Arrest for Aortic Arch Replacement: Results from 1002 Patients

Andreas Zierer[1], Ali El-Sayed Ahmad[1], Nestoras Papadopoulos[1], Anton Moritz[1], Anno Diegeler[2], Paul P. Urbanski[2]

1. Division of Thoracic and Cardiovascular Surgery, Johann-Wolfgang-Goethe University Frankfurt/Main, Germany, Frankfurt Main, Germany. 2. Cardiovascular Clinic Bad Neustadt, Bad Neustadt, Germany.

Invited Discussant: Nicholas T. Kouchoukos

11. Orthotopic Heart Transplant Versus Left Ventricular Assist Device: A National Comparison of Cost and Survival

Daniel P. Mulloy, Castigliano M. Bhamidipati, Matthew L. Stone, Gorav Ailawadi[+], Irving L. Kron[+], John A. Kern[+]

Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Ranjit John

[+]AATS Member

12. Update on Reinterventions and Risk Factors for Reoperation in 2000 Patients After the Ross Procedure—Results of the German-Dutch Ross Registry

Efstratios Charitos[1], Thorsten Hanke[1], Armin W. Gorski[2], Wolfgang Hemmer[3], Cornelius Botha[4], Ulrich Franke[5], Ali Dodge-Khatami[6], Juergen Hoerer[7], Rudiger S. Lange[7], Anton Moritz[8], Katharina Ferrari-Kuehne[9], Roland Hetzer[10], Michael Huebler[10], Ad Bogers[11], Johanna Takkenberg[11], Ulrich Stierle[1], Hans-Hinrich Sievers[+1]

1. Cardiac and Thoracic Vascular Surgery Clinic, University of Luebeck, Luebeck, Germany. 2. Thoracic, Cardiac and Vascular Surgery Clinic, University of Wuerzburg, Wuerzburg, Germany. 3. Heart Surgery Clinic, Sana Stuttgart, Stuttgart, Germany. 4. Cardiac Surgery Clinic, Bodensee Heart Center, Konstanz, Germany. 5. Cardiac and Vascular Surgery Clinic, Robert Bosch Hospital, Stuttgart, Germany. 6. Heart Surgery Clinic, University of Hamburg, Hamburg, Germany. 7. Heart Surgery Clinic, German Heart Center, Munich, Germany. 8. Cardiac and Thoracic Surgery Clinic, Johann Wolfgang Goethe-University, Frankfurt/Main, Germany. 9. Cardiac and Thoracic Surgery Clinic, University of Jena, Jena, Germany. 10. Heart Surgery Clinic, German Heart Center, Berlin, Germany. 11. Heart Surgery Clinic, Erasmus Medical Center, Rotterdam, Netherlands.

Invited Discussant: Joseph A. Dearani

13. A Randomized Comparison of the SAphenous VEin Versus Right Internal Thoracic Artery as a Y-Composite Graft (SAVE-RITA Trial)—An Interim Report

Ho Young Hwang, Se J. Oh, Jun Sung Kim, Ki-Bong Kim[+]

Department of Thoracic & Cardiovascular Surgery, Seoul National University Hospital, Seoul, Republic of Korea.

Invited Discussant: Brian F. Buxton

5:00 p.m. **ADJOURN**

[+]AATS Member

2:00 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Emile A. Bacha
Shunji Sano

14. Long-Term Functional Health Status of Patients with Pulmonary Atresia with Intact Ventricular Septum: A Congenital Heart Surgeons Society Study

Tara Karamlou[1], Jeffrey A. Poynter[2], Marshall L. Jacobs[+3], Jonathan Rhodes[4], Igor Bondarenko[7], Sara Pasquali[9], Stephanie Fuller[6], Linda M. Lambert[5], Henry L. Walters[+7], Kim Duncan[8], Eugene H. Blackstone[+3], William G. Williams[+2], Christopher A. Caldarone[+2], Brian McCrindle[2]

1. Pediatric Cardiothoracic Surgery, Seattle Children's Hospital, Seattle, WA, United States. 2. Cardiac Surgery, The Hospital for Sick Children, Toronto, ON, Canada. 3. Cardiothoracic Surgery, The Cleveland Clinic, Cleveland, OH, United States. 4. Pediatric Cardiology, Children's Hospital of Boston, Boston, MA, United States. 5. Cardiothoracic Surgery, Primary Children's Hospital, Salt Lake City, UT, United States. 6. Cardiothoracic Surgery, Children's Hospital of Pennsylvania, Philadelphia, PA, United States. 7. Cardiothoracic Surgery, Children's Hospital of Michigan, Detroit, MI, United States. 8. Cardiothoracic Surgery, University of Nebraska, Omaha, NE, United States. 9. Pediatric Cardiology, Duke University, Durham, NC, United States.

Invited Discussant: V. Mohan Reddy

[+]AATS Member

15. Cerebral Oxygen Extraction Is Increased After Cardiac Surgery in Neonates and Is Not Related to Use of Deep Hypothermic Circulatory Arrest

Erin M. Buckley[1,4], Donna A. Goff[2], Jennifer M. Lynch[4], Peter Schwab[1], Susan C. Nicolson[3], Lisa M. Montenegro[3], Arjun G. Yodh[4], J. William Gaynor[2], Thomas L. Spray[2], Daniel J. Licht[1]

1. Neurology, Children's Hospital of Philadelphia, Philadelphia, PA, United States. 2. Cardiology, Children's Hospital of Philadelphia, Philadelphia, PA, United States. 3. Cardiothoracic Anesthesia, Children's Hospital of Philadelphia, Philadelphia, PA, United States. 4. Physics and Astronomy, University of Pennsylvania, Philadelphia, PA, United States.

Invited Discussant: Christian Pizarro

16. Predictive Value of Pre- and Post-Operative Near-Infrared Spectroscopy on Neurodevelopmental Outcomes Following Cardiac Surgery in Infancy

Erica Sood[1,2], Julie Simons[1,2], Ryan Davies[1], Edward Woodford[1], Christian Pizarro[+1]

1. Nemours Cardiac Center, Nemours/Alfred I. duPont Hospital for Children, Wilmington, DE, United States. 2. Department of Pediatrics, Division of Behavioral Health, Nemours/Alfred I. duPont Hospital for Children, Wilmington, DE, United States.

Invited Discussant: Charles D. Fraser

17. Post-Operative Electroencephalographic Seizures Are Associated with Worse Executive Function and Behavior at Four Years of Age Following Cardiac Surgery in Infancy

J. William Gaynor[+1], Ramakrishnan Rajagopalan[2], Marsha Gerdes[1], Gail P. Jarvik[2], Judy Bernbaum[1], Gil Wernovsky[1], Susan C. Nicolson[1], Thomas L. Spray[+1], Robert R. Clancy[1]

1. Children's Hospital of Philadelphia, Philadelphia, PA, United States. 2. University of Washington School of Medicine, Seattle, WA, United States.

Invited Discussant: V. Mohan Reddy

3:20 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**

Exhibit Hall, Moscone West Convention Center

[+]AATS Member

3:55 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center

Moderators: Emile A. Bacha
Shunji Sano

18. Long-Term Results of a Strategy of Aortic Valve Repair in the Pediatric Population: Should We Avoid Cusp Extension?

Yves d'Udekem[1], Javariah V. Siddiqui[1], Ajay J. Iyengar[1], Igor E. Konstantinov[+1], Darren Hutchinson[2], Michael M. Cheung[2], Christian P. Brizard[1]

1. Cardiac Surgery Unit, Royal Children's Hospital, Parkville, VIC, Australia. 2. Cardiology, Royal Children's Hospital, Melbourne, VIC, Australia.

Invited Discussant: Kristine Guleserian

19. Unloading of the Right Ventricle by Partial Cavopulmonary Connection in HLHS Patients Leads to a Decrease in the Tricuspid Valve Annulus but Does Not Improve the Tricuspid Regurgitation

Jelena Kasnar-Samprec[1], Andreas Kühn[2], Jürgen Hörer[1], Manfred O. Vogt[2], Julie Cleuziou[1], Rudiger S. Lange[1], Christian Schreiber[1]

1. Department of Cardiovascular Surgery, German Heart Center Munich, Munich, Germany. 2. Department of Pediatric Cardiology and Congenital Heart Disease, German Heart Center Munich, Munich, Germany.

Invited Discussant: Pedro J. del Nido

[+]AATS Member

20. Twenty-Four Hour Ambulatory Blood Pressure Monitoring Detects a High Incidence of Hypertension Late After Coarctation Repair in Patients with Hypoplastic Arches

Melissa G. Lee[1,2], Yves d'Udekem[1,2], Igor E. Konstantinov[+1,2], T.h. Goh[3], Leeanne Grigg[4], Michael M. Cheung[2,5], Bryn Jones[2,5], Remi Kowalski[2,5], Jane Koleff[2,5], Christian P. Brizard[1,2]

1. Cardiac Surgery, Royal Children's Hospital, Parkville, VIC, Australia.
2. Murdoch Children's Research Institute, Melbourne, VIC, Australia.
3. Cardiology, Monash Medical Centre, Clayton, VIC, Australia.
4. Cardiology, The Royal Melbourne Hospital, Parkville, VIC, Australia.
5. Cardiology, Royal Children's Hospital, Parkville, VIC, Australia.

Invited Discussant: J. William Gaynor

5:00 p.m. **ADJOURN**

[+]AATS Member

2:00 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

2007, 2009, 2011 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Joseph B. Shrager
Gaetano Rocco

21. Endoscopic Ultrasound Is Insufficient for Recommending Endoscopic Management of Early Staged Esophageal Cancers
Edward J. Bergeron, Jules Lin, Andrew C. Chang+, Mark B. Orringer+, Rishindra M. Reddy
Section of Thoracic Surgery, University of Michigan, Ann Arbor, MI, United States.

Invited Discussant: Steven R. DeMeester

22. A Comparison of Quality and Cost Indicators by Surgical Specialty for Lobectomy of the Lung
Richard K. Freeman, Theresa Giannini, Anthony J. Ascioti
Thoracic Surgery, St. Vincent Hospital, Indianapolis, IN, United States.

Invited Discussant: Thomas A. D'Amico

23. Clinical Indications and Results Following Chest Wall Resection of Recurrent Mesothelioma in 50 Consecutive Patients
Syed O. Ali, Brian Burt, Marcelo Dasilva, Tamara R. Tilleman, David J. Sugarbaker+
Division of Thoracic Surgery, Brigham and Women's Hospital, Boston, MA, United States.

Invited Discussant: Walter Weder

+AATS Member

24. Pattern of Lymphatic Spread in Thoracic Esophageal Squamous Cell Carcinoma: A Report of 1361 Cases from East China

Bin Li, Haiquan S. Chen+, Jiaqing Xiang, Yawei Zhang, Chengguang Li, Haichuan Hu, Yang Zhang

Thoracic Surgery, Fudan University Shanghai Cancer Center, Shanghai, Shangahi, China.

Invited Discussant: Antoon E. Lerut

3:20 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**

Exhibit Hall, Moscone West Convention Center

3:55 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

2007, 2009, 2011 Moscone West Convention Center

Moderators: Joseph B. Shrager
Gaetano Rocco

25. Robot-Aided Thoracoscopic Thymectomy for Early Stage Thymoma: A Multicenter European Study

Giuseppe Marulli[1], Federico Rea[1], Franca M. Melfi+[2], Thomas Schmid[3], Mahmoud Ismail[4], Olivia Fanucchi[2], Florian Augustin[3], Marc Swierzy[4], Francesco Di Chiara[1], Alfredo Mussi[2], Jens C. Rueckert[4]

1. Department of Cardiothoracic and Vascular Sciences, Division of Thoracic Surgery, University of Padua, Italy, Thoracic Surgery—University of Padova, Padova, Italy. 2. Thoracic Surgery, Pisa, Italy. 3. Thoracic Surgery, Innsbruck, Austria. 4. Thoracic Surgery, Berlin, Germany.

Invited Discussant: Cameron D. Wright

+AATS Member

26. Partial Atrial Resection Without Cardiopulmonary Bypass in Locally Advanced Non-Small Cell Lung Cancer

Domenico Galetta, Alessandro Borri, Roberto I. Gasparri, Francesco Petrella, Lorenzo Spaggiari

Division of Thoracic Surgery, European Institute of Oncology, Milan, Italy.

Invited Discussant: M. Blair Marshall

27. Long-Term Survival and Quality of Life After Pneumonectomy for Non-Small Cell Lung Cancer

Ayesha S. Bryant, Robert J. Cerfolio+

University of Alabama at Birmingham, Birmingham, AL, United States.

Invited Discussant: Michael J. Liptay

5:00 p.m. **AATS Consensus Guidelines for Lung Cancer Screening**
Michael T. Jaklitsch

5:10 p.m. **ADJOURN**

+AATS Member

TUESDAY, MAY 1, 2012

7:00 a.m. **CARDIAC SURGERY FORUM SESSION**
Ballroom Level 3 , Moscone West Convention Center
(5 minute presentation, 5 minute discussion)

Moderators: Mark D. Rodefeld
Todd K. Rosengart

F1. Pulmonary Endothelial Cell Phenotypic and Genetic Alterations in a Large Animal Model of Pulmonary Arteriovenous Malformations Following the Glenn Shunt

Minoo N. Kavarana[1], John S. Ikonomidis[+1], Rupak Mukherjee[1], Jeffrey A. Jones[1], Shaina R. Eckhouse[1], Robert E. Stroud[1], Francis G. Spinale[1,2], Scott M. Bradley[+1]
1. Cardiothoracic Surgery, Medical University of South Carolina, Charleston, SC, United States. 2. Cardiothoracic Surgery, University of South Carolina, Columbia, SC, United States.

Invited Discussant: Paul Kirshbom

F2. Biventricular Fontan Circulation: Chronic Cavopulmonary Assist Using a Viscous Impeller Pump

Mark D. Rodefeld[+1], Jonathan E. DeGan[2], Dinesh Shetty[2], Anna-Elodie M. Kerlo[2], Yann Delorme[2], Jun Chen[2], Guruprasad A. Giridharan[3], Steven Frankel[2]
1. Department of Surgery, Indiana University School of Medicine, Indianapolis, IN, United States. 2. Mechanical Engineering, Purdue University, West Lafayette, IN, United States. 3. Bioengineering, University of Louisville, Louisville, KY, United States.

Invited Discussant: Jennifer C. Hirsch

[+]AATS Member

F3. Pulmonary Arteries Reconstruction with a Small Intestine Submucosa Patch: Viability and Growth Potential in a Chronic Lamb Surgical Model

Lorenzo Boni[1], Fariba Chalajour[1], Takashi Sasaki[1], Walter D. Boyd[2], William T. Ferrier[3], Laura A. Barboza[1], John T. Yeung[1], Radhika L. Snyder[1], R. Kirk Riemer[1], V. Mohan Reddy[+1]

1. Department of Cardiothoracic Surgery, Division of Pediatric Cardiac Surgery, Stanford University, Stanford, CA, United States. 2. Department of Cardiothoracic Surgery, UC Davis Medical Center, Davis, CA, United States. 3. Department of Medicine and Epidemiology, UC Davis School of Veterinary Medicine, Davis, CA, United States.

Invited Discussant: Frank A. Pigula

F4. Complete Thymectomy During Cardiac Surgery in Early Infancy Reduces Circulating T-Cells and Vaccination-Induced IgG Responses: A Study of Three Year Tracing

Hirotsugu Kurobe[1,2], Takashi Tominaga[3,4], Masahisa Urata[1,3], Mikio Sugano[1,3], Yoichiro Hirata[5], Miho Sakata[6], Yasunobu Hayabuchi[6], Takashi Kitaichi[1], Takaki Hori[1], Yoshiyasu Egawa[3], Yousuke Takahama[2], Tetsuya Kitagawa[1]

1. Department of Cardiovascular Surgery, IHBS, the University of Tokushima Graduate School, Tokushima-shi, Tokushima, Japan. 2. Division of Experimental Immunology, Institute for Health Biosciences, Graduate School of Medical Sciences, Tokushima-shi, Tokushima, Japan. 3. Division of Cardiovascular Surgery, Kagawa Children's Hospital, Zentsuji-shi, Kagawa, Japan. 4. Division of Cardiovascular Surgery, Ehime Prefectural Central Hospital, Matsuyama-shi, Ehime, Japan. 5. Department of Pediatrics, Graduate School of Medicine, The University of Tokyo, Bunkyou-ku, Tokyo, Japan. 6. Department of Pediatrics, Institute for Health Biosciences, Graduate School of Medical Sciences, Tokushima-shi, Tokushima, Japan.

Invited Discussant: Joren C. Madsen

[+]AATS Member

F5. Functional Protein Network Mapping of Cardiac Tissue Mitochondria Reveals Aberrant Activation of a Common Lipogenic-Glycogenic Signaling Axis in Patients with Atrial Fibrillation

Niv Ad[+1], Julie Wulfkuhle[2], Maryam Goudarzi[2], Jianghong Deng[2], Lisa M. Martin[1], Chidima Martin[1], Mark Ross[2], Lance Liotta[2], Emanuel Petricoin[2]

1. Cardiac Surgery Research, Inova Heart and Vascular Institute, Falls Church, VA, United States. 2. Center for Applied Proteomics and Molecular Medicine, George Mason University, Manassas, VA, United States.

Invited Discussant: Adam Saltman

F6. Resveratrol Preserves Myocardial Function and Reduces Glucose Intolerance by Activating the AMP-Activated Protein Kinase-Alpha Pathway in a Hypercholesterolemic Swine Model of Chronic Myocardial Ischemia

Michael P. Robich[1], Louis M. Chu[1], Tai Ho Shin[2], Warren J. Manning[3], Frank W. Sellke[+2]

1. Surgery, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, United States. 2. Surgery, Warren Alpert School of Medicine, Brown University, Providence, RI, United States. 3. Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, United States.

Invited Discussant: Bruce R. Rosengard

F7. The Impact of Temperature and Pump Flow Rate During Selective Cerebral Perfusion on Regional Blood Flow in Piglets

Jian Wang[1], Richard M. Ginther[1], Matthew Riegel[2], Rong Huang[3], Mahesh S. Sharma[1], Kristine J. Guleserian[1], Joseph M. Forbess[+1]

1. Pediatric Cardiothoracic Surgery, Children's Medical Center, University of Texas Southwestern Medical Center, Dallas, TX, United States. 2. Animal Resources Center, University of Texas Southwestern Medical Center, Dallas, TX, United States. 3. Clinical Research Department, Children's Medical Center, University of Texas Southwestern Medical Center, Dallas, TX, United States.

Invited Discussant: Christian Etz

[+]AATS Member

F8. Mechanical Preconditioning Enables Electrophysiological Coupling of Skeletal Myoblast Cells to Myocardium

Yeong-Hoon Choi[1], Klaus Neef[1], Suresh Kumar[1], Philipp Treskes[1], Roland Adelmann[3], Markus Khalil[3], Christof Stamm[2], Thorsten Wittwer[1], Thorsten C. Wahlers[1]

1. Department of Cardiothoracic Surgery, Heart Center University of Cologne, Cologne, Germany. 2. Department of Cardiothoracic Surgery, German Heart Institute Berlin, Berlin, Germany. 3. Department of Pediatric Cardiology Cardiothoracic Surgery, University of Cologne, Cologne, Germany.

Invited Discussant: Y. Joseph Woo

F9. A Novel Amiodarone-Eluting Biological Glue for the Prevention of Postoperative Atrial Fibrillation: First Animal Trials

Ziv Beckerman[1], Adi Azran[1], Oved Cohen[1], Ohad Kimhi[1], Robert W. Bolderman[2], Jos G. Maessen[2], Havazelet Bianco-Peled[3], Gil Bolotin[1]

1. Cardiac Surgery, Rambam Healthcare Campus, Haifa, Israel. 2. Department of Cardiothoracic Surgery, Maastricht University Medical Center, Maastricht, The Netherlands. 3. Chemical Engineering Department, Technion, Haifa, Israel.

Invited Discussant: Abe DeAnda

F10. Validation of a Mitral Valve Replacement Skills Trainer: A Simplified, Low-Cost Approach

David G. Greenhouse, Eugene A. Grossi[+], Sophia Dellis, Joy Park, David W. Yaffee, Abe DeAnda[+], Aubrey C. Galloway[+], Leora Balsam

Cardiothoracic Surgery, New York University School of Medicine, New York, NY, United States.

Invited Discussant: James I. Fann

[+]AATS Member

7:00 a.m. **GENERAL THORACIC SURGERY FORUM SESSION**

2007, 2009, 2011 Moscone West Convention Center
(5 minute presentation, 5 minute discussion)

Moderators: Dao M. Nguyen
Richard J. Finley

F11. Development of a Serum Biomarker Panel Predicting Recurrence in Node Negative Non-Small Cell Lung Cancer Patients

Daniel Rinewalt[1], Jeffrey A. Borgia[2,3], David D. Shersher[1], Sanjib Basu[4], Edward Hong[5], Gary Chmielewski[5], William H. Warren[+5], Michael J. Liptay[+5]

1. General Surgery, Rush University Medical Center, Chicago, IL, United States. 2. Biochemistry, Rush University Medical Center, Chicago, IL, United States. 3. Pathology, Rush University Medical Center, Chicago, IL, United States. 4. Preventative Medicine, Rush University Medical Center, Chicago, IL, United States. 5. Thoracic Surgery, Rush University Medical Center, Chicago, IL, United States.

Invited Discussant: Chuong D. Hoang

F12. The In Vitro and In Vivo Therapeutic Efficacy of the CXCR4 Antagonist BKT140 Against Human Non-Small Cell Lung Cancer (NSCLC)

Ori Wald[1,2], Duha Fahham[2], Michal Abraham[2,3], Katia Beider[2], Ido D. Weiss[2], Hanna Wald[2], Zippora Shlomai[4], Orly Eisenberg[3], Gideon Zamir[4], Uzi Izhar[1], Oz M. Shapira[+1], Amnon Peled[2]

1. Cardiothoracic Surgery, Hadassah University Hospital, Jerusalem, Israel. 2. Goldyne Savad Institute of Gene Therapy, Hadassah University Hospital, Jerusalem, Israel. 3. Biokine Theraputics, Weizmann Science Park, Rehovot, Israel. 4. Laboratory for Surgical Research, Hadassah University Hospital, Jerusalem, Israel.

Invited Discussant: Chad Denlinger

[+]AATS Member

F13. Lung Cancer Lymph Node Micrometastasis Detection Using RT-PCR—Correlation with Vascular Endothelial Growth Factor (VEGF) Expression

Chukwumere Nwogu[1,3], Sai Yendamuri[1,3], Wei Tan[2], Carl Morrison[2], Richard Cheney[2], Paul Bogner[2], Elisabeth U. Dexter[1,3], Alan Hutson[2], Mary Reid[2], Alex Adjei[2], Todd L. Demmy[+1,3]

1. Department of Thoracic Surgery, Roswell Park Cancer Institute, Buffalo, NY, United States. 2. Roswell Park Cancer Institute, Buffalo, NY, United States. 3. Department of Surgery, State University of New York, Buffalo, NY, United States.

Invited Discussant: Michael A. Maddaus

F14. Paclitaxel Cytotoxicity in Non-Small Cell Lung Cancer Is Significantly Enhanced by a Novel Small Molecule by Direct Activation of Procaspase-3

Syed S. Razi[1], Gary Schwartz[1], David Y. Lee[1], Koji Park[1], Scott Belsley[1,2], Faiz Y. Bhora[1,2], Cliff P. Connery[1,2]

1. Thoracic Surgery, St. Luke's Roosevelt Hospital, New York, NY, United States. 2. Columbia University College of Physicians and Surgeons, New York, NY, United States.

Invited Discussant: Jack A. Roth

F15. Altered Protein Homeostasis in Lung Adenocarcinoma

Chuong D. Hoang, Manhong Wu, Yue Xu, William Fitch, Ming Zheng, Robert Merritt, Richard I. Whyte[+], Joseph B. Shrager[+], Gary Peltz

Cardiothoracic Surgery, Stanford University, Stanford, CA, United States.

Invited Discussant: Dennis Wigle

F16. Identification and Characterization of Stem-Like Cells in Human Esophageal and Adenocarcinoma Cell Lines

Alan G. Casson[+], Ronghua Zhao

Surgery, University of Saskatchewan, Saskatoon, SK, Canada.

Invited Discussant: Jules Lin

[+]AATS Member

F17. Inhibiting CXCL12 Blocks Fibrocyte Migration and Differentiation and Attenuates Bronchiolitis Obliterans in a Murine Heterotopic Tracheal Transplant Model

David A. Harris[1], Yunge Zhao[1], Damien J. LaPar[1], Abbas Emaminia[1], John Steidle[1], Mark Stoler[1], Joel Linden[2], Irving L. Kron[+1], Christine L. Lau[+1]

1. University of Virginia, Charlottesville, VA, United States. 2. La Jolla Institute for Allergy and Immunology, La Jolla, CA, United States.

Invited Discussant: Yolonda L. Colson

F18. Adenosine A3 Receptor Activation Attenuates Lung Ischemia-Reperfusion Injury via a Neutrophil-Dependent Mechanism

Ashish K. Sharma, Daniel P. Mulloy, Matthew L. Stone, Lucas G. Fernandez, Vanessa A. Hajzus, Heesung S. Kim, Victor E. Laubach, Irving L. Kron[+]

Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Thomas Waddell

F19. Piglet Model of Chronic Thrombo-Embolic Pulmonary Hypertension

Olaf Mercier[1], Francois Haddad[2], François Raoux[1], Julien Guihaire[1], David Boulate[1], Benoit Decante[1], Saadia Eddahibi[1], Philippe G. Dartevelle[1], Elie Fadel[1]

1. Marie Lannelongue Hospital, Le Plessis Robinson, France. 2. Stanford University, San Francisco, CA, United States.

Invited Discussant: Patricia A. Thistlethwaite

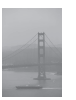
F20. Modified In Vivo Lung Perfusion Technique Allows for Prolonged Perfusion Without Acute Lung Injury

Pedro Reck dos Santos, Ilker Iskender, Tiago Machuca, David M. Hwang, Shaf Keshavjee[+], Thomas K. Waddell[+], Marcelo Cypel

Thoracic Surgery, University of Toronto, Toronto, ON, Canada.

Invited Discussant: Paul E. Van Schil

[+]AATS Member



PLENARY SCIENTIFIC SESSION

8:45 a.m. **PLENARY SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Craig R. Smith
Thoralf M. Sundt, III

28. Aortic Valve Replacement in Neonates and Infants—Contemporary Outcomes in the STS Congenital Heart Surgery Database

Ronald K. Woods[1], Sara Pasquali[2], Marshall L. Jacobs[+3], Erle H. Austin[+4], Jeffrey P. Jacobs[+5], Mary Krolikowski[1], Michael E. Mitchell[1], Christian Pizarro[+6], James S. Tweddell[+1]
1. Cardiothoracic Surgery, Children's Hospital of Wisconsin, Medical College of Wisconsin, Milwaukee, WI, United States. 2. Pediatrics, Duke Clinical Research Institute, Duke University Medical Center, Durham, NC, United States. 3. Pediatric and Congenital Heart Surgery, Cleveland Clinic, Cleveland, OH, United States. 4. Division of Thoracic and Cardiovascular Surgery, University of Louisville, Louisville, KY, United States. 5. Congenital Heart Institute of Florida, All Children's Hospital and Children's Hospital of Tampa, University of South Florida College of Medicine, St. Petersburg and Tampa, FL, United States. 6. Nemours Cardiac Center, Alfred I. duPont Hospital for Children, Wilmington, DE, United States.

Invited Discussant: Christopher A. Caldarone

29. Efficacy of Extracorporeal Membrane Oxygenation as a Bridge-to-Lung Transplantation

Yoshiya Toyoda[+1,2], Jay K. Bhama[2], Norihisa Shigemura[2], Aditya Bansal[2], Diana Zaldonis[2], Joseph Pilewski[2], Maria Crespo[2], Christian Bermudez[2]
1. Temple University, Philadelphia, PA, United States. 2. University of Pittsburgh, Pittsburgh, PA, United States.

Invited Discussant: Joseph B. Zwischenberger

[+]AATS Member

30. Error: Is There a Performance Gap in HLHS?

Frederic Jacques[1], Vijay Anand[2], Edward J. Hickey[1], Yasuhiro Kotani[1], Mrinal Yadava[1], Abdullah A. Alghamdi[1], Christopher A. Caldarone[+1], Glen Van Arsdell[+1]

1. Division of Cardiovascular Surgery, The Hospital for Sick Children, Toronto, ON, Canada. 2. Division of Critical Care Medicine, The Hospital for Sick Children, Toronto, ON, Canada.

Invited Discussant: Emile A. Bacha

31. Valve-Sparing Aortic Root Replacement: Equivalent Long-Term Outcome for Different Valve Types with or Without Connective Tissue Disorders

John-Peder E. Kvitting[1], Fabian A. Kari[1], Michael P. Fischbein[+1], David H. Liang[2], R. Scott Mitchell[+1], D. Craig Miller[+1]

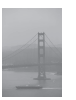
1. Cardiovascular and Thoracic Surgery, Stanford University School of Medicine, Stanford, CA, United States. 2. Cardiovascular Medicine, Stanford University School of Medicine, Stanford, CA, United States.

Invited Discussant: Allan S. Stewart

10:05 a.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**

Exhibit Hall, Moscone West Convention Center

[+]AATS Member



10:40 a.m. **PLENARY SCIENTIFIC SESSION**
Ballroom Level 3 , Moscone West Convention Center
(8 minute presentations, 12 minute discussion)

Moderators: Craig R. Smith
Thoralf M. Sundt, III

32. Should All Moderate Coronary Lesions Be Grafted During Primary Coronary Bypass Surgery? An Analysis of Disease Progression During Angiographic Surveillance in a Trial of Conduits

Philip A. Hayward[2], Trong Thien Nguyen[1], Ying Y. Zhu[1], David L. Hare[3], Brian F. Buxton[2]

1. Melbourne Medical School, University of Melbourne, Parkville, VIC, Australia. 2. Cardiac Surgery, Austin Hospital, Heidelberg, VIC, Australia. 3. Cardiology, Austin Hospital, Heidelberg, VIC, Australia.

Invited Discussant: Joseph F. Sabik

33. Hyperthermic Intraoperative Pleural Cisplatin Chemotherapy (HIOC) Extends Time to Recurrence Among Patients with Epithelial Mesothelioma Categorized as Low Risk and Undergoing Macroscopic Complete Resection

David J. Sugarbaker[+1], Ritu R. Gill[3], Beow Y. Yeap[2], Andrea Wolf[1], Brian Burt[1], Syed O. Ali[1], Brian Goodman[1], Marcelo Dasilva[1], Raphael Bueno[+1], William Richards[1]

1. Thoracic Surgery, Brigham and Women's Hospital, Boston, MA, United States. 2. Biostatistics, Massachusetts General Hospital, Boston, MA, United States. 3. Radiology, Brigham and Women's Hospital, Boston, MA, United States.

Invited Discussant: James D. Luketich

[+]AATS Member

34. Nadir Hematocrit and Morbidity After Cardiac Surgery: A Focus on End-Organ Function and Mortality

Gabriel Loor[1], Eugene H. Blackstone[+1,2], Liang Li[2], Joseph F. Sabik[+1], Jeevanantham Rajeswaran[2], Colleen G. Koch[3]

1. Thoracic and Cardiovascular Surgery, Cleveland Clinic, Cleveland, OH, United States. 2. Department of Quantitative Health Sciences, Cleveland Clinic, Cleveland, OH, United States. 3. Department of Cardiothoracic Anesthesia, Cleveland Clinic, Cleveland, OH, United States.

Invited Discussant: Paul Kurlansky

11:40 a.m. **HONORED SPEAKER LECTURE**

"Medicine in Media"
Mehmet C. Oz
Columbia University

Introduced By: Craig R. Smith

12:30 p.m. **ADJOURN FOR LUNCH – VISIT EXHIBITS**
Exhibit Hall, Moscone West Convention Center

[+]AATS Member

2:00 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

Ballroom Level 3 , Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Harold L. Lazar
David C. McGiffin

35. Chordal Replacement with PTFE Sutures for Mitral Valve Repair: A 25-Year Experience

Tirone E. David[+], Susan Armstrong, Joan Ivanov
Toronto General Hospital, Toronto, ON, Canada.

Invited Discussant: David H. Adams

36. Results of Treatment of Severe Mitral Regurgitation with the MitraClip Device in High Surgical Risk Patients

Michael Argenziano[+1], Michael J. Mack[+2], Paul Grayburn[3], Alfredo Trento[+4], W. Randolph Chitwood[+5], Ted Feldman[6], Donald D. Glower[+7]

1. Adult Cardiac and Thoracic Surgery, New York Presbyterian Hospital/Columbia University, New York, NY, United States. 2. Surgery, Baylor Health Care System/The Heart Hospital, Plano, TX, United States. 3. Cardiology and Echocardiography, University Medical Center, Dallas, TX, United States. 4. Cardiothoracic Surgery, Cedars-Sinai Medical Center, Los Angeles, CA, United States. 5. Cardiothoracic and Vascular Surgery, East Carolina Heart Institute, Greenville, NC, United States. 6. Cardiac Catheterization, Evanston Hospital, Evanston, IL, United States. 7. Surgery, Duke University Medical Center, Durham, NC, United States.

Invited Discussant: Steven F. Bolling

[+]AATS Member

37. Very Long-Term Results (Up to 17 Years) with the Double Orifice Mitral Valve Repair Associated to Ring Annuloplasty for Degenerative Mitral Regurgitation

Michele De Bonis[1], Elisabetta Lapenna[1], Roberto Lorusso[2], Nicola Buzzatti[1], Sandro Gelsomino[3], Maurizio Taramasso[1], Enrico Vizzardi[4], Ottavio R. Alfieri[+1]

1. Department of Cardiac Surgery, San Raffaele University Hospital, Milan, Italy. 2. Cardiac Surgery Unit, Community Hospital, Brescia, Italy. 3. Cardiac Surgery Unit, Careggi Hospital, Florence, Italy. 4. Cardiology Unit, Community Hospital, Brescia, Italy.

Invited Discussant: Donald D. Glower

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:45 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center

Moderators: Harold L. Lazar
David C. McGiffin

38. Blood Product Conservation Is Associated with Improved Outcomes and Reduced Costs Following Cardiac Surgery

Damien J. LaPar[1,5], Ivan K. Crosby[+1,5], Bruce D. Spiess[+4,5], Jeffrey B. Rich[+3,5], Vigneshwar Kasirajan[4,5], Edwin Fonner[5], Alan M. Speir[+2,5]

1. Surgery, University of Virginia, Charlottesville, VA, United States. 2. Inova Heart and Vascular Institute, Fairfax, VA, United States. 3. Surgery, Sentara Heart Hospital, Norfolk, VA, United States. 4. Surgery, Virginia Commonwealth University Pauley Heart Center, Richmond, VA, United States. 5. Virginia Cardiac Surgery Quality Initiative, Charlottesville, VA, United States.

Invited Discussant: Edward D. Verrier

[+]AATS Member

39. Relevance of the Surgical Care Improvement Project on Glycemic Control in CABG Patients Receiving Continuous Insulin Infusions

Marie E. McDonnell[2], Sarah M. Alexanian[2], Ana Junquiera[2], Howard Cabral[1], Harold L. Lazar[+1]

1. Cardiothoracic Surgery, Boston Medical Center, Boston, MA, United States. 2. Endocrinology, Boston Medical Center, Boston, MA, United States.

Invited Discussant: Anthony P. Furnary

40. A Prospective Randomized Comparison of Three Contemporary Bioprosthetic Aortic Valves—Should Hemodynamic Performance Influence Device Selection?

Rakesh M. Suri[+1], Hector Michelena[2], Harold M. Burkhart[+1], Kevin Greason[1], Richard C. Daly[+1], Lyle D. Joyce[+1], Soon J. Park[+1], John M. Stulak[1], Joseph A. Dearani[+1], Thoralf M. Sundt[+3], Zhou Li[1], Hartzell V. Schaff[+1]

1. Cardiovascular Surgery, Mayo Clinic, Rochester, MN, United States.
2. Cardiology, Mayo Clinic, Rochester, MN, United States.
3. Massachusetts General Hospital, Boston, MA, United States.

Invited Discussant: Tirone E. David

5:00 p.m. **EXECUTIVE SESSION**
(*AATS Members Only*)
Ballroom Level 3 , Moscone West Convention Center

[+]AATS Member

2:00 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: V. Mohan Reddy
Christopher A. Caldarone

41. Poor Aortic Distensibility Following Norwood Procedure Is Associated with Reduced Ventricular Function
Alessandro Giardini, Giovanni Biglino, Silvia Schievano, Jennifer A. Steeden, Catriona Baker, Martin Kostolny, Victor T. Tsang[+], Tain-Yen Hsia, Andrew Taylor
Cardiac Unit, Great Ormond Street Hospital for Children, NHS Trust, London, United Kingdom.

Invited Discussant: William DeCampli

42. Ductal-Associated Pulmonary Artery Stenosis with Neonatal Blalock-Taussig Shunt: Incidence and Management
Kirk R. Kanter[+1,2], Brian E. Kogon[+1,2], Paul M. Kirshbom[+1,2]
1. Pediatric Cardiac Surgery, Emory University School of Medicine, Atlanta, GA, United States. 2. Pediatric Cardiac Surgery, Children's Healthcare of Atlanta, Atlanta, GA, United States.

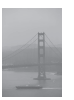
Invited Discussant: Richard G. Ohye

43. Arrhythmia Surgery for Atrial Fibrillation Associated with Atrial Septal Defect: Right-Sided Maze Versus Biatrial Maze
Tae-Jin Yun, Yumi Im, Joon Bum Kim
Pediatric Cardiac Surgery, Asan Medical Center, Seoul, Korea, Republic of.

Invited Discussant: Christian Pizarro

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

[+]AATS Member



3:45 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center

Moderators: V. Mohan Reddy
Christopher A. Caldarone

44. Surgical Technical Performance Scores Are Predictors for Late Mortality and Unplanned Reinterventions in Infants After Cardiac Surgery

Meena Nathan[1], John Karamichalis[1], Hua Liu[1], Sitaram Emani[1], Christopher Baird[1], Frank A. Pigula[+1], Steven Colan[1], Ravi Thiagarajan[1], Emile A. Bacha[+2], Pedro J. del Nido[+1]

1. Department of Cardiovascular Surgery and Department of Cardiology, Children's Hospital, Boston, Boston, MA, United States. 2. Division of Congenital and Pediatric Heart Surgery, Morgan Stanley Children's Hospital, New York, NY, United States.

Invited Discussant: David M. Overman

45. Rapid Two-Stage Norwood I for High-Risk Hypoplastic Left Heart Syndrome

Marcello Gomide[1], Barbara Furci[2], Branko Mimic[1], Tain-Yen Hsia[1], Kate L. Brown[1], Martin Kostolny[1,2], Marc R. de Leval[+1,2], Victor T. Tsang[+1,2]

1. Cardiothoracic Surgery, Great Ormond Street Hospital, London, United Kingdom. 2. Cardiothoracic Surgery, Harley Street Clinic, London, United Kingdom.

Invited Discussant: Glen Van Arsdell

46. Bilateral Pulmonary Artery Banding for Resuscitation in High-Risk Single Ventricle Neonates and Infants: Single Center Experience

Kristine J. Guleserian[1], Mahesh S. Sharma[1], Gregory Barker[2], Joy Macaluso[1], Alan Nugent[2], Joseph M. Forbess[+1]

1. Cardiovascular and Thoracic Surgery, UT Southwestern Medical Center/Children's Medical Center of Dallas, Dallas, TX, United States. 2. Pediatrics, UT Southwestern Medical Center/Children's Medical Center of Dallas, Dallas, TX, United States.

Invited Discussant: Thomas Yeh

5:00 p.m. **EXECUTIVE SESSION**
(AATS Members Only)
Ballroom Level 3, Moscone West Convention Center

[+]AATS Member

2:00 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

2007, 2009, 2011 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: David J. Sugarbaker
David R. Jones

47. Omental Reinforcement of the Thoracic Esophagogastric Anastomosis—An Analysis of Leak and Reintervention Rates in Planned and Salvage Esophagectomy Patients

Boris Sepesi, Stephen G. Swisher+, Garrett L. Walsh+, Arlene M. Corea, Reza J. Mehran+, David C. Rice+, Jack A. Roth+, Ara A. Vaporciyan+, Wayne L. Hofstetter+

Thoracic and Cardiovascular Surgery, University of Texas MD Anderson Cancer Center, Houston, TX, United States.

Invited Discussant: Gail Darling

48. The Effect of Center Volume on the Incidence of Postoperative Adverse Events and Their Impact on Survival After Lung Transplantation

Arman Kilic[1], Christian A. Merlo[2], John V. Conte+[1], Ashish S. Shah+[1]

1. Division of Cardiac Surgery, Johns Hopkins Hospital, Baltimore , United States. 2. Division of Pulmonary and Critical Care Medicine, Johns Hopkins Hospital, Baltimore , United States.

Invited Discussant: Matthew Bacchetta

49. Pleural Perfusion Thermochemotherapy (PPTCT) for Stage IVa and Pleural Relapses of Thymic Epithelial Tumors: Long-Term Outcome

Alon Yellin[1], David A. Simansky[1], Ronny Ben-Avi[1], Marina Perelman[2], Alon Ben Nun[1]

1. Thoracic Surgery, Sheba Medical Center, Ramat Gan, Israel. 2. Pathology, Sheba Medical Center, Ramat Gan, Israel.

Invited Discussant: Joshua R. Sonett

+AATS Member

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:45 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**
2007, 2009, 2011 Moscone West Convention Center

Moderators: David J. Sugarbaker
David R. Jones

50. Safety of Thoracic Surgery in Patients with Pulmonary Hypertension
Julissa E. Jurado, Matthew D. Bacchetta, Mark E. Ginsburg, Lyall A. Gorenstein, Frank D'Ovidio, Alexis Newmark, Matthew Lavelle, Gopal Singh, Joshua R. Sonett+
Division of Thoracic Surgery, Columbia University Medical Center—New York Presbyterian Hospital, New York, NY, United States.

Invited Discussant: Alexander S. Krupnick

51. Preoperative Pathologic Evaluation of Hilar (N1) Lymph Nodes with Endobronchial Ultrasound and Transbronchial Needle Aspiration: A Potential Application to Clinical Trials
David D. Odell, Bryan A. Whitson, Mara B. Antonoff, Jonathan D'Cunha+, Michael A. Maddaus+, Rafael S. Andrade+
Division of Thoracic and Foregut Surgery, University of Minnesota, Minneapolis, MN, United States.

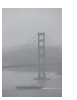
Invited Discussant: Kazuhiro Yasufuku

52. Differences in Reported Esophageal Cancer Resection Outcomes Between National Clinical and Administrative Databases
Damien J. LaPar, Christine L. Lau, David R. Jones+, Benjamin D. Kozower+
Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Antoon Lerut

5:00 p.m. **EXECUTIVE SESSION**
(AATS Members Only)
Ballroom Level 3, Moscone West Convention Center

+AATS Member



WEDNESDAY, MAY 2, 2012

PLENARY AND CONTROVERSIES SESSIONS

7:00 a.m. **EMERGING TECHNOLOGIES AND TECHNIQUES FORUM**
Ballroom Level 3, Moscone West Convention Center
(6 minute presentation, 5 minute discussion)

Moderators: Charles R. Bridges
Tomislav Mihaljevic

T1. Multi-Center Rapid-Deployment Aortic Valve Replacement Trial: 1-Year Results of the First 150 Patients
Alfred Kocher[1], Guenther Laufer[+1], Axel Haverich[+2], Malakh Shrestha[2], Thomas Walther[+4], Martin Misfeld[5], Joerg Kempfert[4], Christoph Schmitz[6], Thorsten C. Wahlers[+3], Jens Wippermann[3], Friedrich W. Mohr[+5], Dominik Wiedemann[1], Michael A. Borger[+5]
1. Department of Cardiac Surgery, Vienna Medical University, Vienna, Austria. 2. Medical University Hannover, Hannover, Germany. 3. Medical University of Cologne, Cologne, Germany, 4. Kerckhoff Klinic, Bad Nauheim, Bad Nauheim, Germany. 5. University of Leipzig, Leipzig, Germany. 6. University of Munich, Munich, Germany

T2. Early Single-Center Experience in Sutureless Aortic Valve Implantation in More Than 70 Patients
Otto E. Dapunt, Jerry Easo, Harald C. Eichstaedt
Department for Cardiac Surgery, Klinikum Oldenburg, Oldenburg, Germany.

[+]AATS Member

T3. Combined Proximal Stent Grafting Plus Distal Bare Metal Stenting for Management of Aortic Dissection: Superior to Standard Endovascular Repair?

Sophie C. Hofferberth[1], Andrew E. Newcomb[1,2], Michael Y. Yii[1,2], Ian K. Nixon[1,2], Peter J. Mossop[3]

1. Department of Medicine (St. Vincent's), The University of Melbourne, Fitzroy, VIC, Australia. 2. Department of Cardiac Surgery, St. Vincent's Hospital, Melbourne, Melbourne, VIC, Australia. 3. Department of Medical Imaging, St. Vincent's Hospital, Melbourne, Melbourne, VIC, Australia.

T4. Thoracoscopic Localization of Intraparenchymal Pulmonary Nodules Using Direct Intracavitary Thoracoscopic Ultrasound Prevents Conversion of VATS Procedures to Thoracotomy

Mohamed Khereba[1,2], Pasquale Ferraro[+1,2], Andre C. H. Duranceau[+1,2], Jocelyne Martin[1,2], Eric Goudie[1,2], Mehdi Tahiri[1,2], Vicky Thiffault[1,2], Moishe Liberman[1,2]

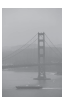
1. Thoracic Surgery, University of Montreal, Montreal, QC, Canada. 2. CHUM Endoscopic Tracheobronchial and Oesophageal Center (C.E.T.O.C.), University of Montreal, Montreal, QC, Canada.

T5. Expanded Experience Using the Transaortic Approach for Transcatheter Valve Implantation

Rizwan Q. Attia[1], Martyn Thomas[2], Simon Redwood[2], Jane Hancock[2], Kirsty Macgillivary[2], Karen Wilson[2], Christopher Young[1], Vinayak Bapat[1]

1. Cardiothoracic Surgery, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom. 2. Cardiology, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom.

[+]AATS Member



T6. Durable Staged Hybrid Ablation with Thoracoscopic and Percutaneous Approach for Treatment of Long Standing Atrial Fibrillation: Results at 30 Months Assessed with Continuous Monitoring

Claudio Muneretto[+1], Gianluigi Bisleri[1], Luca Bontempi[2], Antonio Curnis[2]

1. Division of Cardiac Surgery, University of Brescia Medical School, Brescia, Italy. 2. Division of Cardiology, University of Brescia Medical School, Brescia, Italy.

T7. Initial Experience with a New Technique Using EUS Access for Biopsy of Para-Aortic (Station #6) Mediastinal Lymph Nodes

Moishe Liberman[1,2], Andre C. H. Duranceau[+1,2], Etienne Grunenwald[1,2], Vicky Thiffault[1,2], Mohamed Khereba[1,2], Pasquale Ferraro[+1,2]

1. Thoracic Surgery, University of Montreal, Montreal, QC, Canada. 2. CHUM Endoscopic Tracheobronchial and Oesophageal Center (C.E.T.O.C.), University of Montreal, Montreal, QC, Canada.

T8. Promise of Unrestricted Mobility with Innovative, Portable Wireless Powering of a Mechanical Circulatory Assist Device

Pramod Bonde[1], Benjamin Waters[2], Alanson Sample[2], Joshua R. Smith[2,3]

1. Section of Cardiac Surgery, Yale School of Medicine, New Haven, CT, United States. 2. Department of Electrical Engineering, University of Washington, Seattle, WA, United States. 3. Department of Computer Sciences and Engineering, University of Washington, Seattle, WA, United States.

T9. A High-Volume Transcatheter Valve Program Within a Surgical Department—Is "Transfemoral First" Still Reasonable?

Sabine Bleiziffer, Domenico Mazzitelli, Anke Opitz, Nicolo Piazza, Rudiger S. Lange[+]

German Heart Center Munich, Munich, Germany.

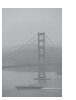
[+]AATS Member

T10. Safety and Feasibility of Sentinel Lymph Node Identification in Non-Small Cell Lung Cancer

Denis M. Gilmore[1], Onkar V. Khullar[1], Michael T. Jaklitsch[+1], John V. Frangioni[2], Yolonda L. Colson[+1]

1. Thoracic Surgery, Brigham and Women's Hospital, Boston, MA, United States. 2. Beth Israel Deaconess Medical Center, Boston, MA, United States.

[+]AATS Member



WEDNESDAY, MAY 2, 2012

PLENARY AND CONTROVERSIES SESSIONS

9:00 a.m. – 10:00 a.m. **CONTROVERSIES IN CARDIOTHORACIC SURGERY PLENARY SESSION**
Ballroom Level 3, Moscone West Convention Center

Topic: **Given Duty Hours Limitations, More Efficient Education Will Produce Capable Surgeons Without Extending the Duration of Residency**

Moderator: Thoralf M. Sundt, III

Pro: A. Pieter Kappetein

Con: David R. Jones

10:00 a.m. – 11:00 a.m. **ADULT CARDIAC DEBATE**
Ballroom Level 3, Moscone West Convention Center

Topic: **Access to TAVR Should Be Limited to High Volume Surgical Centers**

Moderator: D. Craig Miller

Pro: Joseph E. Bavaria

Con: Allan Schwartz

10:00 a.m. – 11:00 a.m. **CONGENITAL DEBATE**
2001, 2003, 2005 Moscone West Convention Center

Topic: **Anomalous Coronary from Left Coronary Should Be Operated On**

Moderator: Frank L. Hanley

Pro: Harold M. Burkhart

Con: Emile A. Bacha

10:00 a.m. – 11:00 a.m. **GENERAL THORACIC DEBATE**

Topic: **Three-Field Open Esophagectomy Is a Superior Therapeutic Oncologic Procedure to Minimally Invasive Esophagectomy**
2007, 2009, 2011 Moscone West Convention Center

Moderator: David J. Sugarbaker

Pro: Nasser K. Altorki

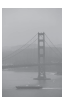
Con: James D. Luketich

11:00 a.m. – 2:30 p.m. **TRANSCATHETER THERAPY IN COLLABORATION: Defining our Future**
3016, 3018 Moscone West Convention Center
Co-Sponsored by Cardiovascular Research Foundation

Chairs: A. Marc Gillinov
Cleveland Clinic

Mathew R. Williams
Columbia University

This session will provide valuable data and training on advancements in surgical techniques, such as lesser-invasive approaches, robotics, novel valves and repair procedures, use of intraoperative imaging, novel devices, and optimal pharmacotherapy, in order to improve outcomes for patients undergoing cardiac surgery. With the expansion of hybrid surgical and interventional revascularization for coronary artery disease and the growing use of endografts as primary therapy for aortic aneurysms, the contemporary surgeon has never had more options available for the treatment of patients with cardiovascular disease. The TCT session is an in-depth course focusing on novel and advanced surgical techniques for surgeons interested in the most contemporary surgical techniques and catheter-based approaches.



TREATMENT OF CORONARY ARTERY DISEASE

Moderators: A. Marc Gillinov
Mathew Williams

11:00 a.m. **What I Like About Coronary Artery Bypass Surgery and How Could It Be Better?**
Susheel Kodali

11:10 a.m. **What I Like About Percutaneous Coronary Intervention and How Could It Be Better?**
John G. Byrne

11:20 a.m. **Hybrid Therapy for Multivessel Disease: Better for You, Better for Me and Best for the Patient?**
Johannes Bonatti

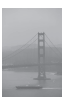
11:40 a.m. **Percutaneous Coronary Intervention: New Technologies: Are There Any Game Changers in the Next 5–10 Years?**
Ajay J. Kirtane

TREATMENT OF AORTIC VALVE DISEASE

12:00 p.m. **Who Is the Ideal Candidate for Transcatheter Aortic Valve Replacement?**
Craig R. Smith

12:10 p.m. **Could Transcatheter Aortic Valve Replacement Become the Treatment of Choice in all Patients with Senile (Non-Bicuspid) Calcific Aortic Stenosis? What Data Do We Need?**
Michael J. Reardon

12:20 p.m.	**Staying in the Game: Training the Surgeon for Transcatheter Valve Therapy** Mathew Williams
12:30 p.m.	**Transcatheter Treatment of Aortic Stenosis: New Devices and Concepts** Martin B. Leon
	TREATMENT OF MITRAL VALVE DISEASE
1:00 p.m.	**If the Devices were Available, Who Would I Refer for Transcatheter Mitral Valve Therapy?** A. Marc Gillinov
1:10 p.m.	**Surgery will Always be Preferred for Some Patients with Mitral Regurgitation** Saibal Kar
1:20 p.m.	**A Single Surgeons Experience with Transcatheter Mitral Valve Therapy** Francesco Maisano
1:30 p.m.	**Transcatheter Treatment of Mitral Valve Disease: New Devices and Concepts** Saibal Kar



CREATING A COLLABORATIVE HEART TEAM

Moderators: Susheel Kodali
Mathew Williams

2:00 p.m. **An Integrated Heart Institute: The Cleveland Clinic**
Bruce W. Lytle

2:05 p.m. **An Integrated Heart Institute: Vanderbilt University**
John G. Byrne

2:15 p.m. **Collaborative Team: Columbia University**
Susheel Kodali

2:20 p.m. **Collaborative Team: Penn**
Wilson Y. Szeto

2:30 p.m. **92nd ANNUAL MEETING ADJOURNS**

92ND Annual Meeting Abstracts

SUNDAY, APRIL 29, 2012

C. WALTON LILLEHEI RESIDENT FORUM SESSION

2008, Moscone West Convention Center

3:00 p.m. – 5:00 p.m. **15th Annual C. Walton Lillehei Resident Forum**

(7 minute presentation, 8 minute discussion)

Moderators: Marc R. Moon
Washington University of St. Louis
Thomas Waddell
University of Toronto

L1. CD11c+ Dendritic Cells Mediate Lung Ischemia-Reperfusion Injury Through an IL-23-Dependent Mechanism

Matthew L. Stone, Ashish K. Sharma, Lucas G. Fernandez, Vanessa A. Hajzus, Daniel P. Mulloy, Victor E. Laubach, Irving L. Kron+
Department of Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Daniel Kreisel

OBJECTIVE(S): Natural killer T cell-derived IL-17 is a principle mediator of lung ischemia-reperfusion injury (IRI). Activated CD11c+ dendritic cells may act in an antigen-independent manner to activate IL-17 through the production of IL-23; however, the role of CD11c+ cells and IL-23 in lung IRI remains unknown. This study tests the hypothesis that IRI is mediated by IL-23 production by CD11c+ dendritic cells.

METHODS: Bone marrow transplant (BMT) of CD11c-diptheria toxin receptor (DTR) donor marrow into C57BL/6 mice enabled the in vivo analysis of CD11c+ cells. Diptheria-toxin administration was performed to deplete CD11c+ cells in these mice. Such CD11c-DTR BMT mice were studied in addition to C57BL/6 (WT) BMT and IL-23p19 knockout (KO) BMT mice. All groups underwent sham thoracotomy or lung IRI (1 hour left hilar occlusion and 2 hours of reperfusion). Lung injury was assessed by

measuring lung function, pro-inflammatory cytokine expression in bronchoalveolar lavage fluid, and leukocyte infiltration. IL-23 gene expression was evaluated by real-time polymerase chain reaction (RT-PCR) in WT BMT and CD11c-DTR BMT groups.

RESULTS: Compared to WT BMT mice, both CD11c-DTR and IL-23KO BMT groups exhibited significant functional protection from lung IRI with decreased pulmonary artery pressures ($p < 0.01$) and increased pulmonary compliance ($p < 0.01$). In addition, CD11c-DTR BMT mice exhibited decreased inflammatory cytokine expression (IL-6 $p < 0.01$, MCP-1 $p = = 0.02$, RANTES $p = 0.02$, KC $p = 0.04$, MCP-1 $p = 0.02$, MIP-1a $p = 0.02$, TNF-alpha $p = 0.03$) and neutrophil infiltration ($p < 0.01$) following lung IRI in comparison to the WT BMT control group. CD11c-DTR BMT mice also demonstrated decreased IL-23 gene expression by RT-PCR following lung IRI ($p = 0.02$) (Figure).

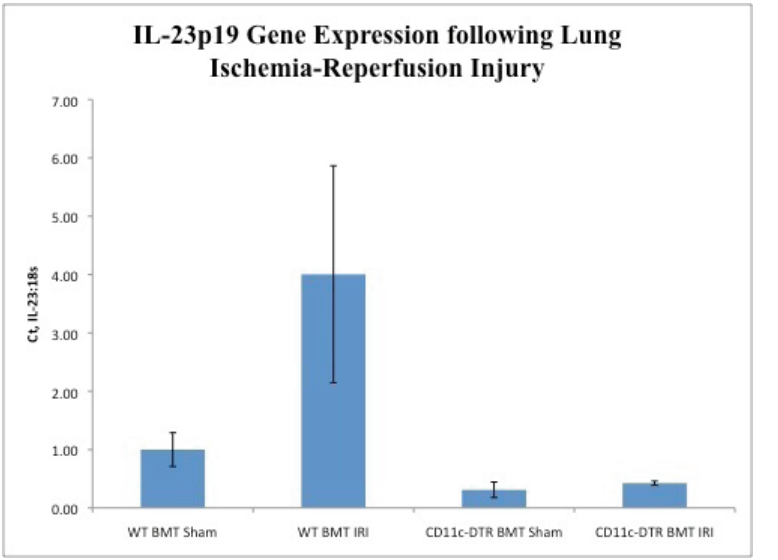


Figure 1: *Real-time PCR results demonstrating significantly higher IL-23p19 gene expression in WT BMT mice following lung IRI but no increase in CD11c-DTR BMT mice after IRI. *p = 0.02 vs CD11cDTR BMT IRI.*

CONCLUSIONS: Depletion of CD11c+ dendritic cells affords significant protection from lung IRI, at least in part, by the reduction of IL-23 expression. This study is the first to provide evidence that dendritic cells are an important initial cell mediator of lung IRI following transplantation. These results define potential novel therapeutic targets closer to the initiation of lung ischemia-reperfusion injury.

L2. Ex Vivo Reconditioning of Non-Heart-Beating Donor Lungs in a Preclinical Porcine Model: Delayed Perfusion Results in Superior Lung Function

Daniel P. Mulloy, Matthew L. Stone, Ivan K. Crosby+, Damien J. LaPar, Christine L. Lau+, Victor E. Laubach, Irving L. Kron+
Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: David P. Mason

OBJECTIVE(S): Normothermic Ex Vivo Lung Perfusion (EVLP) is a promising modality for the evaluation and treatment of marginal donor lungs. The optimal timing of EVLP initiation and potential for rehabilitation of donor lungs with extended warm-ischemic times is unknown. This study compares the efficacy of different treatment strategies for non-heart-beating donor lungs.

METHODS: Mature domestic swine underwent hypoxic arrest followed by 60 minutes of no-touch warm-ischemic time. Lungs were then harvested by the standard clinical technique with 4°C Perfadex® flush. Three groups of donor lungs (n = 4/group) were stratified according to preservation method: standard cold-static preservation (CSP: 4 hrs storage at 4°C), immediate EVLP (I-EVLP: 4 hrs perfusion at 37°C), and delayed EVLP (D-EVLP: 4 hrs CSP followed by 4 hrs perfusion at 37°C). EVLP groups were perfused with acellular Steen solution™ supplemented with heparin, methylprednisolone, cefazolin, and ATL-1223 (a selective adenosine 2A receptor agonist). Lungs then underwent allotransplantation followed by four hours of recipient reperfusion. Lung injury was assessed through measurement of physiologic parameters and proinflammatory cytokine expression in bronchoalveolar lavage fluid.

RESULTS: Donor blood oxygenation (PO2) prior to euthanasia was not different between groups (p = 0.63) (Table). Blood oxygenation after transplantation was significantly higher in the D-EVLP group when compared to either I-EVLP or CSP (506.9 ± 104 vs. 269.4 ± 108 and 184.5 ± 48, respectively, p = 0.002). In addition, D-EVLP treatment resulted in lower mean airway pressure (p = 0.006) and trended toward decreased pulmonary artery pressure (p = 0.09). Expression of the proinflammatory cytokine IL-8, a predictive marker for primary graft dysfunction, was decreased

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in the D-EVLP group (p = 0.001). Importantly, blood oxygenation during EVLP and after transplantation exceeded acceptable clinical levels only in the D-EVLP group.

Table:

	CSP	I-EVLP	D-EVLP
Post-Transplant PO_2	184.5±48	269.4±108	506.9±104*#
EVLP PO_2	N/A	258.2±105	468.6±50#
Pre-Euthanasia Donor PO_2	459.5±84	395.8±119	319.6±92
Pulm Artery Pressure (mmHg)	29.8±1.5	28.3±6.2	22.3±3.4
Mean Airway Pressure (cmH_20)	12.0±0.4	10.9±1.1	7.0±0.4*#
IL-8 (pg/mL)	193.4±32.7	130.1±48.24	34.8±6.4*#

* $p<0.05$ vs. CSP, # $p<0.05$ vs. I-EVLP. Data reported as Mean±SEM.

CONCLUSIONS: Donor lungs with extended warm-ischemic times can be reconditioned to an acceptable functional level for clinical transplantation. Surprisingly, the combination of CSP and EVLP present in the D-EVLP group was necessary to reduce inflammation and restore optimal post-transplant lung function. This finding, if confirmed clinically, could change the future of lung transplantation by allowing expanded use of non-heart-beating donor lungs.

L3. Knockdown of Secretory Phospholipase A2 Reduces Lung Cancer Growth In Vitro and In Vivo

Jessica A. Yu[1], David Mauchley[1], Howard Li[2], Xianzhong Meng[1], Raphael A. Nemenoff[2], David A. Fullerton[+1], Michael J. Weyant[1]

1. Department of Surgery, University of Colorado School of Medicine, Aurora, CO, United States. 2. Department of Medicine, University of Colorado School of Medicine, Aurora, CO, United States.

Invited Discussant: David S. Schrump

OBJECTIVE(S): Lung cancer cell growth and invasion can be attenuated in vitro by blocking secretory phospholipase A2 group IIa (sPLA2 IIa) with a small molecule inhibitor. Nuclear factor kappa B (NF-κB) is an intracellular signaling molecule that plays a pivotal role in regulating cancer cell growth and is modulated by phospholipase activity in many cancer cells. We hypothesize that knockdown of sPLA2 in lung cancer cells will reduce cell proliferation and NF-κB activity in vitro. Furthermore, we propose sPLA2 knockdown in lung cancer cells will attenuate tumor growth in vivo.

METHODS: Two human non-small cell lung cancer cell lines (A549 and H358) were transduced with a lentiviral vector containing short hairpin RNA (shRNA) sequences targeting group IIa sPLA2 mRNA. A non-targeted shRNA sequence was used as a transduction control. Quantitative RT-PCR and immunoblotting were used to evaluate for knockdown of sPLA2 IIa mRNA and protein, respectively. Cell proliferation was evaluated by the 5-bromo-2′-deoxyuridine (BrdU) DNA labeling assay. NF-κB phosphorylation was assayed by western blot. Nude mice (6–8 week old) were injected into their left flanks with 1 x 10^6 of A549 or A549 sPLA2 knockdown cells. Flank tumors were serially measured using digital calipers.

RESULTS: Stable cell lines with knockdown of sPLA2 IIa were generated in both A549 and H358 cells. Transduction did not alter the morphology of the cells. Successful knockdown of both mRNA and protein was confirmed over several cell passages by quantitative RT-PCR and immunoblotting, respectively. Knockdown of sPLA2 in A549 cells was associated with a decrease in NF-κB phosphorylation ($p = 0.004$). In addition, knockdown of sPLA2 reduced cell proliferation in both cell lines, with a 40% reduction in A549 sPLA2 knockdown cells (Figure 1A, $p = 0.001$). sPLA2 knockdown also reduced tumor growth in vivo. At day 23, A549 control tumors measured 105.6 $mm^3 \pm 18.0$ mm^3. In contrast, sPLA2 knockdown tumors measured 46.4 $mm^3 \pm 8.4$ mm^3 (Figure 1B and 1C, $p = 0.018$).

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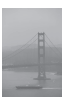
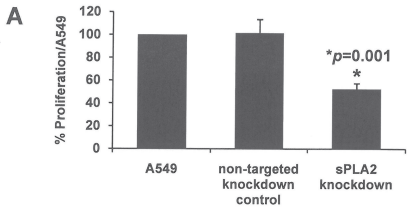
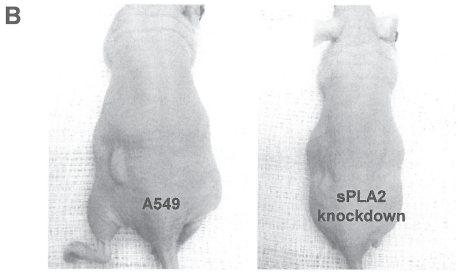
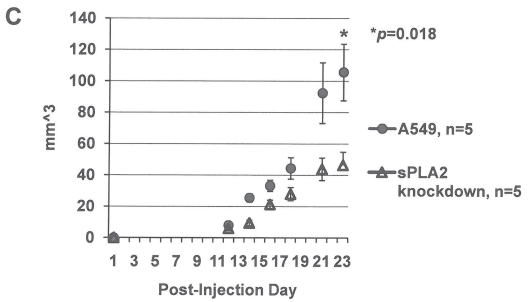


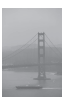
Figure 1


A
% Proliferation/A549
120
100
80
60
40
20
0
*p=0.001
*
A549
non-targeted knockdown control
sPLA2 knockdown


B
A549
sPLA2 knockdown


C
mm^3
140
120
100
80
60
40
20
0
1 3 5 7 9 11 13 15 17 19 21 23
Post-Injection Day
*p=0.018
A549, n=5
sPLA2 knockdown, n=5

CONCLUSIONS: sPLA2 IIa plays a significant role in modulating lung cancer cell growth. Knockdown of sPLA2 IIa reduces NF-κB phosphorylation and cell proliferation in vitro, and more importantly, knockdown of sPLA2IIa suppresses lung cancer cell growth in vivo. These findings justify further investigation into the cellular mechanisms of sPLA2 in lung cancer and its potential role as a therapeutic target.



L4. A Stem Cell Ligand Induced by Cigarette Smoke Enhances the Malignant Phenotype of Lung Cancer Cells

Robert T. Ripley, Clinton D. Kemp, Aarti Mathur, Julie A. Hong, Mary Zhang, Mahadev Rao, David S. Schrump+

Surgery Branch, National Cancer Institute, Bethesda, MD, United States.

Invited Discussant: Dao M. Nguyen

OBJECTIVE(S): Although active smoking status at diagnosis or during treatment correlates with poor outcome of lung cancer patients, the mechanisms underlying this phenomenon have not been fully established. Recent studies suggest that treatment resistance is due to emergence of cancer stem cells. The present study was untaken to ascertain if cigarette smoke activates stem cell signaling in lung cancer cells.

METHODS: Microarray and quantitative RT-PCR (qRT-PCR) techniques were used to examine gene expression profiles in cultured lung cancer cells exposed to cigarette smoke condensate (CSC). Calu-6, H841 and A549 cells were transduced with lentiviral vectors expressing stem cell ligand Wnt5a, shRNA targeting Wnt5a, or control sequences. Cell count, scratch, matrigel, and murine xenograft experiments were used to evaluate proliferation, migration, invasion, and tumorigenicity of lung cancer cells. qRT-PCR array and immunoblot techniques were used to evaluate Wnt5a signaling. Affymetrix microarrays were used to examine global gene expression profiles mediated by constitutive Wnt5a expression.

RESULTS: CSC significantly increased Wnt5a expression in Calu-6 and H841 cells, and to a lesser extent in A549 cells, expressing relatively low and high endogenous levels of Wnt5a, respectively. Relative to vector controls, Calu-6 and H841 cells constitutively expressing Wnt5a exhibited significantly increased proliferation, migration, and invasion ($p < 0.05$); exogenous recombinant Wnt5a recapitulated this phenomenon. Knockdown of Wnt5a inhibited proliferation, migration, and invasion of A549 cells. Constitutive expression of Wnt5a increased tumor take (10% (2/20) vs 40% (8/20); $p < 0.05$), and size of Calu-6 xenografts ($p < 0.05$). Whereas short-term exposure (24 h) of parental lung cancer cells to recombinant Wnt5a appeared to activate only non-canonical Wnt pathways, constitutive expression of Wnt5a modulated down-stream targets of canonical as well as non-canonical Wnt signaling, including activation of cyclin D and MYC proto-oncogenes, and down-regulation of the Wnt antagonists WISP1 and WIF1.

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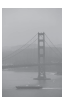
CONCLUSIONS: Stem cell ligand Wnt5a is induced by cigarette smoke, and enhances the malignant phenotype of lung cancer cells via autocrine as well as paracrine mechanisms. These findings provide a potential mechanistic link between smoking status and outcome of lung cancer patients, and warrant evaluation of inhibitors of Wnt5a-mediated signaling for lung cancer therapy.



L5. Mesothelin Promotes Mesothelioma Cell Invasion and MMP-9 Secretion in an Orthotopic Mouse Model and in Malignant Pleural Mesothelioma (MPM) Patients: A Potential Mechanism for MPM Regional Aggressiveness

Elliot L. Servais[1,2], Christos Colovos[1,2], Luis Rodriguez[1,2], Adam J. Bograd[1,2], Jun-ichi Nitadori[1], Camelia Sima[3], Michel Sadelain[2,4], Valerie W. Rusch[+1], Prasad S. Adusumilli[1,]

1. Division of Thoracic Surgery, Memorial Sloan-Kettering Cancer Center, New York, NY, United States. 2. Center for Cell Engineering, Memorial Sloan-Kettering Cancer Center, New York, NY, United States. 3. Department of Epidemiology & Biostatistics, Memorial Sloan-Kettering Cancer Center, New York, NY, United States. 4. Department of Medicine, Memorial Sloan-Kettering Cancer Center, New York, NY, United States.

Invited Discussant: Raphael Bueno

OBJECTIVE(S): Mesothelin (MSLN) is a tumor-associated antigen, currently investigated as a biomarker and therapeutic target in MPM, a tumor characterized by regional aggressiveness and rare distant metastases. We hypothesized that MSLN over-expression promotes MPM invasion and explored the mechanistic basis for MSLN-associated tumor invasion.

METHODS: In vitro, we examined the influence of MSLN (over-expression or shRNA knock-down) in human and murine MPM cells on cell proliferation (viability assay), migration and invasion (Boyden chamber assay), differential gene enrichment (gene expression array) and matrix metalloproteinases (MMP) secretion (Luminex bead assay). In an orthotopic mouse model of homogenous and heterogeneous MSLN expressing MPM, we assessed the influence of MSLN on tumor progression (serial bioluminescence and serum MSLN), chest wall and diaphragm invasion (H&E, Immunohistochemistry), and survival. We confirmed our preclinical findings using a tissue microarray established from MPM patient samples (n = 139 patients, 729 cores).

RESULTS: In vitro, MSLN expression does not increase cell proliferation, but promotes invasion, expression of invasive gene sets, and MMP-9 secretion in both human and murine MPM cells ($p < 0.01$). In the orthotopic MPM mouse model, MSLN over-expressing cells preferentially localize

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to the invading tumor edge, co-localize with MMP-9 expression, and decrease overall survival (p = 0.001). In epithelioid MPM patients, MSLN over-expression is associated with higher tissue MMP-9 expression (p < 0.001). In a uniform cohort of stage III epithelioid MPM patients, increasing levels of MSLN were associated with higher T-stage (T2 to T3, 24% vs. 51%, p = 0.05), tumor invasion being the only characteristic differentiating T2 from T3 in MPM.

CONCLUSIONS: Our data, for the first-time, provide specific evidence regarding the biologic function of MSLN over-expression in MPM. Our findings in vitro, in an orthotopic mouse model, and in patients suggest that MSLN promotes cancer cell invasion and MMP-9 secretion. This study provides a potential mechanism underlying locoregional invasion in MLSN-expressing MPM and supports further investigation of MSLN as a biomarker and therapeutic target.

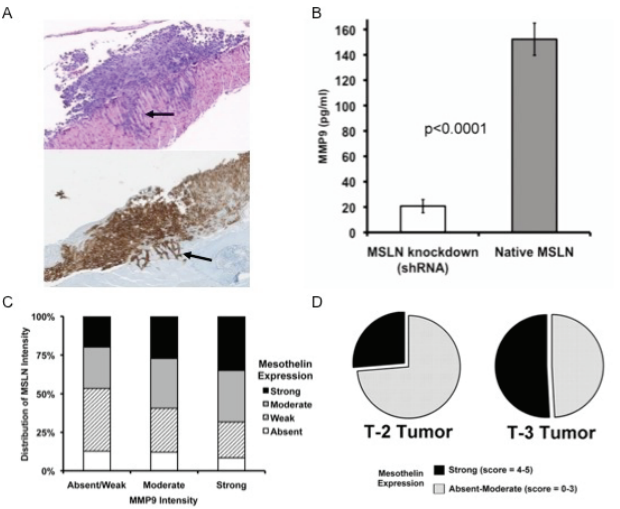


Figure: *(A) MPM cells show diaphragmatic invasion in the orthotopic mouse model (H&E, top) with MSLN staining at the invasive leading edge (IHC, bottom). (B) Knockdown of MSLN in MPM cells decreases MMP-9 secretion (p < 0.0001). (C) In human tumor specimens, MSLN expression correlates with MMP-9 (p < 0.001). (D) Increasing MSLN expression correlates with higher T-stage in MPM patients (p = 0.05).*

L6. Ischemia-Reperfusion Causes a Dynamic Microrna Interstitial Signature: Relation to Membrane Type-1 Matrix Metalloproteinase Activity and Regional Contractility

Shaina R. Eckhouse[1], Christina B. Logdon[1], J. Marshall Oelsen[1], Elizabeth C. O'Quinn[1], Robert E. Stroud[1], Jeffrey A. Jones[1,2], Rupak Mukherjee[1], John S. Ikonomidis[+1], Francis G. Spinale[+3,4]

1. Division of Cardiothoracic Surgery, Medical University of South Carolina, Charleston, SC, United States. 2. Ralph H. Johnson Veterans Affairs Medical Center, Charleston, SC, United States. 3. Division of Cell Biology and Anatomy, University of South Carolina School of Medicine, Columbia, SC, United States. 4. William Jennings Bryan Dorn Veterans Affairs Medical Center, Columbia, SC, United States.

Invited Discussant: Paul W. Fedak

OBJECTIVE(S): Coronary revascularization as well as acute coronary syndromes, are accompanied by myocardial ischemia reperfusion (I/R) which can result in reduced regional contractility. The transmembrane protease, the membrane type-1 matrix metalloproteinase (MT1-MMP), is critical to a number of proteolytic events and implicated to contribute to regional contractile dysfunction with I/R. However, the upstream regulation of MT1-MMP in the context of I/R remains poorly understood. MicroRNAs (miRs) have been shown to regulate post-transcriptional events, and initial in silico mapping studies have identified a conserved sequence in miR-133a for MT1-MMP. Using a porcine model of I/R and in vivo microdialysis, this study tested the hypothesis that MT1-MMP interstitial activity is induced with I/R and is coincident to changes in cellular importation/exportation of miR-133a.

METHODS: Adult pigs (n = 12) underwent I/R (90 minutes ischemia and 120 minutes reperfusion) where sonomicrometry was used to calculate regional preload recruitable stroke work (rPRSW), and a parallel set of microdialysis probes utilized to measure fluorogenic MT1-MMP activity (validated quenched substrate) and interstitial miR-133a (real time PCR). Measurements were performed simultaneously within the targeted I/R region as well as in the remote region of each preparation.

RESULTS: At the end of reperfusion, rPRSW fell by over 50% from baseline (139 ± 20 mmHg to 44 ± 11 mmHg, $p < 0.05$) within the IR region with no change in the remote region. In the I/R region, MT1-MMP activity increased by 120 minutes of reperfusion while in the remote region, MT1-MMP activity increased with ischemia and remained elevated with reperfusion (Figure 1A). Interstitial miR-133a expression level ($2^{(-\Delta CT)}$) was 3.23 x 10^{-3} ± 1.15 x 10^{-3} at baseline and dynamically changed with I/R (Figure 1B). Specifically, interstitial miR-133a levels fell with ischemia in both regions; indicative of cellular re-uptake. Reperfusion caused an abrupt shift in interstitial miR-133a transport within the I/R region, but not in the remote region.

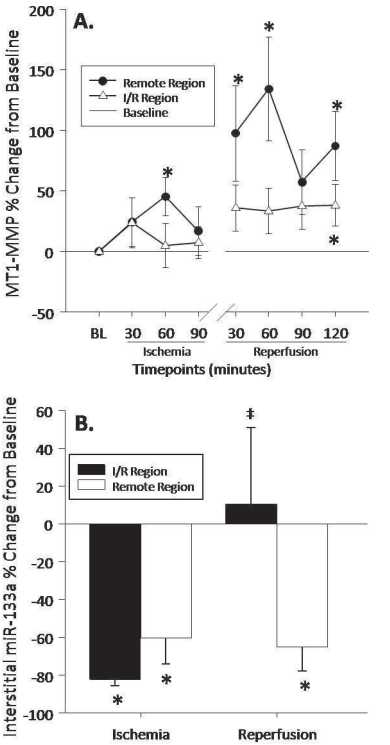


Figure 1: ** $p < 0.05$ versus baseline; ǂ $p < 0.05$ versus peak ischemia.*

CONCLUSIONS: This study demonstrated that dynamic changes in interstitial miR-133a occur with I/R, and these changes occur simultaneously with changes in MT1-MMP interstitial activity which suggests a probalistic relationship exists between miR-133a and MT1-MMP activity. Modulation of miR-133a trafficking may represent a novel mechanism by which a cascade of proteolytic events is initiated in response to acute I/R.

L7. Metformin Alters the Insulin Signaling Pathway in Ischemic Cardiac Tissue in a Swine Model of Metabolic Syndrome

Nassrene Y. Elmadhun, Antonio D. Lassaletta, Louis M. Chu, Frank W. Sellke+

Division of Cardiothoracic Surgery Cardiovascular Research Center, Warren Alpert Medical School, Brown University, Providence, RI, United States.

Invited Discussant: Harold L. Lazar

OBJECTIVE(S): Previous experiments have demonstrated that Ossabaw miniswine fed a hypercaloric diet develop metabolic syndrome and glucose intolerance that is normalized with metformin, however, without affecting insulin levels. The purpose of this study is to evaluate the effect of metformin on myocardial perfusion and insulin signaling in ischemic cardiac tissue in a swine model of metabolic syndrome.

METHODS: Twenty-four Ossabaw pigs were fed a regular diet (OC, n = 8), or a hypercaloric, high-fat/cholesterol diet. Three weeks after diet initiation, all animals underwent ameroid constrictor placement to the left circumflex coronary artery to induce chronic ischemia. Hypercaloric fed animals were then split into a diet alone group (OHC, n = 8) or were supplemented with 500 mg of metformin twice daily (OHCM, n = 8). Seven weeks after ameroid placement, myocardial perfusion was measured with isotope-labeled microspheres both at rest and during demand pacing. Protein expression in the ischemic territories was evaluated by Western blot.

RESULTS: There were no differences in myocardial blood flow in the chronically ischemic territories either at rest (0.51, 0.58, 0.49 ml/min/g) or during demand pacing (0.67, 0.67, 0.56 ml/min/g) between OC, OHC or OHCM respectively. In the OHC group, there was both inactivation (elevated levels of pIRS1) and activation of IRS1, which initiates insulin signaling. The OHCM group had elevated levels of inactivated pIRS1 and pIRS2. Both groups had elevated levels of RBP4, which is involved in insulin resistance, and elevated PI3K, which propagates insulin signaling. Both groups also had marked inactivation (elevated levels of pFOX01) and activation of FOX01, which regulates insulin sensitivity. In contrast to the OHC group, OHCM had marked up-regulation of pAMPKα, which is the mechanism

by which metformin improves insulin sensitivity. AKT and activated pAKT, which propagate insulin signaling, were also moderately elevated, as well as MTOR and Raptor, which activate cell growth when insulin signaling pathway is up-regulated. See Table below.

Western Blot Analysis of Ossabaw High Cholesterol and Ossabaw High Cholesterol and Metformin Protein Expression in Ischemic Territories[a]

	Ossabaw High Cholesterol	Ossabaw High Cholesterol + Metformin
Insulin Receptor Substrate 1 (**IRS1**)	**1.39±0.10 p=0.01**	1.29±0.15 p=0.14
pIRS1 (Ser 612)	**1.43±0.10 p=0.02**	**1.74±0.31 p=0.05**
IRS2	1.11±0.07 p=0.52	1.25±0.08 p=0.18
pIRS2 (Ser 731)	1.08±0.5 p=0.52	**1.43±0.05 p=0.004**
AMP-Kinase α (**AMPKα**)	0.93±0.11 p=0.61	0.95±0.11 p=0.75
pAMPKα (Thr 172)	0.98±0.078 p=0.95	**30.68±2.09 p=4.28E-08**
AKT	1.54±0.38 p=0.19	**2.26±0.35 p=0.01**
pAKT (Thr 308)	0.72±0.06 p=0.16	0.79±0.08 p=0.36
pAKT (Ser 473)	1.04±0.15 p=0.90	**14.02±1.46 p=4.23E-7**
Forkhead Box 01 (**FOX01**)	**1.48±0.15 p=0.01**	**1.59±0.13 p=0.001**
pFOX01 (Ser 256)	**2.45±0.61 p=0.04**	**3.19±0.60 p=0.01**
Mammalian target of rapamycin (**MTOR**)	1.40±0.27 p=0.27	**2.54±0.19 p=1.15E-4**
pMTOR (Ser 2481)	1.59±0.36 p=0.17	**6.96±1.03 p=1.34 E-4**
Sirtuin 1 (**SIRT1**)	1.43±0.23 p=0.10	1.29±0.14 p=0.12
RAPTOR	0.95±0.12 p=0.76	**1.26±0.09 p=0.04**
PPAR-gamma coactivator 1 (**PGC1α**)	1.18±0.25 p=0.55	1.30±0.14 p=0.19
Phosphoinositide 3-kinase (**PI3K**)	**1.44±0.07 p=2.80E-4**	**1.34±0.17 p=0.02**
Retinol Binding Protein 4 (**RBP4**)	**2.08±0.32 p=0.01**	**2.37±0.58 p=0.04**
Glucose transporter 4 (**GLUT4**)	0.85±0.12 p=0.34	1.06±0.22 p=0.81
Glycogen synthase kinase 3 (**GSK3B**)	1.00±0.13 p=0.99	0.94±0.09 p=0.63

[a]Fold change ± standard error of the mean compared to Ossabaw control.

CONCLUSIONS: Both OHC and OHCM groups demonstrate aberrant activation of the insulin-signaling pathway. Although metformin improves insulin sensitivity, there are also proteins that are down regulated or negatively impact insulin sensitivity. Metformin has a complex effect on insulin signaling in ischemic cardiac tissue.

L8. Sirtuin 6 Is a Critical Determinant of Endothelial Function in Mice

Lawrence E. Greiten[+1,2], Carolyn Roos[1], Fritz-Patrick Jahns[1,3], Jordan D. Miller[+1,2]

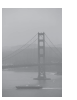
1. Department of Physiology and Biomedical Engineering, Mayo Clinic, Rochester, MN, United States. 2. General Surgery, Mayo Clinic, Rochester, MN, United States. 3. Kings College, London, United Kingdom.

Invited Discussant: Joseph D. Schmoker

OBJECTIVE(S): To test the hypotheses that: 1) reductions in the histone deacetylase Sirtuin 6 (SIRT6) increase endothelial dysfunction in genetically altered mice, and 2) pharmacological inhibition of the p300 histone acetyltransferase (p300HA) normalizes endothelial function in SIRT6-deficient mice.

METHODS: We used young (2–3 months old), littermate-matched, SIRT6 wild-type (WT) and SIRT6 heterozygous (HET) mice. SIRT6 expression is reduced by 50% in these mice, and expression of other SIRT isoforms is not affected. To determine whether inhibition of p300HA improved endothelial function in WT or HET mice, animals were assigned to one of two treatment groups: 1) oral gavage with curcumin (CURC, a p300HA inhibitor; 100 mg/kg, gavaged daily) or 2) oral gavage with vehicle (VEH; glycerol formal/cremophore/water mixture). Following 14 days of treatment, mice were euthanized and vasomotor function of aortic rings was evaluated using an isolated organ bath system. Responses to acetylcholine, sodium nitroprusside, and prostaglandin F2α were examined; subsets of vessels underwent short-term incubation with either the NAD (P)H oxidase inhibitor apocynin or curcumin in the bath (10 μM).

RESULTS: In line with our hypothesis, relaxation in response to acetylcholine (MRach) was significantly impaired in HET+VEH mice compared to littermate-matched WT+VEH controls (63 ± 4% versus 78 ± 4%, respectively; $p < 0.05$). Responses to sodium nitroprusside were similar between WT+VEH (95 ± 2%) and HET+VEH (94 ± 4%) groups, suggesting that reductions in MRach were due to decreased nitric oxide bioavailability. While MRach was not improved in WT+CURC mice (75 ± 4%), MRach was



slightly improved in HET+CURC mice (68 ± 5%). Daily gavage with CURC did not alter vascular responses to sodium nitroprusside. While short-term incubation of aortic rings with CURC did not improve MRach in WT or HET mice, incubation with the NAD (P)H oxidase inhibitor apocynin did significantly improve MRach only in HET+VEH mice (75 ± 5%, $p < 0.05$ versus non-incubated HET+VEH rings).

CONCLUSIONS: These data suggest that SIRT6 is a key regulator of endothelial function. Specifically, we propose that SIRT6 appears to serve as a tonic suppressor of NAD (P)H oxidase expression and activation, as inhibition of NAD (P)H oxidase improved endothelial function in SIRT6 haploinsufficient mice. Collectively, SIRT6 activation and p300HA inhibition may be useful therapeutic targets to reduce endothelial dysfunction and combat cardiovascular disease.

5:00 p.m. **ADJOURN TO WELCOME RECEPTION IN EXHIBIT HALL**

MONDAY, APRIL 30, 2012

7:30 a.m. **Business Session**
(*AATS Members Only*)
Ballroom Level 3, Moscone West Convention Center

7:45 a.m. **PLENARY SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Craig R. Smith
Thoralf M. Sundt, III

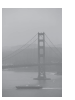
1. Long-Term Mechanical Circulatory Support (Destination Therapy): On Track to Compete with Heart Transplantation?

James K. Kirklin[+1], David C. Naftel[1], Francis D. Pagani[+2], Robert L. Kormos[+3], Lynne Stevenson[4], James B. Young[5]
1. Cardiothoracic Surgery, University of Alabama at Birmingham, Birmingham, AL, United States. 2. Cardiac Surgery, University of Michigan, Ann Arbor, MI, United States. 3. Cardiothoracic Surgery, University of Pittsburgh, Pittsburgh, PA, United States. 4. Cardiovascular Medicine, Brigham and Women's Medical Center, Boston, MA, United States. 5. Cardiovascular Disease, Cleveland Clinic Foundation, Cleveland, OH, United States.

Invited Discussant: Soon J. Park

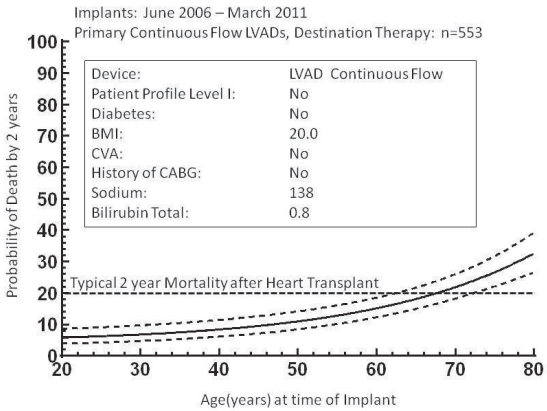
OBJECTIVE(S): Average one-year survival following cardiac transplantation is typically 85%–87%. The evolution and subsequent approval of larger pulsatile and, more recently, continuous flow mechanical circulatory support (MCS) technology for destination therapy (DT) offers the potential for triage of some patients awaiting cardiac transplantation to DT.

METHODS: The National Heart, Lung and Blood Institute Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) is a national multi-institutional study of chronic mechanical circulatory support which has enrolled 593 primary pulsatile and 2839 continuous flow



left ventricular assist devices (LVADs) at 106 U.S. institutions between June 2006 and March 2011. Of these, 101 pulsatile and 553 continuous flow pumps (19% of total primary LVADs) carried an initial strategy of DT therapy. In the past 14 months, 522 of 1588 primary (33%) LVADs had a strategy of DT. Actuarial and parametric survival was examined and risk factors identified via multivariable hazard function analysis.

RESULTS: Actuarial one and two year survival for DT was 75% and 51%. (pulsatile therapy: 61% and 35%; continuous flow 79% and 78%). By multivariable analysis, risk factors ($p < 0.05$) for mortality following DT included older age, larger body mass index, diabetes, history of CABG, INTERMACS level I (cardiogenic shock), lower sodium, increased bilirubin and use of a pulsatile flow device. Among continuous flow LVAD patients, a particularly favorable survival was associated with no diabetes, patients not in cardiogenic shock, and BUN <50 (n = 163), resulting in one and two year survival of 85%. Among favorable patients (see Figure), expected 2 year survival exceeds 80% up to about age 70.



CONCLUSIONS: 1) Destination Therapy represents an increasing LVAD application and currently accounts for nearly 1/3 of overall MCS activity in the U.S.; 2) Evolution from pulsatile to continuous flow technology has dramatically improved one and two year survival; 3) Destination Therapy is not appropriate for patients with rapid hemodynamic deterioration or shock; 4) Important subsets of DT patients now enjoy survival which is competitive with heart transplantation out to about two years.

2. Experience with 50 Ex Vivo Lung Perfusions in Clinical Lung Transplantation

Marcelo Cypel, Jonathan Yeung, Tiago Machuca, Manyin Chen, Lianne Singer, Kazuhiro Yasufuku+, Marc de Perrot+, Andrew F. Pierre+, Thomas K. Waddell+, Shaf Keshavjee+
Thoracic Surgery, University of Toronto, Toronto, ON, Canada.

Invited Discussant: R. Duane Davis

OBJECTIVE(S): Normothermic ex vivo lung perfusion (EVLP) is a novel method to evaluate and improve function of injured donor lungs. We reviewed our experience after 50 consecutive clinical normothermic EVLP.

METHODS: Retrospective study using prospectively collected data. High risk brain death donor (BDD) lungs (defined as P/F < 300 mmHg or lungs with radiographic or clinical findings of pulmonary edema), and lungs from cardiac death donors (DCD) were subjected to 4–6 h of EVLP. Lungs that achieved stable airway and vascular pressures, and a P/F over 400 mmHg during EVLP were transplanted. Incidence of primary graft dysfunction (PGD) grade 3 at 72 h after transplantation, duration of mechanical ventilation, ICU and hospital length of stay (LOS), and overall survival were analyzed and compared to lung transplants not requiring EVLP. Patients on extra-corporeal life support (ECLS) prior to LTx were excluded from this study.

RESULTS: A total of 288 lung transplants (LTx) were performed from 09/2008 to 09/2011. Eleven patients were on ECLS prior to LTx and therefore excluded. 50 clinical EVLP procedures were performed resulting in 43 LTx (86% utilization after EVLP). Seven lungs were not utilized due to deterioration of functional parameters while on the circuit. Recipient diagnosis were emphysema (n = 17), pulmonary fibrosis (n = 13), cystic fibrosis (n = 11), LAM (n = 1), and retransplantation for BOS (n = 1). Of these, 17 were from DCD's and 26 BDD's. Mean donor P/F was 322 mmHg in EVLP group and 442 mmHg in non-EVLP group (p = 0.0002). Mean recipient P/F at ICU arrival was 363 mmHg in EVLP vs. 357 mmHg in non-EVLP (p = 0.87). Incidence of PGD 3 at 72 h was 2.3% in EVLP and 8.5% in non-EVLP (p = 0.21). One patient (2.3%) required ECLS for PGD in EVLP and 5 (2.1%) in the non-EVLP group (p = 1.00). Median time to extubation, ICU and hospital LOS were 2, 4 and 21 days in EVLP, and 3, 4 and 24 days in non-EVLP

($p > 0.05$). 30 day mortality (4.7% in EVLP and 3.5% non-EVLP, $p = 0.60$) and 1 year survival (83.4% in EVLP and 83.8% non-EVLP, $p = 1.00$) were similar in both groups.

CONCLUSIONS: Transplantation after 4–6 h of EVLP is safe. Short and intermediate outcomes are similar to conventional LTx. EVLP improved our center utilization of donor lungs. This strategy in fact accounted for 15.5% of our LTx activity and promises to further increase utilization rates of donor lungs and the safety of lung transplantation.

3. The Natural and Unnatural History of the Systemic Right Ventricle in Adult Survivors of Atrial Switch for Complete Transposition of the Great Arteries and Congenitally Corrected Transposition of the Great Arteries

Richard Dobson[1,2], Niki Walker[1], Mark Danton[+1], Hamish Walker[1]
1. Scottish Adult Congenital Cardiac Service, Golden Jubilee National Hospital, Glasgow, Dunbartonshire, United Kingdom. 2. College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, United Kingdom.

Invited Discussant: Shunji Sano

OBJECTIVE(S): To evaluate long-term trends in morbidity and mortality in a cohort of adult patients with a systemic right ventricle

METHODS: All patients with a recorded diagnosis of complete transposition of the great arteries status post atrial switch procedure (TGA-atrial switch) or congenitally corrected transposition of the great arteries (ccTGA) surviving to the age of 18 years were identified from the computerised database for a national adult congenital heart disease service. Patient specific timelines from baseline of 18 years to date of death/cardiac transplant, or last review. Life table and Kaplan Meier analysis of freedom from death/transplant, arrhythmia, and surgical or percutaneous intervention. Semiquantitative analysis of systemic RV and AV valve function based on MRI or TTE appearances.

RESULTS: A total of 97 TGA-atrial switch (80 Mustard/17 Senning) and 29 ccTGA adult survivors. Median age at latest follow up was 28 and 33 years respectively.

At 20, 30 and 40 years of age freedom from death/transplant was 0.99, 0.92 and 0.92 for TGA-atrial switch, and 0.96, 0.90 and 0.90 for ccTGA ($p = 0.591$).

A total of 78/97 TGA-atrial switch and 27/29 ccTGA patients reached 18 years without arrhythmia. Freedom from arrhythmia at 20, 30 and 40 years of age was 0.97, 0.73 and 0.51 for TGA-atrial switch and 1.00, 1.00, and 0.91 for ccTGA ($p = 0.014$)

A total of 73/97 TGA-atrial switch patients reached 18 years without intervention following their original surgery, and 15/29 ccTGA patients reached 18 years without intervention. Freedom from intervention at 20,

30 and 40 years of age was 0.93, 0.67, 0.48 for TGA-atrial switch and 0.93, 0.86 and 0.76 for ccTGA (p = 0.317)

Pacemaker devices were implanted in 16/93 TGA-atrial switch patients and 11/27 ccTGA patients. 23/74 TGA-atrial switch and 5/22 ccTGA patients had moderate/severe RV impairment, and 14/93 TGA-atrial switch and 9/21 ccTGA patients had moderate/severe AV valve regurgitation. 78/83 TGA atrial switch and 22/24 ccTGA patients were NYHA class 1 or 2 at last review

CONCLUSIONS: Those patients who survive to adulthood with a diagnosis of TGA-atrial switch and ccTGA experience low mortality and good functional status over a median duration of approximately 30 years. However there is a substantial burden of atrial tachyarrhythmia, which occurs earlier in TGA-atrial switch patients. Management of atrial tachyarrhythmia, systemic RV dysfunction and AV valve regurgitation is likely to be a major challenge for this group of patients over the next decade

4. Right Atrial Lesions Do Not Confer an Efficacy Benefit When Added to a Full Left Atrial Lesion Set in the Treatment of Atrial Fibrillation—but May Increase Procedural Morbidity

Lori Soni, Sophie R. Cedola, Jacob Cogan, Jeffrey Jiang, Alexandra J. Ross, Lewis Hwang, Jonathan A. Yang, Edward Chan, Halit Yerebakan, Hiroo Takayama, Faisal H. Cheema, Michael Argenziano+

Cardiothoracic Surgery, New York Columbia Presbyterian, New York, NY, United States.

Invited Discussant: Ralph J. Damiano, Jr.

OBJECTIVE(S): Various modifications of the Cox Maze procedure for surgical ablation of atrial fibrillation (SAFA) have been proposed, utilizing a number of different lesion sets. Some have suggested that a biatrial lesion set is superior to left-sided SAFA. We sought to evaluate how the use of specific lesion combinations affect short-term procedural efficacy and complications.

METHODS: Since 1999, we have performed 823 SAFA procedures. In order to analyze energy sources currently in use, we analyzed 268 consecutive procedures performed over a 4-year period from 2007 through 2010. Operative data was collected prospectively. Procedure success, defined as freedom from atrial fibrillation (AF) or flutter (AFl), was determined by 12-lead ECG in 3 month intervals in the postoperative period, with any episode of AF/AFl counted as failure. Four possible lesions were created: pulmonary vein isolation alone (PVI), PVI plus mitral valve annulus (MVA), PVI plus MVA plus left atrial appendage (LAA), and right atrium (RA). Lesion sets were isolated to the left atrium in 189 cases, and were biatrial in 79. Statistical analysis included chi-2 and logistic regression.

RESULTS: Freedom from AF/AFl at 3–12 months was superior for biatrial (BA) than left atrial (LA) lesion sets (78.7% vs. 63.2%, $p = 0.03$). However, when 66 epicardial PVI procedures were excluded, this difference in efficacy disappeared (80.3% in 71 BA vs. 73.7% in 131 LA, $p = 0.35$). The only association that approached significance was the superiority of full LA lesion sets (PVI+MVA+LAA with or without RA) to less extensive lesion sets (PVI or PVI+MVA, with or without RA), with freedom from AF/AFl of 85.3% vs. 72.8% ($p = 0.11$). The need for a permanent pacemaker postoperatively was significantly greater for BA vs. LA lesion sets (16.5% vs. 6.4%, $p < 0.01$).

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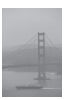


CONCLUSIONS: The addition of right atrial lesions to full left atrial SAFA does not confer any additional benefit with regards to efficacy and results in higher rates of pacemaker placement. Since a full LA lesion set has equivalent efficacy to biatrial approaches, the reported benefit of biatrial over left atrial procedures may be related to inferior efficacy of isolated PVI in the latter group. These data need to be validated in larger patient cohorts, and at longer-term follow up.

9:05 a.m.	**AWARD PRESENTATIONS**
9:20 a.m.	**INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK** *Exhibit Hall/Moscone West Convention Center*
10:00 a.m.	**BASIC SCIENCE LECTURE**
	"Will a Robot Take Your Job?" John E. Bares *Carnegie Robotics LLC*
	Introduced By: Craig R. Smith

10:40 a.m. **PLENARY SCIENTIFIC SESSION**

Moderators: Hartzell V. Schaff
Thoralf M. Sundt, III

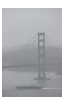
5. Mitral Valve Repair or Replacement for Ischemic Mitral Regurgitation? The Italian Study on the Treatment of Ischemic Mitral Regurgitation (ISTIMIR)

Roberto Lorusso[1], Sandro Gelsomino[2], Giuseppe De Cicco[1], Fabiana Luca[2], Antonio Messina[3], Gianni Troise[3], Valentino Borghetti[4], Alessandro Pardini[4], Filiberto Serraino[5], Attilio Renzulli[5], Davide Pacini[6], Roberto DiBartolomeo[6], Alessandro Parolari[7], Francesco Alamanni[7], Philippe Caimmi[8], Ezio Micalizzi[8], Antonio Miceli[9], Mattia Glauber[9], Ugolino Livi[+10], Fabio Ius[10], Giovanni Mariscalco[11], Cesare Beghi[11], Francesco Nicolini[12], Tiziano Gherli[12], Paolo Ferrazzi[13], Carlo Fino[13], Michele Di Mauro[14], Antonio Calafiore[14]

1. Cardiac Surgery, Community Hospital, Brescia, Italy. 2. Cardiac Surgery, Careggi Hospital, Florence, Italy. 3. Cardiac Surgery, Poliambulanza Hospital Brescia, Brescia, Italy. 4. Cardiac Surgery, Terni Hospital, Terni, Italy. 5. Cardiac Surgery, Germaneto Hospital, Catanzaro, Italy. 6. Cardiac Surgery, S. Orsola Hospital, Bologna, Italy. 7. Cardiac Surgery, Monzino Hospital, Milan, Italy. 8. Cardiac Surgery, Community Hospital, Novara, Italy. 9. Cardiac Surgery, Pasquinucci Hospital, Massa, Italy. 10. Cardiac Surgery, Community Hospital, Udine, Italy. 11. Cardiac Surgery, Community Hospital, Varese, Italy. 12. Cardiac Surgery, Community Hospital, Parma, Italy. 13. Cardiac Surgery, Community Hospital, Bergamo, Italy. 14. Cardiac Surgery, Community Hospital, Catania, Italy.

Invited Discussant: Irving L. Kron

OBJECTIVE(S): It is still uncertain whether mitral valve (MV) replacement is really inferior to mitral valve repair (MVR) for the treatment of chronic ischemic mitral regurgitation (CIMR). This multicentric study is aimed to give a contribution to answer this question.



METHODS: Among 1,067 patients with CIMR and impaired left ventricular (LV) function (ejection fraction <40%) operated on at 13 Italian Institutions between 1996 and 2011, 298 (27.9%) underwent mitral valve (MV) replacement whereas 769 (72.1%)had a MVR. Propensity scores (PS) were calculated by a non-parsimonious multivariable logistic regression and 244 pairs of patients were successfully matched using calipers of width 0.2 SDs of the logit of the PS. The post-matching median standardized difference was 0.031143 (Interquartile Range [IQR] 0.015661–0.075236) and in none of the covariates it exceeded 10%.

RESULTS: Early death were 3.3% (n = 8) in MVR vs. 5.3% (n = 13) in MV replacement (p = 0.32). During a median 46.5-month follow up (IQR 26–69) thirty-six patients (14.7%) undergoing repair and 41 (16.8%) in the replacement group died (p = 0.51). Eight-year survival were 81.6 ± 2.8 and 79.6 ± 4.8 (stratified log-rank test 0.42) whereas freedom from valve-related death were 99.1 ± 4.6 and 99.2 ± 6.4 (p = 0.84)in the repair and replacement group, respectively.

Recurrence of MR (≥2+) was observed in 61 patients (25%) vs. 4(1.6%) in repair and replacement, respectively (p < 0.001). Freedom from reoperation were 80 ± 4.1 vs. 64.3 ± 4.3 (p < 0.001).Freedom from valve-related complications was 85.5 ± 5.2 after repair and 87.8 ± 4.6 after MVR (p = 0.88). Left ventricular ejection fraction did not significantly improve and it was comparable in the two Groups at follow up control (36.9 ± 38.5, p = 0.66).

At Cox proportional hazard regression models stratified on the matched pairs MVR was a strong predictor of reoperation (HR 2.84 [95% CI 2.51–3.26], p < 0.001).

CONCLUSIONS: MV replacement is a suitable option for patients with CIMR and impaired LV function. It provides better results in terms of freedom from reoperation with comparable long-term survival and valve-related complication rates.

6. Pulmonary Resections Performed at Cardiothoracic Surgery Teaching Hospitals Have Superior Outcomes

Castigliano M. Bhamidipati, George J. Stukenborg, Christine L. Lau+, Benjamin D. Kozower+, David R. Jones+

Division of Thoracic and Cardiovascular Surgery, Department of Surgery, University of Virginia School of Medicine, Charlottesville, VA, United States.

Invited Discussant: Mark J. Krasna

OBJECTIVE(S): Pulmonary resections are performed at cardiothoracic teaching (CT), general surgery teaching (GS), non-surgical teaching (NS), and non-teaching (NT) hospitals. We hypothesize that morbidity and mortality for these procedures are different between hospitals and that operations performed at CT teaching hospitals have superior results.

METHODS: Discharge records of adults who underwent pneumonectomy, segmentectomy, lobar, and non-anatomic resections (N = 498,099) were evaluated in an all-payer inpatient database between 2003–2009. Hospital teaching status was determined by linkage to Association of American Medical College's Graduate Medical Education Tracking System. Patient demographics, risk factors, and hospital characteristics were evaluated. Multiple logistic regression models examined in-hospital mortality, the occurrence of any complication, and failure to rescue (FTR, death following a complication).

RESULTS: The mean annual pulmonary resection volume among hospitals was CT (11,721, 16%), GS (12,119, 17%), NS (19,699, 28%), and NT (27,571, 39%). The average age of pulmonary resection recipients amongst hospitals was similar, as were their mean number of comorbidities (2 ± 1.5). CT hospitals treated the least number of patients with Medicare and the most number of patients with Medicaid ($P < 0.001$). Unadjusted mortality for all procedures (Table 1) was lowest at CT hospitals (CT: 2.6%, GS: 2.8%, NS: 3.4%, NT 3.6%, $P < 0.001$). Similarly, any complication was also least likely to occur at CT hospitals (CT: 20.5%, GS: 23.5%, NS: 24.6%, NT: 24.9%, $P < 0.001$). Unadjusted procedural complications were similar across hospitals, although pulmonary complications were least likely to occur at CT hospitals ($P < 0.001$). Following case-mix adjustment, the risk of any complication following SG or NA was lower at CT hospitals versus

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GS hospitals (P < 0.001). Among pneumonectomy recipients, CT teaching status independently reduced the adjusted odds ratio (AOR) of FTR by >25% compared to NS (AOR 0.34; 95% CI, 0.27–0.43 vs. AOR 0.62; 95% CI, 0.52–0.73; P < 0.001). Similarly in pneumonectomy patients, CT centers lowered the AOR of death by >30% compared to GS hospitals (AOR 0.33; 95% CI, 0.27–0.40 vs. AOR 0.69; 95% CI 0.58–0.81; P < 0.001).

Table 1. Cumulative unadjusted mortality of pulmonary resections by type of hospital

	Pneumonectomy *N = 22,663*	Segmentectomy *N = 43,851*	Lobar Resection *N = 222,586*	Non-Anatomic Resection *N = 208,999*
Type of Hospital				
Cardiothoracic Teaching	290 / 4441 (6.5%)	175 / 7608 (2.3%)	716 / 30936 (2.3%)	951 / 39060 (2.4%)
General Surgery Teaching	372 / 3847 (9.7%)	211 / 8412 (2.5%)	746 / 37815 (2.0%)	1027 / 34762 (3.0%)
Non-Surgical Teaching	633 / 6676 (9.5%)	336 / 10803 (3.1%)	1929 / 63658 (3.0%)	1749 / 56758 (3.1%)
Non-Teaching	881 / 7670 (11.5%)	660 / 17000 (3.9%)	2785 / 90031 (3.1%)	2673 / 78299 (3.4%)

Shown as Mortality / Total Volume (%)

CONCLUSIONS: In comparison to other hospitals, including GS teaching hospitals, CT surgery teaching hospitals have lower morbidity and mortality. These results support using CT hospital teaching status as an independent prognosticator of outcomes in pulmonary resections.

11:25 a.m. **PRESIDENTIAL ADDRESS**

"To Model Excellence"
Craig R. Smith
Columbia University

Introduced By: Hartzell V. Schaff

12:15 p.m. **ADJOURN FOR LUNCH – VISIT EXHIBITS**
Exhibit Hall, Moscone West Convention Center

2:00 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

(8 minute presentation, 12 minute discussion)

Moderators: Friedhelm Beyersdorf
Joseph Sabik

7. Sutureless Aortic Valve Replacement as an Alternative Treatment for Patients Belonging to the "Grey Zone" Between Transcatheter Aortic Valve Implantation and Conventional Surgery: A Propensity Matched, Multicenter Analysis

Augusto D'Onofrio[1], Antonio Messina[2], Roberto Lorusso[3], Ottavio R. Alfieri[+4], Melissa Fusari[5], Paolo Rubino[6], Mauro Rinaldi[7], Roberto Di Bartolomeo[8], Mattia Glauber[9], Giovanni Troise[2], Gino Gerosa[+1]

1. Division of Cardiac Surgery, University of Padova, Padova, Italy. 2. Division of Cardiac Surgery, Poliambulanza Hospital, Brescia, Italy. 3. Division of Cardiac Surgery, Community Hospital, Brescia, Italy. 4. Department of Cardiac Surgery, San Raffaele University Hospital, Milan, Italy. 5. Department of Cardiovascular Sciences, Centro Cardiologico Monzino, IRCCS, University of Milan, Milan, Italy. 6. Invasive Cardiology Laboratory, Cardiology Division, Montevergine Clinic, Mercogliano, Italy. 7. Division of Cardiac Surgery, University of Turin, Turin, Italy. 8. Division of Cardiac Surgery, University of Bologna, Bologna, Italy. 9. Department of Adult Cardiac Surgery, G. Pasquinucci Heart Hospital, Massa, Italy.

Invited Discussant: Thierry-Pierre Carrel

OBJECTIVE(S): New emerging valve technologies are now available for the treatment of patients with severe aortic valve stenosis (AS) deemed unsuitable or at high risk for conventional surgery. Sutureless aortic valve replacement (SU-AVR) has been proposed as a possible treatment for patients belonging to the "grey zone" between conventional surgery and transcatheter aortic valve implantation (TAVI). Aim of this propensity-matched, multicenter study was to compare clinical and echocardiographic outcomes at hospital discharge of patients undergoing transapical TAVI (TA-TAVI) vs patients undergoing SU-AVR for severe symptomatic AS.

[+]AATS Member

METHODS: After excluding 98 TA-TAVI patients who were inoperable for porcelain aorta, we reviewed 468 TA-TAVI performed in 20 centers from March 2008 to May 2011 and 51 SU-AVR performed in 3 centers from March to September 2011. Based on a propensity score analysis, 2 groups (TA-TAVI and SU-AVR) with 38 matched pairs were created. Variables used in the propensity analysis were: age, sex, body surface area, NYHA class, logistic Euroscore, peripheral vascular disease, chronic obstructive pulmonary disease, aortic valve area, mitral regurgitation and left ventricular ejection fraction (LVEF). Propensity c-statistics was 0.96.

RESULTS: After propensity matching, the two groups were comparable in terms of preoperative characteristics. In particular, in TA-TAVI and in SU-AVR patients, logistic Euroscore (14.8 ± 7.5% vs 13.7 ± 7.2%, p = 0.47) and age (80.9 vs 81.1 years, p = 0.92) were similar. Hospital mortality was 5.3% (2 patients) and 0% in TA-TAVI and SU-AVR groups, respectively (p = 0.49). We did not observe neither stroke nor acute myocardial infarction in the two groups. Permanent pace-make implantation was needed in 2 patients of each group (5.3%, p = 1.0). Dialysis for acute kidney injury was required in 2 patients (5.3%) of the SU-AVR group and in 1 patient (2.7%) of the TA-TAVI group (p = 1.0). Pre-discharge echocardiographic data showed that the incidence of paravalvular leak (at least mild) was higher in the TA-TAVI group (17 patients, 44.7% vs 6 patients, 15.8%; p = 0.001) but there were no differences in terms of mean trans-prosthetic gradient (10.3 ± 4.9 mmHg vs 11 ± 3.9 mmHg, p = 0.56) and LVEF (56.2 ± 13.7% vs 57.1 ± 11.5%; p = 0.74).

CONCLUSIONS: This preliminary experience demonstrated that, in patients at higher risk for conventional surgery, SU-AVR is as safe and effective as TA-TAVI and that it is associated with a lower rate of post-procedural paravalvular leak.

8. Transcatheter Heart Valves as a Valve-in-Valve Implantation in Patients with Degenerated Aortic Bioprostheses

Vinayak Bapat[1], Rizwan Q. Attia[1], Hassan Y. Tehrani[1], Martyn Thomas[2], Simon Redwood[2], Jane Hancock[2], Kirsty Macgillivary[2], Karen Wilson[2], Christopher Young[1]

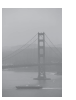
1. Cardiothoracic Surgery, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom. 2. Cardiology, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom.

Invited Discussant: Anson Cheung

OBJECTIVE(S): Reoperations for degenerated aortic bioprostheses and homografts carry a high risk especially in patients with multiple co-morbidities. Transcatheter Aortic Valve Implantation (TAVI) as a treatment for high-risk patients with native aortic stenosis (AS) that has been applied to this group. We present our experience with TAVI as a valve-in-valve (V-in-V) procedure in this cohort of patients.

METHODS: Over 300 patients underwent TAVI using the Edwards Lifesciences Sapien™ valve at our institution between February 2008 to December 2011. Of these 19 patients underwent TAVI as a V-in-V procedure (transapical 17, transfemoral 2). Ten of those were degenerated stented bioprostheses, seven were stentless and two were homografts. All patients were discussed in a multidisciplinary meeting and the decision for TAVI was based on a high predictive risk for redo AVR. The mean age was 78.1 ± 6.3 and sex ratio 2.5 M:1F. The mean logistic EuroSCORE was 32.65 ± 6.9% and STS score was 6.7 ± 1.8. Aortic stenosis was predominant in 10 and aortic regurgitation (AR) in 9. 91% were in New York Heart Association functional class III-IV. The peak and mean gradients across the stenotic valves were 54.3 ± 13.8 and 29.6 ± 8.6 mmHg, respectively. The mean valve area was 0.94 ± 0.15 cm^2.

RESULTS: Procedural success was achieved in all patients (100%). There was a significant reduction in the post-procedural mean and peak gradients (16.0 ± 3.9 mmHG (P = 0.008) and 8.8 ± 2.3 mmHg (P = 0.002), respectively). The postprocedural valve area significantly increased to 1.50 ± 0.68 cm2 (P = 0.03). None of the patients had ≥ Grade 2 aortic regurgitation at discharge. None of the patients sustained neurological, vascular or cardiac complications. One patient required pre-procedural insertion of a permanent pacemaker for persistent AV block. There was no 30-day



mortality. 1 patient died at day 46 of infra-renal aneurysm rupture. All patients were in NYHA class I-II at a median follow up of 180 days. Cumulative survival was superior in patients who had V-in-V in a stented vs. stentless prosthesis.

CONCLUSIONS: The use of TAVI as a valve-in-valve for the treatment of degenerated bioprostheses is feasible with excellent short-term results in a cohort of high surgical risk patients. Use is dictated by the internal diameter of the degenerated bioprosthesis and longer follow up periods are needed to assess the durability of this treatment option if it were to become an option for lower risk patients.

9. The CURE-AF Trial: A Prospective, Multicenter Trial of Irrigated Radiofrequency Ablation for the Treatment of Persistent Atrial Fibrillation During Concomitant Cardiac Surgery

Ralph J. Damiano, Jr.[+1], Vinay Badhwar[+2], Michael Acker[+3], Ramesh Veeragandham[4], Thoralf M. Sundt, III[+5]

1.Washington University School of Medicine. 2.University of Pittsburgh Medical Center. 3.Hospital of the University of Pennsylvania. 4.John Muir Medical Center. 5.Massachusetts General Hospital.

Invited Discussant: Niv Ad

OBJECTIVE(S): The purpose of this study was to examine the efficacy and safety of irrigated unipolar and bipolar radiofrequency (RF) ablation for the treatment of persistent and long-standing persistent atrial fibrillation (AF) during concomitant cardiac surgical procedures.

METHODS: Between May, 2007 and July, 2011, 150 consecutive patients were enrolled at 15 US centers. Patients were followed for 6–9 months, at which time a 24-hour Holter was obtained as the primary efficacy end-point. Recurrent AF was defined as any episode of atrial tachyarrhythmias over 30 seconds on the Holter monitor. The safety end-point was the percent of patients who suffered a major adverse cardiac event (MACE) within 30 days of surgery. All patients underwent a standardized biatrial Cox-Maze IV lesion set using irrigated RF ablation devices. Pulmonary vein isolation (PVI) was assessed by testing for exit block.

RESULTS: Patient and procedural demographics are shown in Table 1. Total mean RF ablation time was 9 ± 3 min. All patients assessed for PVI (n = 128) had conduction block. Operative mortality was 4%, and there were only 4 (3%) 30-day MACE. The overall freedom from AF was 66%, with 47% of patients free from AF and also off antiarrhythmic drugs at 6-9 months. The success rate was 82% in patients with persistent AF, as opposed to 63% with long-standing, persistent AF. Increased left atrial (LA) diameter, shorter total RF ablation time and an increasing number of concomitant procedures were significantly ($p < .05$) associated with the occurrence of recurrent AF.

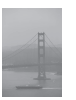


Table 1: Patient and Procedural Demographics

Mean Age	**70.5 ± 9.4 Years**
Male	56%
NYHA Class II, III	94%
Paroxysmal AF	3%
Persistent AF	22%
Longstanding, persistent AF	75%
Left atrial diameter	5.2 ± 0.9 cm
AF duration	64 ± 78 months
Single valve ± CABG	53%
Double valve ± CABG	30%
Triple valve ± CABG	1%
CABG	15%
Other	1%

CONCLUSIONS: Irrigated RF ablation to treat persistent AF during cardiac surgery was associated with a low complication rate, and there were no device-related complications. The Cox-Maze IV lesion set was effective at restoring sinus rhythm and had higher success rates in patients with shorter duration of AF, smaller LA diameters and more thorough ablation times.

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:35 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center

Moderators: Ralph J. Damiano, Jr.
Joseph Sabik

10. Selective Antegrade Cerebral Perfusion and Mild (28–30°C) Systemic Hypothermic Circulatory Arrest for Aortic Arch Replacement: Results from 1002 Patients

Andreas Zierer[1], Ali El-Sayed Ahmad[1], Nestoras Papadopoulos[1], Anton Moritz[1], Anno Diegeler[2], Paul P. Urbanski[2]
1. Division of Thoracic and Cardiovascular Surgery, Johann-Wolfgang-Goethe University Frankfurt/Main, Germany, Frankfurt Main, Germany. 2. Cardiovascular Clinic Bad Neustadt, Bad Neustadt, Germany.

Invited Discussant: Nicholas T. Kouchoukos

OBJECTIVE(S): Use of selective antegrade cerebral perfusion (ACP) makes deep hypothermia non-essential for aortic arch replcacement. Consequently, a growing tendency to increase the body temperature during circulatory arrest with ACP has recently been reported from various institutions. However, very little is known about the clinical impact of different modes of ACP (unilateral vs. bilateral) on neurologic morbidity and the save limits of this approach for spinal chord and visceral organ protection are yet to be defined.

METHODS: Between January 2000 and January 2011, 1002 consecutive patients underwent aortic arch repair during ACP (unilateral: n = 673; bilateral: n = 329) with mild systemic hypothermia (31°C ± 2°C; range 26–34°C) at 2 centres in Germany. Mean age was 62 ± 14 years, 663 patients (66%) were men and 347 patients (35%) had acute type A dissection. Hemiarch replacement was performed in 684 patients (68%) while the remaining 318 patients (32%) underwent total arch replacement.

RESULTS: Cardiopulmonary bypass time accounted for 158 ± 56 minutes, and myocardial ischemic time was 101 ± 41 minutes. Isolated ACP was performed for 36 ± 19 (range 9 to 135) minutes. We observed new

postoperative permanent neurologic deficits in 28 patients (3%;stroke:n = 25;paraplegia:n = 3) and transient neurologic deficits in 42 patients (4%). All 3 cases of paraplegia occured in patients with acute type A dissection and a broad range of ACP times (24, 41, and 127 minutes). There was a trend towards a reduced permanent neurologic deficit rate following unilateral ACP ($p = 0.06$) while there was no difference in occurrence of transient neurologic deficits ($p = 0.81$). Overal, early mortality rate was 5% ($n = 52$). Temporary dialysis was necessary primarily after surgery in 38 patients (4%) and 3 patients developed hepatic failure. Among patients with ACP times up to 90 minutes, neurologic morbidity, early mortality, and the need for temporary dialysis were independent of the duration of ACP and were not affected by unilateral versus bilateral ACP ($p \geq 0.68$).

CONCLUSIONS: Current data suggest that ACP and mild systemic hypothermic circulatory arrest can safely be applied to complex aortic arch surgery requiring up to 90 minutes of ACP times. Unilateral ACP offers at least equal brain and visceral organ protection as bilateral ACP and may be advantageous in that it reduces embolism arising from surgical manipulation on arch vessels.

11. Orthotopic Heart Transplant Versus Left Ventricular Assist Device: A National Comparison of Cost and Survival

Daniel P. Mulloy, Castigliano M. Bhamidipati, Matthew L. Stone, Gorav Ailawadi+, Irving L. Kron+, John A. Kern+

Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Ranjit John

OBJECTIVE(S): Orthotopic heart transplantation (OHT) is the accepted standard of care for end-stage heart disease. Left ventricular assist device (LVAD) implantation offers an alternative treatment approach for patients awaiting, or ineligible for, OHT. LVAD clinical practice has changed dramatically since the 2008 FDA approval of the HeartMate II® (Thoratec, Pleasanton, CA), but at what societal cost? This study examines the cost and efficacy of both treatments over time.

METHODS: All patients who underwent either OHT (N = 9,369) or placement of an implantable LVAD (N = 6,414) from 2005 through 2009 in the Nationwide Inpatient Sample were selected. Trends in treatment utilization, mortality, complications, charges, and costs were analyzed.

Table:

	2005	2006	2007	2008	2009
Heart Transplant	1744	1696	1459	2243	2227
Mortality	105 (6)	110 (7)	56 (4)	90 (4)	112 (5)
Cost	$120,414 ± $1,656	$109,526 ± $1,565	$129,044 ± $1,984	$145,709 ± $1,872	$168,576 ± $2,366
Entitlement Program	704 (40)	692 (41)	624 (43)	1106 (49)	990 (44)
Private Insurance	946 (55)	803 (48)	696 (48)	1055 (47)	1088 (49)
Implantable LVAD	811	952	909	1444	2298
Mortality	343 (42)	395 (41)	320 (35)	318 (22)	390 (17)
Cost	$177,508 ± $3,504	$160,844 ± $2,718	$193,960 ± $3,621	$199,353 ± $2,814	$208,523 ± $1,968
Entitlement Program	325 (40)	314 (33)	394 (43)	755 (52)	1160 (51)
Private Insurance	437 (55)	519 (55)	430 (47)	619 (43)	984 (46)

Data shown as N (%) or Mean ± SEM

RESULTS: The incidence of OHT increased marginally over 5 years (Table). Meanwhile, annual LVAD implantation rates nearly tripled, eclipsing OHT for the first time in 2009 (P < 0.001). Mortality from LVAD implantation decreased precipitously, from 42% in 2005 to 17% in 2009 (P < 0.001).

Yearly mortality for OHT remained relatively stable (Range: 4% to 7%). From 2005 to 2009, mean cost-per-patient increased for both OHT and LVAD (40% and 17%, respectively). With the observed increase in both device utilization and cost-per-patient, cumulative LVAD cost rose 79% over 5 years ($210,001,893 to $375,418,974). By 2009, the entitlement programs (Medicare and Medicaid combined) were the primary payer for nearly half of all patients (OHT: 45%, LVAD: 51%).

CONCLUSIONS: Since FDA approval of the HeartMate II in 2008, mortality after LVAD implantation has decreased rapidly yet remains higher than OHT. Despite lower mortality, improvements in patient care, and enhancements in device technology, LVAD costs continue to rise and are significantly higher than OHT. In light of the evolving healthcare economics climate, with increasing emphasis on costs and comparative-effectiveness, a concerted effort at LVAD cost-containment and judicious utilization is essential to preserve the viability of this invaluable treatment.

12. Update on Reinterventions and Risk Factors for Reoperation in 2000 Patients After the Ross Procedure—Results of the German-Dutch Ross Registry

Efstratios Charitos[1], Thorsten Hanke[1], Armin W. Gorski[2], Wolfgang Hemmer[3], Cornelius Botha[4], Ulrich Franke[5], Ali Dodge-Khatami[6], Juergen Hoerer[7], Rudiger S. Lange[7], Anton Moritz[8], Katharina Ferrari-Kuehne[9], Roland Hetzer[10], Michael Huebler[10], Ad Bogers[11], Johanna Takkenberg[11], Ulrich Stierle[1], Hans-Hinrich Sievers[+1]

1. Cardiac and Thoracic Vascular Surgery Clinic, University of Luebeck, Luebeck, Germany. 2. Thoracic, Cardiac and Vascular Surgery Clinic, University of Wuerzburg, Wuerzburg, Germany. 3. Heart Surgery Clinic, Sana Stuttgart, Stuttgart, Germany. 4. Cardiac Surgery Clinic, Bodensee Heart Center, Konstanz, Germany. 5. Cardiac and Vascular Surgery Clinic, Robert Bosch Hospital, Stuttgart, Germany. 6. Heart Surgery Clinic, University of Hamburg, Hamburg, Germany. 7. Heart Surgery Clinic, German Heart Center, Munich, Germany. 8. Cardiac and Thoracic Surgery Clinic, Johann Wolfgang Goethe-University, Frankfurt/Main, Germany. 9. Cardiac and Thoracic Surgery Clinic, University of Jena, Jena, Germany. 10. Heart Surgery Clinic, German Heart Center, Berlin, Germany. 11. Heart Surgery Clinic, Erasmus Medical Center, Rotterdam, Netherlands.

Invited Discussant: Joseph A. Dearani

OBJECTIVE(S): Reinterventions after the Ross procedure remain a concern for the patients as well as the treating physicians. Aim of the present study was to provide an update on reinterventions after the Ross procedure in the large patient population of the German-Dutch Ross Registry

METHODS: Between 1988 and 2011, 2023 patients (mean age 39.05 ± 16.5, 1502 male, 1642 adults) underwent a Ross procedure in 13 centers. Mean follow-up was 7.1 ± 4.6 years (range: 0–22 years, with a total of 13168 patient*years).

RESULTS: 134 autograft reinterventions in 126 patients (6.2%, Linearized Occurrence Rate (LOR) 1.0% / patient*year) and 118 homograft reinterventions in 98 patients (4.8%, 0.89% / patient * year) were observed. 20%

of the autograft and homograft reinterventions were performed due to endocarditis. Freedom from autograft reintervention was 87% at 10 years and 83% at 12 years. The subcoronary technique in the adult population resulted in significantly superior autograft durability (freedom from autograft reintervention 91% at 10 years, 88% at 12 years, $p < 0.001$). The root replacement technique without root reinforcement (Hazard Ratio (HR): 3.0, 95% C.I. 1.8–4.9) as well as the presence of pure aortic insufficiency preoperatively (HR 2.6, 95% C.I 1.8–3.9) were statistically significant predictors for shorter time to reoperation. Freedom from homograft reoperation was 93% at 10 years and 91% at 12 years, with younger recipient and older donor age being significant predictors of shorter time to homograft reoperation.

CONCLUSIONS: In general, the autograft principle remains a valid option in young patient requiring aortic valve replacement. The risk for reoperation depends largely on the utilized surgical technique. The subcoronary Ross technique results in acceptable long term results after the Ross procedure. Adequate endocarditis prophylaxis may further reduce the need for reoperation.

13. A Randomized Comparison of the SAphenous VEin Versus Right Internal Thoracic Artery as a Y-Composite Graft (SAVE-RITA Trial)—An Interim Report

Ho Young Hwang, Se J. Oh, Jun Sung Kim, Ki-Bong Kim+

Department of Thoracic & Cardiovascular Surgery, Seoul National University Hospital, Seoul, Republic of Korea.

Invited Discussant: Brian F. Buxton

OBJECTIVE(S): The SAVE-RITA trial was developed to evaluate non-inferiority of the saphenous vein compared to the right internal thoracic artery (ITA) as a Y composite graft in terms of early and 1 year angiographic patency rates and mid-term clinical outcomes. As an interim analysis, we compared early clinical outcomes and early angiographic patency rates.

METHODS: From September 2008, 212 patients (mean age, 63.1 ± 7.8 years) with multi-vessel coronary artery disease have been recruited and randomized as a 1:1 manner at a single institute. Off-pump coronary artery bypass grafting was performed using the saphenous vein graft from a lower leg (SVG group, n = 106) or right ITA (RITA group, n = 106) as a second Y-composite graft connected to the in situ left ITA. Early postoperative (1.4 ± 1.1 days) angiographies were performed in 211 patients. Clinical outcomes were compared in all patients as an intention-to-treat analysis. Five patients were excluded from the comparison of angiographic patency rates due to intraoperative changes in grafting strategy.

RESULTS: Total number of distal anastomoses was 3.5 ± 0.8, without intergroup difference. For complete revascularization, a third graft was needed in 4 and 35 patients in the SVG and RITA groups, respectively (3.8% vs 33.0%, P < .001). The numbers of distal anastomoses using a second graft were 2.3 ± 0.8 and 1.8 ± 0.7 in the SVG and RITA groups, respectively (P < .001). There was one operative death (0.5%) in the RITA group. Postoperative complications included atrial fibrillation (n = 31, 14.6%), acute renal failure (n = 3, 1.4%), bleeding reoperation (n = 3, 1.4%), perioperative myocardial infarction (n = 1, 0.5%) and mediastinitis (n = 1, 0.5%). No differences in early clinical outcomes were observed between the 2 groups except atrial fibrillation (SVG vs RITA groups, n = 10, 9.4% vs n = 21, 19.8%; P = .033). Early postoperative angiograms demonstrated an overall patency rate of 99.1% (729 of 734 distal anastomoses). Patency rates of the second grafts were 98.7% (231 of 234) and 99.5% (197 of 198) in the SVG and RITA groups, respectively (P = .628, Table 1).

+AATS Member

Table1. Early Angiographic Patency Rates

	Total n = 206)	SVG group (n = 103)	RITA group (n = 103)	P value
Total	729/734 (98.9%)	362/366 (98.1%)	367/368 (99.7%)	.216
Left ITA	253/253 (100%)	128/128 (100%)	125/125 (100%)	—
Second graft	428/432 (99.1%)	231/234 (98.7%)	197/198 (99.5%)	.628
Third graft	48/49 (98.0%)	3/4 (75.0%)	45/45 (100%)	.082

CONCLUSIONS: The right ITA composite graft was relatively short for complete revascularization in 33.0% of the patients. The saphenous vein composite grafts used as a second conduit were non-inferior to the right ITA composite grafts in terms of clinical outcomes and early angiographic patency. (NCT01051986).

5:00 p.m. **ADJOURN**

2:00 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

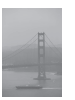
Moderators: Emile A. Bacha
Shunji Sano

14. Long-Term Functional Health Status of Patients with Pulmonary Atresia with Intact Ventricular Septum: A Congenital Heart Surgeons Society Study

Tara Karamlou[1], Jeffrey A. Poynter[2], Marshall L. Jacobs[+3], Jonathan Rhodes[4], Igor Bondarenko[7], Sara Pasquali[9], Stephanie Fuller[6], Linda M. Lambert[5], Henry L. Walters[+7], Kim Duncan[8], Eugene H. Blackstone[+3], William G. Williams[+2], Christopher A. Caldarone[+2], Brian McCrindle[2]
1. Pediatric Cardiothoracic Surgery, Seattle Children's Hospital, Seattle, WA, United States. 2. Cardiac Surgery, The Hospital for Sick Children, Toronto, ON, Canada. 3. Cardiothoracic Surgery, The Cleveland Clinic, Cleveland, OH, United States. 4. Pediatric Cardiology, Children's Hospital of Boston, Boston, MA, United States. 5. Cardiothoracic Surgery, Primary Children's Hospital, Salt Lake City, UT, United States. 6. Cardiothoracic Surgery, Children's Hospital of Pennsylvania, Philadelphia, PA, United States. 7. Cardiothoracic Surgery, Children's Hospital of Michigan, Detroit, MI, United States. 8. Cardiothoracic Surgery, University of Nebraska, Omaha, NE, United States. 9. Pediatric Cardiology, Duke University, Durham, NC, United States.

Invited Discussant: V. Mohan Reddy

OBJECTIVE(S): Selection of repair pathway for patients with pulmonary atresia with intact ventricular septum (PAIVS) is influenced by the degree of right-heart hypoplasia. A balanced approach achieves optimal short-term outcome, but a bias remains favoring biventricular repair (BV). We sought to address the question: What are the implications of forcing a borderline candidate down a BV repair pathway in terms of late exercise capacity (EC) and functional health status (FHS)?



METHODS: Between 1987 and 1997, 448 neonates with functional PAIVS were enrolled in a multi-institutional study. EC and FHS were assessed at a mean of 14 years following repair using standardized exercise testing and three separate, validated FHS instruments (CHQ, CHAT, PedsQL). Scores on FHS and EC testing were related to initial morphologic features and other patient variables using multivariable linear regression. The relationships between patient-perceived FHS and measured EC and three potential endstates (BV, univentricular [UV], or one-and-one-half ventricle repair [1.5V]) were evaluated.

RESULTS: 106 of 271 survivors participated, including 63 BV, 25 UV, 14 1.5V, 3 palliated patients, and one transplant recipient. Participating survivors had higher initial tricuspid valve Z-scores (ITVZ; P = 0.02), lower prevalence of RV-dependent coronary circulation (P = 0.009), and a higher proportion of BV repairs (P < 0.001) compared to the inception cohort. PAIVS patients had lower FHS scores in domains of physical functioning (85.0 ± 16.4) compared to published norms (94.8 ± 9.6; P < 0.001), but scored higher in psychosocial domains. In general, age- and gender-adjusted EC and FHS measures were lower in UV patients (Figure 1A). While similarly low across repair groups, percent predicted max VO2 was more normal for those with larger ITVZ across all repair groups (P = 0.03), with an important interaction magnifying this effect within the BV group (Figure 1B). Achievement of BVR was associated with improved EC relative to UV repair only in patients whose ITVZ exceeded zero.

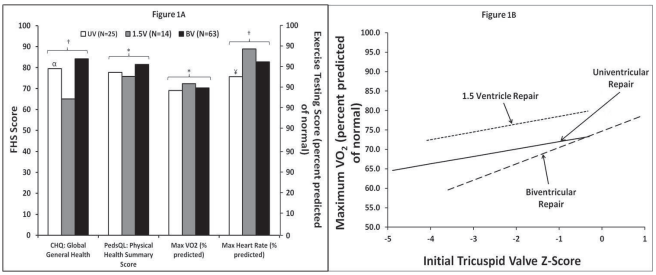
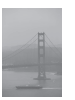


Figure: *Measures of functional health status and exercise capacity organized by repair type (Figure 1A), and nomogram relating the association between late maximum VO_2 and initial tricuspid valve z-score by repair group (Figure 1B). * = Overall p value non-significant; † = Overall p value < 0.05; ¥ = P < 0.05 compared to reference group (1.5V); UV = univentricular; BV = biventricular; 1.5V = one and one-half ventricle.*

CONCLUSIONS: Late patient-perceived FHS and measured EC are reduced, regardless of type of PAIVS repair achieved. For those with greater initial right-sided hypoplasia, achievement of survival with BV repair may be at a cost of late deficits in exercise capacity. These findings further point to the need for a balanced approach regarding repair strategy.



15. Cerebral Oxygen Extraction Is Increased After Cardiac Surgery in Neonates and Is Not Related to Use of Deep Hypothermic Circulatory Arrest

Erin M. Buckley[1,4], Donna A. Goff[2], Jennifer M. Lynch[4], Peter Schwab[1], Susan C. Nicolson[3], Lisa M. Montenegro[3], Arjun G. Yodh[4], J. William Gaynor[2], Thomas L. Spray[2], Daniel J. Licht[1]

1. Neurology, Children's Hospital of Philadelphia, Philadelphia, PA, United States. 2. Cardiology, Children's Hospital of Philadelphia, Philadelphia, PA, United States. 3. Cardiothoracic Anesthesia, Children's Hospital of Philadelphia, Philadelphia, PA, United States. 4. Physics and Astronomy, University of Pennsylvania, Philadelphia, PA, United States.

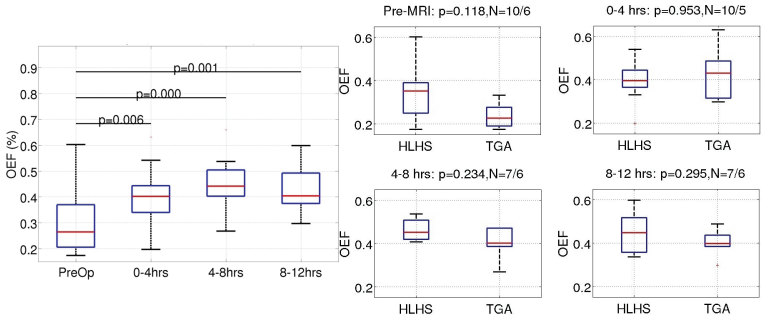
Invited Discussant: Christian Pizarro

OBJECTIVE(S): The early post-operative period is a time of increased risk for white matter injury following cardiac surgery in neonates. The mechanisms underlying this increased risk are not known. The effects of deep hypothermic circulatory arrest (DHCA) versus continuous cardiopulmonary bypass (CPB) on early post-operative cerebral metabolism have not been delineated. We monitored early post-operative cerebral hemodynamics and oxygen extraction fraction (OEF) in neonates with hypoplastic left heart syndrome (HLHS) who undergo DHCA and neonates with transposition of the great arteries (TGA) who do not undergo DHCA. We hypothesized that recovery from DHCA would require increased OEF post-operatively.

METHODS: For 12 hours after surgery, diffuse optical spectroscopy (DOS) was used to acquire periodic cerebral hemodynamic data every 2 hours. DOS quantified cerebral oxy-, deoxy- and total hemoglobin concentrations (HbO2, Hb, THC, respectively). Cerebral oxygen saturations (ScO2) were calculated as ScO2 = HbO2/THCx100%. Arterial oxygen saturations (SaO2) from arterial blood gases were obtained and combined with ScO2 to yield an estimate of oxygen extraction fraction [OEF = (SaO2–ScO2)/SaO2].

The time frame for each patient's measurements was standardized by defining t = 0 as the time the patient was removed from cardiopulmonary bypass (CPB). Total surgical support time (SST) was calculated as CPB plus-DHCA times. Measurements were binned into 4 categories: 1) Pre-CPB, 2) 0 to 4 hours post-CPB, 3) 4 to 8 hours post-CPB, and 4) 8 to 12 hours

post-CPB. A two-sided Wilcoxon signed rank test was used to compare each parameter, and Pearson's correlation coefficent (R) tested relations between OEF and SST/DHCA.



RESULTS: Cerebral hemodynamics were assessed in 16 patients, 10 with HLHS and 6 with TGA. OEF increased from pre-operative levels ($p < 0.001$) (see Figure 1, left). No differences in OEF were found between HLHS and TGA patients preoperatively or at any point postoperatively ($p>0.05$, Figure 1, right). The increase in OEF was sustained at above preoperative levels throughout the 12 hour monitoring sessions. No relationships were observed between post-operative OEF at any time bin and duration of SST or DHCA (all $p>0.05$).

CONCLUSIONS: Cerebral oxygen utilization is significantly increased above preoperative levels in the early post-operative period after cardiac surgery in neonates. This increase in OEF is independent of the use or duration of DHCA, and may explain the increased vulnerablity to brain injury.

16. Predictive Value of Pre- and Post-Operative Near-Infrared Spectroscopy on Neurodevelopmental Outcomes Following Cardiac Surgery in Infancy

Erica Sood[1,2], Julie Simons[1,2], Ryan Davies[1], Edward Woodford[1], Christian Pizarro[+1]

1. Nemours Cardiac Center, Nemours/Alfred I. duPont Hospital for Children, Wilmington, DE, United States. 2. Department of Pediatrics, Division of Behavioral Health, Nemours/Alfred I. duPont Hospital for Children, Wilmington, DE, United States.

Invited Discussant: Charles D. Fraser

OBJECTIVE(S): The predictive value of near-infrared spectroscopy (NIRS) monitoring on neurodevelopmental outcome (NDO) remains unclear. Previous studies have focused on the intraoperative period, lacking pre- and post-operative NIRS data. This study aims to examine the relationships of pre- and post-operative regional cerebral oxygen saturation (rSO2) measured by NIRS to NDO following infant cardiac surgery.

METHODS: Cross-sectional neurodevelopmental evaluation at 2 years of age was performed for patients who had congenital heart surgery with NIRS monitoring between 2007–2009. The third edition of Bayley scales of Infant and Toddler Development was used to assess cognitive, language, and motor functioning. Clinical and perioperative data were extracted from the medical record, including preoperative NIRS (baseline), NIRS nadir during the 48-hour postoperative period, number of recorded postoperative NIRS values under 40%, 30%, and 20% saturation, and percent decrease from baseline.

Descriptive Data (N = 26)

	Median (1Q–3Q)	Frequency (%)
Clinical Variables		
Premature Birth		2 (7.7%)
Single Ventricle Physiology		6 (23.1%)
Significant Comorbidity		6 (23.1%)
Preoperative ICU		16 (61.5%)
Age of Surgery (Months)	0.6 (0.2–3.4)	
Weight at Surgery (Kg)	3.6 (3–4.5)	
Aristotle Complexity Score	12.0 (9.3–14.6)	
Duration of CPB (Mins)	96 (75.5–130)	
Use of DHCA		23 (88.5%)
Duration of DHCA (Mins)	39.5 (16.8–45.3)	
Postoperative Cyanosis		5 (19.2%)
Length of ICU Stay (Days)	7.5 (3.8–12.8)	
Length of Hospital Stay (Days)	14.5 (11.8–23.8)	
Morbidity		14 (53.8%)
Required CPR		0
Required ECMO		0
Multiple Procedures (Lifetime)		11 (42.3%)
Multiple DHCA (Lifetime)		8 (30.8%)
Cumulative DHCA Duration (Mins in Lifetime)	43.5 (35–74)	
NIRS Variables		
Preoperative rSO2 (Baseline)	72 (52.8–80)	
Postoperative rSO2 Nadir	55.5 (40.8–62)	
rSO2 % Decrease from Baseline	21.4 (10.2–37.2)	
Postoperative rSO2 Nadir < 40%		5 (19.2%)
20% Decrease from Baseline		14 (53.8%)
Lactate Levels		
8 Hours Post-operative	2.0 (1.5–3.3)	
16 Hours Post-operative	1.4 (1.1–1.8)	
24 Hours Post-operative	1.3 (0.8–1.8)	

RESULTS: Perioperative NIRS and NDO data were available for 26 patients without chromosomal abnormality (Table 1). No patients had cardiac arrest or received ECMO support. Mean cognitive (8.9 ± 3.3), language (receptive: 9.3 ± 4.1; expressive: 10.0 ± 4.3), and motor (fine: 10.3 ± 2.7; gross: 8.4 ± 1.5) scores fell within one standard deviation of the normative mean (10 ± 3). rSO2 measured by NIRS was inversely correlated with post-operative lactate levels at 8 and 16 hours ($P < .05$). Pre- and post-operative NIRS was not significantly associated with NDO in univariable analyses. In multivariable analyses, length of hospital stay predicted worse outcomes in the cognitive domain ($\beta = -.68$, $P < .001$, 43% of variance), length of ICU stay predicted worse outcomes in the fine motor domain ($\beta = -.58$, $P < .01$, 31% of variance), and presence of a significant comorbidity ($\beta = -.62$, $P < .01$) and cumulative duration of deep hypothermic circulatory arrest (DHCA) in lifetime ($\beta = -.42$, $P = .01$) predicted worse outcomes in the gross motor domain (54% of variance). Language outcomes in this sample were not significantly associated with any clinical or perioperative characteristics.

CONCLUSIONS: In this contemporary cohort of infants undergoing cardiac surgery, NDO at 2 years of age is predominantly influenced by innate patient characteristics as well as duration and intensity of medical care. Although postoperative NIRS correlates with lactate level, it did not enhance the ability to predict NDO beyond other perioperative and clinical characteristics.

17. Post-Operative Electroencephalographic Seizures Are Associated with Worse Executive Function and Behavior at Four Years of Age Following Cardiac Surgery in Infancy

J. William Gaynor[+1], Ramakrishnan Rajagopalan[2], Marsha Gerdes[1], Gail P. Jarvik[2], Judy Bernbaum[1], Gil Wernovsky[1], Susan C. Nicolson[1], Thomas L. Spray[+1], Robert R. Clancy[1]

1. Children's Hospital of Philadelphia, Philadelphia, PA, United States.

2. University of Washington School of Medicine, Seattle, WA, United States.

Invited Discussant: V. Mohan Reddy

OBJECTIVE(S): The occurrence of an electroencephalographic (EEG) seizure after the arterial switch operation has been associated with worse long-term neurodevelopmental (ND) outcomes. These findings have not been replicated in an independent cohort and the significance of seizures after repair of other types of congenital heart defects (CHD) is not known. A recent study at our institution demonstrated seizures documented by 48-hour EEG monitoring in 20 (11%) of 178 neonates and infants after surgery for complex CHD, including hypoplastic left heart syndrome (HLHS). Evaluation at 1 year of age did not identify an overall adverse effect of an EEG seizure on ND outcomes. The current study was undertaken to determine if testing in the pre-school period would identify deficits which only become apparent as children develop.

METHODS: Neurodevelopmental outcomes were re-assessed at 4 years of age including cognition, language, attention, impulsivity, executive function, social competence, academic achievement, and visual-motor and fine-motor skills.

RESULTS: Developmental evaluations were performed in 132 (87%) of 151 survivors, including 39 with HLHS or variant. Postoperative EEG seizures had occurred in 14 (11%) overall and in 7 (18%) of those with HLHS. For the entire cohort, the Full Scale IQ was 95.0 ± 18.5. IQ was 95.1 ± 18.7 for patients without a history of seizure and 93.6 ± 16.7 for those with a history of seizure. After adjustment for patient and management factors, occurrence of an EEG seizure was associated with worse executive function ($p = 0.02$) and impaired social interactions/restricted behavior ($p = 0.05$). Seizures were not significantly associated with worse performance for cognition, language, attention, impulsivity, academic achievement, or motor skills, all $p > 0.1$.

CONCLUSIONS: The occurrence of a seizure after cardiac operation is a biomarker of central nervous system injury. This study confirms that postoperative EEG seizures are associated with worse ND outcomes characterized by impairments of executive function and behavior in preschool survivors of cardiac surgery in infancy. However, EEG seizures were not associated with worse cognitive, language, or motor skills.

3:20 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:55 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**
2001, 2003, 2005 Moscone West Convention Center

Moderators: Emile A. Bacha
Shunji Sano

18. Long-Term Results of a Strategy of Aortic Valve Repair in the Pediatric Population: Should We Avoid Cusp Extension?

Yves d'Udekem[1], Javariah V. Siddiqui[1], Ajay J. Iyengar[1], Igor E. Konstantinov[+1], Darren Hutchinson[2], Michael M. Cheung[2], Christian P. Brizard[1]

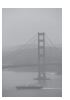
1. Cardiac Surgery Unit, Royal Children's Hospital, Parkville, VIC, Australia. 2. Cardiology, Royal Children's Hospital, Melbourne, VIC, Australia.

Invited Discussant: Kristine Guleserian

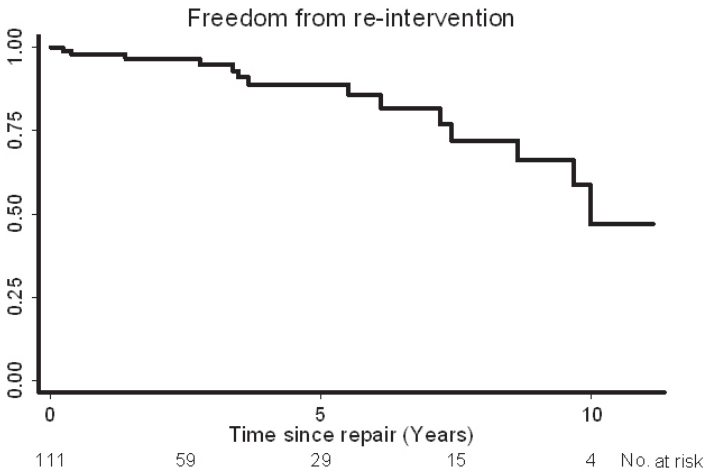
OBJECTIVE(S): To determine the rate of reoperation subsequent to a policy of primary valve repair in the pediatric population.

METHODS: Between 1996 and 2009, 114 consecutive patients underwent an aortic valve repair in our institution. Fourty-two had previous interventions: previous balloon valvuloplasties (14), repair (12), and Ross (1). The mean age at surgery was 9.8 ± 6.4 years, with 21 being less than 1 year. Indication for surgery was stenosis (55), regurgitation (50), both (8) or endocarditis (1). Thirty patients had additional concomitant procedures, the most common one being VSD closure (13) and relief of subaortic membrane obstruction (14). Thirty-nine patients had a repair with no addition of patch, while 75 patients required addition of patches of glutaraldehyde preserved autologous pericardium for cusp extension (42) and other repair (33).

RESULTS: In the early postoperative period after cusp extension repair, two patients had a sudden unexplained death and one a cardiac arrest requiring mechanical support and heart transplantation. Two additional patients with cusp extension displayed electrocardiographic signs of coronary ischemia. Two patients required a reoperation during the same hospital stay. After a mean follow-up of 3.9 ± 3.5 years, only one patient



died of non-cardiac cause. Ten year survival was 95% (95% CI: 81–99). Fifteen patients necessitated a re-intervention consisting in a second repair (2), a Ross procedure (9) or a prosthetic valve replacement (4). Seven years freedom from reoperation was 82% (95%CI:66–91) (Figure1). By univariate analysis, the only predictors of reintervention seemed to be smaller body size (p = 0.049) and addition of patch (p = 0.06). At last echocardiography follow-up, 23 of the 96 survivors without reoperation had moderate (24%) and one severe regurgitation (1%), while 10 (10%) suffered from a moderate degree of stenosis.



CONCLUSIONS: A policy of aortic valve repair in the pediatric population is effective in postponing reintervention. The longevity of the repair may be shorter when addition of patch material is necessary and when performed at an early age. Cusp extension technique should be used with caution or avoided because it can be responsible for mortality related to occlusion of the coronary ostia by the patches.

19. Unloading of the Right Ventricle by Partial Cavopulmonary Connection in HLHS Patients Leads to a Decrease in the Tricuspid Valve Annulus but Does Not Improve the Tricuspid Regurgitation

Jelena Kasnar-Samprec[1], Andreas Kühn[2], Jürgen Hörer[1], Manfred O. Vogt[2], Julie Cleuziou[1], Rudiger S. Lange[1], Christian Schreiber[1]

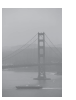
1. Department of Cardiovascular Surgery, German Heart Center Munich, Munich, Germany. 2. Department of Pediatric Cardiology and Congenital Heart Disease, German Heart Center Munich, Munich, Germany.

Invited Discussant: Pedro J. del Nido

OBJECTIVE(S): The objective of this study was to evaluate the influence of volume unloading by partial cavopulmonary connection (PCPC) on the systemic right ventricle in the patients with hypoplastic left heart syndrome (HLHS). We measured the size of the tricuspid annulus as a measure of RV volume and the degree of tricuspid regurgitation (TI).

METHODS: Ninety consecutive HLHS patients, operated between 2001 and 2010, who survived the early postoperative period after PCPC, were included in this retrospective study. Seven patients were excluded due to tricuspid valve surgery for severe TI (grade IV) before or at the time of PCPC. The echocardiograms of the remaining patients (n = 83) were reevaluated for tricuspid regurgitation and the size of the tricuspid valve annulus before PCPC and at the last available follow-up before total cavopulmonary connection. The size of the tricuspid annulus was standardized to the body surface area of the patient at the time of the echocardiography. Significant TI was defined as grade III or IV.

RESULTS: Echocardiograms before PCPC were performed at median of 5 days before the operation (range 0–25 days). TI was graded as 0 in 11 patients (13%), I in 37 patients (45%), II in 24 patients (29%) and III in 11 (13%) patients. Follow-up echocardiograms were performed at median of 17 months after PCPC (range 7 days–57 months). Postoperatively, TI was graded as 0 in 14 patients (17%), I in 37 patients (45%), II in 21 patients (25%), III in 6 patients (7%) and IV in 5 patients (6%). The mean Z value of the tricuspid valve annulus was preoperatively significantly lower in the



patients with nonsignificant TI (1.0 ± 0.8) than in the ones with significant TI (1.7 ± 0.7), p = 0.009. Postoperatively, the mean Z value of the tricuspid valve annulus decreased significantly in all patients, in comparison to the preoperative data (p < 0.001): 0.5 ± 0.7 in the patients with preoperatively nonsignificant TI (p < 0.001); 0.9 ± 0.6 in the ones with preoperatively significant TI (p = 0.003). There was no significant change in the level of TI after PCPC compared to the preoperative data (p = 0.68 for the patients with TI II or more, p = 1.00 for the patients with TI III or more).

CONCLUSIONS: The size of the tricuspid valve annulus in HLHS patients decreases after PCPC, most likely due to volume unloading and promotion of the remodelling of the systemic right ventricle. However, this remodelling of the right ventricle does not improve the degree of tricuspid regurgitation.

20. Twenty-Four Hour Ambulatory Blood Pressure Monitoring Detects a High Incidence of Hypertension Late After Coarctation Repair in Patients with Hypoplastic Arches

Melissa G. Lee[1,2], Yves d'Udekem[1,2], Igor E. Konstantinov[+1,2], T.h. Goh[3], Leeanne Grigg[4], Michael M. Cheung[2,5], Bryn Jones[2,5], Remi Kowalski[2,5], Jane Koleff[2,5], Christian P. Brizard[1,2]

1. Cardiac Surgery, Royal Children's Hospital, Parkville, VIC, Australia.
2. Murdoch Children's Research Institute, Melbourne, VIC, Australia.
3. Cardiology, Monash Medical Centre, Clayton, VIC, Australia.
4. Cardiology, The Royal Melbourne Hospital, Parkville, VIC, Australia.
5. Cardiology, Royal Children's Hospital, Parkville, VIC, Australia.

Invited Discussant: J. William Gaynor

OBJECTIVE(S): Residual arch obstruction is an identified risk factor for developing hypertension (HT) late after coarctation repair. Resting blood pressure (BP) measurements may underestimate the incidence of HT compared to 24 hour BP monitoring. We wanted to determine the risks of developing HT late after coarctation repair in patients who initially presented with some degree of aortic arch hypoplasia.

METHODS: All patients who had a coarctation repair in our institution, aged 10 years or more and living in the same state, and estimated to have some degree of arch hypoplasia at the time of diagnosis (either by direct surgical examination or echocardiography) were invited to participate in the study. Sixty-two of the 116 potential candidates underwent a transthoracic echocardiogram and 24 hour BP monitoring. The median age at repair was 11 days (6–48). The mean preoperative Z-score of the proximal transverse arch was –2.43 ± 0.46 (26 patients). Eight patients had a repair via sternotomy (6 end-to-side anastomosis, 2 patch repair) and 54 a conventional repair via thoracotomy.

RESULTS: After a follow-up of 18 ± 5 years, 27% of the patients (17/62) suffered from resting HT and 60% (37/62) from abnormal ambulatory BP. The sensitivity of an abnormal resting BP in being able to detect an abnormal 24 hour ambulatory BP was poor (41%). Patients operated via a thoracotomy had a higher incidence of abnormal ambulatory BP than patients operated using an end-to-side repair via a sternotomy: 63% (34/54) vs. 33% (2/6) ($p = 0.11$).

Twenty patients were identified as having arch obstruction on echocardiography at last follow-up (18 thoracotomy, 2 patch repair via sternotomy). Ninety per cent of these 20 patients (18/20) had abnormal ambulatory BP. Half of all patients with resting HT (8/17), and half of all patients with abnormal ambulatory BP (19/37) had no evidence of arch reobstruction on echo. None of the patients operated on with end-to-side repair via sternotomy had reobstruction compared with 33% (18/54) repaired via thoracotomy.

CONCLUSIONS: Patients with a hypoplastic arch operated on with a thoracotomy have an alarming prevalence of HT. It is likely that patients with the smallest arches should undergo a more extensive procedure via sternotomy. Regular follow-up with 24 hour ambulatory BP monitoring should be warranted after coarctation repair, especially in patients who had a smaller aortic arch at the time of the initial operation.

5:00 p.m. **ADJOURN**

2:00 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

2007, 2009, 2011 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Joseph B. Shrager
Gaetano Rocco

21. Endoscopic Ultrasound Is Insufficient for Recommending Endoscopic Management of Early Staged Esophageal Cancers

Edward J. Bergeron, Jules Lin, Andrew C. Chang+, Mark B. Orringer+, Rishindra M. Reddy
Section of Thoracic Surgery, University of Michigan, Ann Arbor, MI, United States.

Invited Discussant: Steven R. DeMeester

OBJECTIVE(S): Esophageal endoscopic ultrasound (EUS) is an essential component of esophageal cancer staging. There is an increasing trend towards endoscopic-based alternative therapies (i.e., endoscopic mucosal resection, radiofrequency ablation) for early stage esophageal cancers (T0 –T1 tumors) due to concerns of perioperative esophagectomy outcomes. We evaluated our institutional experience with preoperative EUS staging of early esophageal cancers in patients having undergone esophagectomy for concerns of understaging by EUS and potential inadequate treatment recommendations.

METHODS: A prospective esophagectomy database of all patients having an esophagectomy for esophageal cancer at a single, high volume institution was retrospectively reviewed for patients with early stage esophageal cancer. This study analyzes the substages of T0 and T1 disease as predicted by preoperative EUS and the correlation with pathologic T- and N-stages following esophagectomy and postoperative outcomes.

RESULTS: From 2005 to 2011, 107 patients (93 males, 14 females) with a mean age of 65 years (range 39–91) were staged by preoperative EUS to have esophageal high grade dysplasia, carcinoma in situ, or T1 cancer and underwent an esophagectomy. EUS understaged 87% of clinical T0 tumors (20 of 23), 39.1% of clinical T1a tumors (18 of 46), and 2.6% of clinical T1b tumors (1 of 38). Of the EUS staged N0 lesions, there were positive

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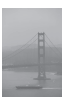

lymph nodes in 15% of lesions in the T1a lamina propria (2 of 13) and 18% of lesions in the T1a muscularis mucosa (5 of 28). When the threshold for endoscopic treatment is set from T0 to T1a lamina propria lesions, EUS has a sensitivity of 36% and a specificity of 69%. Transhiatal esophagectomy was performed in 105 patients. The median hospital stay was 8 days (range 7–48). Postoperative complications included anastomotic leak (11.2%, 12 of 107 patients), atrial fibrillation (11.2%, 12 of 107), hoarseness (4.67%, 5 of 107), chylothorax (1.87%, 2 of 107), deep venous thrombosis (< 1%, 1 of 107), and wound infection (1.87%, 2 of 107). The 30-day mortality rate was < 1% (1 of 107).

CONCLUSIONS: The sensitivity and specificity of EUS for determining endoscopic therapy versus esophagectomy is poor for early staged esophageal cancers. EUS routinely understaged lesions felt to be T0–T1a. Tumors felt to be T1a were shown to have at least N1 disease in 15% of cases. Esophagectomy with lymph node dissection is still the gold standard operation for EUS-early staged esophageal cancers.

22. A Comparison of Quality and Cost Indicators by Surgical Specialty for Lobectomy of the Lung

Richard K. Freeman, Theresa Giannini, Anthony J. Ascioti
Thoracic Surgery, St. Vincent Hospital, Indianapolis, IN, United States.

Invited Discussant: Thomas A. D'Amico

OBJECTIVE(S): This investigation compares patients undergoing lobectomy for non-small cell lung cancer performed by either a general surgeon or a cardiothoracic surgeon across a geographically diverse system of hospitals to see if a significant difference in quality or cost is present.

METHODS: The Premiere administrative database (Premiere Research Services, USA) and tumor registry data of a single health system's hospitals was used to compare adherence to national treatment guidelines, patient outcomes and charges for patients undergoing lobectomy for non small cell lung cancer over a five year period. Surgeons performing lobectomy were designated a general surgeon or cardiothoracic surgeon based on their national provider number and board certification status. Excluded from analysis were centers that performed less than 50 lobectomies during the study period.

	General Surgeon	Cardiothoracic Surgeon	p
N	2823	3653	
Length of Stay (mean days)	9	6	< 0.0001
Operative Morbidity	310 (11%)	146 (4%)	< 0.0001
Operative Mortality	198 (7%)	73 (2%)	< 0.0001
National Guideline Adherence	1609 (57%)	3142 (86%)	< 0.0001
Charges (mean dollars)	$89,000	$78,000	< 0.0001

RESULTS: During the study period, 2823 were performed by 46 general surgeons and 3653 lobectomies were performed by 29 cardiothoracic surgeons in 54 hospitals in a single healthcare system. The table displays that significant differences were found between general and cardiothoracic surgeons in the case of adherance to national guidlelines in staging

and treatment, mean length of stay, significant morbidity and operative mortality. Mean charges were also found to differ significantly between general and cardiothoracic surgeons for lobectomy of the lung.

CONCLUSIONS: This review found that currently measurable indicators for quality of care were significantly superior and overall charges were significantly reduced when a lobectomy for non-small cell lung cancer was performed by a cardiothoracic surgeon when compared to a general surgeon.

23. Clinical Indications and Results Following Chest Wall Resection of Recurrent Mesothelioma in 50 Consecutive Patients

Syed O. Ali, Brian Burt, Marcelo Dasilva, Tamara R. Tilleman, David J. Sugarbaker+

Division of Thoracic Surgery, Brigham and Women's Hospital, Boston, MA, United States.

Invited Discussant: Walter Weder

OBJECTIVE(S): Ipsilateral hemithorax is the most common site of recurrence after surgical resection for malignant pleural mesothelioma. The role of chest wall resection in the management of isolated chest wall recurrences after initial cytoreductive surgery was explored.

METHODS: With IRB approval, 2394 patients with MPM seen at our institution between 1986 and 2011 were retrospectively reviewed. Patients who underwent surgical resection and were subsequently treated for localized recurrence with a chest wall resection were identified and examined.

RESULTS: A total of 1142 patients underwent cytoreductive surgery by either extrapleural pneumonectomy (794 patients) or pleurectomy/decortication (348 patients). Fifty patients (4.38%) who returned for follow-up were found to have local chest wall recurrence amenable to further resection. Average age was 60.8 years, with 39 (78%) men. The predominant cell type was epithelial (70%). Thirty-three patients (66%) underwent extrapleural pneumonectomy, while 17 (34%) underwent pleurectomy. Recurrence after primary surgery was predominantly incisional (48%) and/or costophrenic in location (40%). Thirteen patients (26%) had more than one chest wall resection for recurrent disease. Median time to a chest wall resection from initial surgery was 22 months (range 3–106). Overall median survival was 40.4 months. Median survival for epithelial cell type was 52 months (range, 4–121) versus 20 months for nonepithelial (range, 7–67) ($p = 0.01$).

CONCLUSIONS: Surgical resection is an effective strategy for managing chest wall recurrences in malignant pleural mesothelioma yielding significant survival extension in select patients. Patients with epithelial cell type and those who underwent multiple chest wall resections benefited most.

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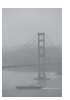

24. Pattern of Lymphatic Spread in Thoracic Esophageal Squamous Cell Carcinoma: A Report of 1361 Cases from East China

Bin Li, Haiquan S. Chen+, Jiaqing Xiang, Yawei Zhang, Chengguang Li, Haichuan Hu, Yang Zhang

Thoracic Surgery, Fudan University Shanghai Cancer Center, Shanghai, Shangahi, China.

Invited Discussant: Antoon E. Lerut

OBJECTIVE(S): The aim of this study is to study the pattern of LNM, determine the frequency the lymphatic metastases and biological behavior of ESCC by a large study number.

METHODS: A total of 1361 thoracic ESCC patients who underwent a curative R0 esophagectomy with three-field or two-field lymphadenectomy was retrospectively examined. Factors associated with LNM were identified by logistic regression analysis.

RESULTS: A total of 33253 lymph nodes were resected, the average number was 24 ± 13 (range 6–83). 714 patients (52.5%) were found LNM. No patients with Tis tumor was found LNM, the incidence of LNM was 25.4% in patients with pT1 tumor, 47.3% in pT2 tumor, 61.0% in pT3 tumor, and 74.4% in pT4 tumor. Paratracheal nodes were the most frequent metastasis nodes (15.9%). The incidence of LNM was 9.8% in cervical area, 18.0% in upper mediastinum, 18.9% in middle mediastinum, 11.8% in lower mediastinum, and 28.4% in the abdomen. 424 (31.2%) patients present as one single field involvement, 255 (18.7%) patients involved two fields, and 35 patients (2.6%) present as three fields LNM. Logistic regression analysis identified that tumor length >3 cm ($P < 0.001$), depth of tumor invasion ($P < 0.001$), tumor differentiation ($P < 0.001$), and angiolymphatic invasion ($P < 0.001$) as risk factors of LNM. Tumor location ($P < 0.001$), depth of tumor invasion ($P < 0.001$), angiolymphatic invasion ($P = 0.003$), and patatracheal nodes involvement ($P = 0.008$) were identified as risk factors for cervical LNM.

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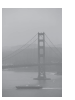
CONCLUSIONS: Metastases were more frequent in the abdomen than in the neck. A total mediastinal and upper abdominal lymphadenectomy should be carefully conducted. Factors, such as Tumor location, depth of tumor invasion angiolymphatic invasion, and patatracheal nodes involvement, may be helpful in performed cervical lymphadenectomy individually.

3:20 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:55 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**
2007, 2009, 2011 Moscone West Convention Center

Moderators: Joseph B. Shrager
Gaetano Rocco



25. Robot-Aided Thoracoscopic Thymectomy for Early Stage Thymoma: A Multicenter European Study

Giuseppe Marulli[1], Federico Rea[1], Franca M. Melfi[+2], Thomas Schmid[3], Mahmoud Ismail[4], Olivia Fanucchi[2], Florian Augustin[3], Marc Swierzy[4], Francesco Di Chiara[1], Alfredo Mussi[2], Jens C. Rueckert[4]

1. Department of Cardiothoracic and Vascular Sciences, Division of Thoracic Surgery, University of Padua, Italy, Thoracic Surgery—University of Padova, Padova, Italy. 2. Thoracic Surgery, Pisa, Italy. 3. Thoracic Surgery, Innsbruck, Austria. 4. Thoracic Surgery, Berlin, Germany.

Invited Discussant: Cameron D. Wright

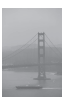
OBJECTIVE(S): Minimally invasive thymectomy for stage I-II thymoma has been suggested in last years and considered technically feasible; however due to lack of data on long term results, controversies still exist on surgical access indication. We sought to evaluate short and long term results after robot-assisted thoracoscopic thymectomy in early stage thymoma.

METHODS: Data were prospectively collected from 4 European Centers with large experience in robot-assisted thymectomy. Between 2002 and 2011, 79 patients (38 males and 41 females, median age 57 years) with early stage thymoma were operated on by left-sided (82.4%), right-sided (12.6%) or bilateral (5%) robotic thoracoscopic approach. 45 (57%) patients had myasthenia gravis associated.

RESULTS: Median operative time was 155 minutes (range 70–320). One patient needed open conversion due to large diameter of disease interfering with a safe dissection, in one case a standard thoracoscopy was used after break down of robotic system, in 5 cases an additional access was required. No vascular and nervous injuries were recorded, no perioperative mortality occurred. Ten (12.7%) patients had postoperative complications. Median hospital stay was 3 days (2–15). Median diameter of tumor resected was 3 cm (range 1–12), Masaoka stage was I (n = 14, 17.7%), IIA (n = 25, 31.6%) and IIB (n = 40, 50.7%), WHO histology was A in 14, AB in 22, B1 in 12, B2 in 18, B3 in 12 and C in 1 case. Postoperative radiation therapy was administered in 18 cases. At last follow up 74 patients are alive and free of recurrence, 5 died (4 patients for non-thymoma related causes and 1 for a diffuse intrathoracic recurrence) with a 5-year survival rate of 87%.

[+]AATS Member

CONCLUSIONS: Our data indicates that robot-enhanced thoracoscopic thymectomy for early stage thymoma is a technically sound and safe procedure with low complication rate and short hospital stay. Oncological outcome seems good, but prospective randomized trials are needed for comparison with transternal approach.



26. Partial Atrial Resection Without Cardiopulmonary Bypass in Locally Advanced Non-Small Cell Lung Cancer

Domenico Galetta, Alessandro Borri, Roberto I. Gasparri, Francesco Petrella, Lorenzo Spaggiari

Division of Thoracic Surgery, European Institute of Oncology, Milan, Italy.

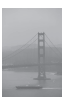
Invited Discussant: M. Blair Marshall

OBJECTIVE(S): Resection of lung cancer invading the left atrium (T4atrium) without cardiopulmonary bypass (CPB) is rarely been reported and results remain controversial. We reviewed our experience analyzing surgical results and long-term outcomes.

METHODS: Patients who underwent extended lung resection for T4atrium without CPB between September 1998 and August 2011 were retrospectively reviewed using a prospective database.

RESULTS: Forty-three patients were collected (33 men, median age of 63 years). Twenty-five patients underwent preoperative mediastinal staging and 27 received induction chemotherapy (IC). Lung resection included 39 (90.7%) pneumonectomies, 3 (7.0%) lobectomies and one bilobectomy (2.3%). Pathological nodal status was N0 in 9 patients (20.9%), N1 in 18 (41.9%), and N2 in 16 (37.2%). Four patients receiving IC had complete pathological response (9.3%). Nineteen patients (44.2%) had microscopic evidence of the neoplasm on the atrial resected margins. Mortality was nil. Major complication rate was 11.6%: one BPF, one cardiac herniation, and three cases of hemothorax all requiring re-intervention. Minor complication rate was 25.5% including 8 atrial arrhythmias, and 3 atelectasis. After a median survival of 22 months (range, 1–141 months), 18 patients (41.8%) were alive. Five-year survival and disease-free interval were 38% and 45.8%, respectively. Patients with N0 disease and without residual cancer on the atrial muscle had a best prognosis (log-rank test: p = .03, and p = .01, respectively). IC neither influenced survival nor postoperative complications. At multivariate analysis, pN0 [p = .04 (95% CI: 0,65–9,66)] and negative atrial margins [p = .02 (95% CI: 0,96–8,35) were positive independent prognostic factors.

CONCLUSIONS: Resection of T4atrium is a technically feasible and effective surgical procedure with low mortality and acceptable morbidity. Our results suggest that lung cancer invading the left atrium should not be systematically considered as a definitive contraindication to surgery.



27. Long-Term Survival and Quality of Life After Pneumonectomy for Non-Small Cell Lung Cancer

Ayesha S. Bryant, Robert J. Cerfolio+
University of Alabama at Birmingham, Birmingham, AL, United States.

Invited Discussant: Michael J. Liptay

OBJECTIVE(S): Pneumonectomy is often called a "disease". The objective of this study was to assess the long-term quality of life (QOL) of patients who underwent pneumonectomy over a 13 year period for non-small cell lung cancer (NSCLC).

METHODS: A cross-sectional study using a prospective database to evaluate the long-term impacts of pneumonectomy on a consecutive series of patients who underwent pneumonectomy for resection of NSCLC. QOL was ascertained in all patients who were at least a year post-op via the SF-12 QOL survey (using both the physical and mental components scores).

RESULTS: Results: There were 112 patients who underwent pneumonectomy between 1/97 and 12/10 for NSCLC. Sixty-four were right-sided and 48 were left. Thirteen underwent a completion pneumonectomy. Mean survival is 3.4 years and the overall 5- and 7-year Kaplan Meier survivals are 37% and 34%, respectively. QOL obtained in 98% of patients at least one year post-operatively yielded an overall QOL score comparable to those of the "average population". However the mean physical component score was significantly lower than that of the average population's score ($p = 0.02$), while the mental QOL score was significantly higher ($p = 0.03$).

CONCLUSIONS: It is a misnomer to call a pneumonectomy a disease. Overall QOL assessment in post-pneumonectomy patients (and perhaps other post-surgical patients as well), should be stratified by mental and physical component scores to better elucidate the impact of surgery on the QOL of patients.

5:00 p.m. **AATS Consensus Guidelines for Lung Cancer Screening**
Michael T. Jaklitsch

5:10 p.m. **ADJOURN**

+AATS Member

TUESDAY, MAY 1, 2012

7:00 a.m. **CARDIAC SURGERY FORUM SESSION**
Ballroom Level 3, Moscone West Convention Center
(5 minute presentation, 5 minute discussion)

Moderators: Mark D. Rodefeld
Todd K. Rosengart

F1. Pulmonary Endothelial Cell Phenotypic and Genetic Alterations in a Large Animal Model of Pulmonary Arteriovenous Malformations Following the Glenn Shunt

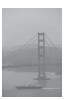
Minoo N. Kavarana[1], John S. Ikonomidis[+1], Rupak Mukherjee[1], Jeffrey A. Jones[1], Shaina R. Eckhouse[1], Robert E. Stroud[1], Francis G. Spinale[1,2], Scott M. Bradley[+1]
1. Cardiothoracic Surgery, Medical University of South Carolina, Charleston, SC, United States. 2. Cardiothoracic Surgery, University of South Carolina, Columbia, SC, United States.

Invited Discussant: Paul Kirshbom

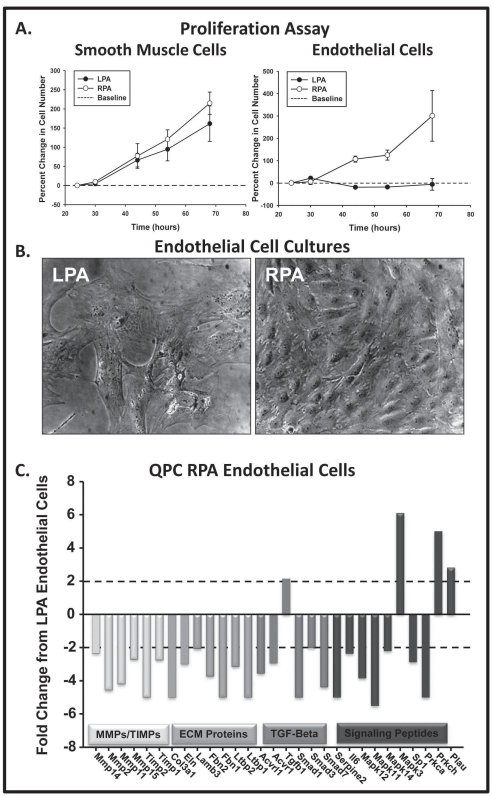
OBJECTIVE(S): The superior cavopulmonary shunt (SCPC) is frequently complicated by pulmonary arteriovenous malformations (PAVMs). We developed a model of SCPC in order to test the central hypothesis that changes in pulmonary artery endothelial cells (PAEC), favoring angiogenesis, would occur coincident with PAVM formation.

METHODS: SCPC (Glenn Shunt) was constructed in 7 pigs (31 kg). 4 acute experiments were performed to develop the operative technique. 3 animals were studied chronically and PAVM formation quantified by contrast echocardiography at 6 weeks. PAECs as well as smooth muscle cell (SMC) cultures were established from the right pulmonary artery (RPA / SCPC side) and the left pulmonary artery (LPA / non shunted side). Cell proliferation assays and quantitative real-time PCR analyses were performed using a custom designed PCR array to assess gene expression of several critical determinants of matrix remodeling and cellular signaling.

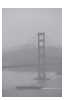
RESULTS: At 6 weeks following surgery, contrast echocardiography showed significant right-to-left shunting, consistent with PAVM formation. While the proliferation rate for SMCs isolated from the RPA and LPA



were similar, the proliferation rate for ECs from the RPA was significantly higher than those from the LPA (Figure 1A). When examined microscopically (Figure 1B) the ECs from the LPA were large and spread out, while the cells from the RPA were smaller, and grew more densely, consistent with a higher proliferation rate. Multiple genes displayed differential expression in the ECs isolated from the RPA versus the LPA (Figure 1C). The expression of genes encoding the matrix metalloproteinases (MMPs) and extracellular matrix (ECM) proteins were generally lower, while those for transforming growth factor-beta (TGF) and some other signaling molecules were differentially elevated in ECs from the RPA compared to those from the LPA.



CONCLUSIONS: A large animal model of the Glenn shunt with subsequent development of PAVMs was successfully established. The loss of pulsatile blood flow or change in composition of blood perfusing the RPA induced changes in EC proliferative ability and phenotype. Moreover, there were clear differences in the expression of genes related to ECM remodeling. These alterations in EC phenotype and gene expression may play mechanistic roles in the development of PAVMs. Persistent changes in gene expression may provide novel therapeutic targets in the management of children with PAVMs following Glenn shunt palliation.



F2. Biventricular Fontan Circulation: Chronic Cavopulmonary Assist Using a Viscous Impeller Pump

Mark D. Rodefeld[+1], Jonathan E. DeGan[2], Dinesh Shetty[2], Anna-Elodie M. Kerlo[2], Yann Delorme[2], Jun Chen[2], Guruprasad A. Giridharan[3], Steven Frankel[2]

1. Department of Surgery, Indiana University School of Medicine, Indianapolis, IN, United States. 2. Mechanical Engineering, Purdue University, West Lafayette, IN, United States. 3. Bioengineering, University of Louisville, Louisville, KY, United States.

Invited Discussant: Jennifer C. Hirsch

OBJECTIVE(S): Late Fontan failure and attrition is becoming an increasingly problematic issue for which there is no primary therapy. A permanent right-sided power source which can provide a modest (2–6 mmHg) augmentation of cavopulmonary blood flow in the Fontan venous pathway would address this problem. By simultaneously reducing systemic venous pressure and increasing preload, it would effectively restore more stable biventricular physiologic status.

METHODS: A rotary blood pump implant, based on the von Karman viscous impeller pump (VIP), was modeled in the total cavopulmonary connection (TCPC). The surface contours of a rigid VIP housing were modified from an idealized TCPC model to reflect a housing design that is compatible with a chronically implanted device. This includes outflow offset and cutwater re-design. Computational fluid dynamics was used to predict and optimize the flow patterns and pressure generated under various fixed flow rates with impeller rotation. Performance was validated in vitro using a mock loop of a univentricular Fontan circulation.

RESULTS: A permanently implantable VIP design will modestly augment 4-way Fontan flow in the ideal pressure range. At 3,000 RPM, the pump produces a pressure rise of 4 mmHg in the modified housing design, as compared to 2.1 mmHg in the unmodified (anatomic TCPC) design. Pressure rise up to 15 mmHg can be provided at 7,000 RPM. Shear rates and zones of stasis and recirculation were optimized to levels which predict low thrombogenicity risk. As a default (failure) function, a stationary impeller continues to provide a streamlining benefit by reducing hydraulic energy loss within the TCPC junction. Right/left flow disparity is also reduced, addressing risk of arteriovenous malformation due to hepatic factor maldistribution. Computational and in vitro correlation is excellent.

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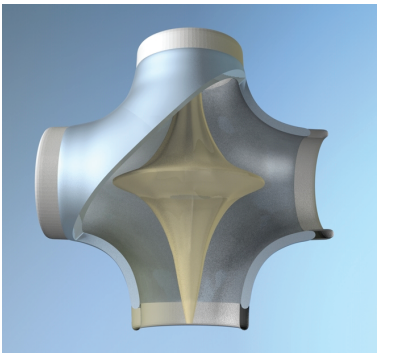


CONCLUSIONS: Chronic cavopulmonary assist using a permanent VIP implant is a potential surgical therapy which will address late Fontan failure and attrition. Further development of a device which can be surgically implanted into the TCPC is warranted. This will include determination of the ideal magnitude of chronic pressure step-up (as a percentage of normal right ventricular function), bearing and impeller support structure, thrombogenicity mitigation, and power source. Successful development of a chronic cavopulmonary assist device will enable the ultimate exit strategy for single ventricle patients: biventricular physiologic status for life.

F3. Pulmonary Arteries Reconstruction with a Small Intestine Submucosa Patch: Viability and Growth Potential in a Chronic Lamb Surgical Model

Lorenzo Boni[1], Fariba Chalajour[1], Takashi Sasaki[1], Walter D. Boyd[2], William T. Ferrier[3], Laura A. Barboza[1], John T. Yeung[1], Radhika L. Snyder[1], R. Kirk Riemer[1], V. Mohan Reddy[+1]

1. Department of Cardiothoracic Surgery, Division of Pediatric Cardiac Surgery, Stanford University, Stanford, CA, United States. 2. Department of Cardiothoracic Surgery, UC Davis Medical Center, Davis, CA, United States. 3. Department of Medicine and Epidemiology, UC Davis School of Veterinary Medicine, Davis, CA, United States.

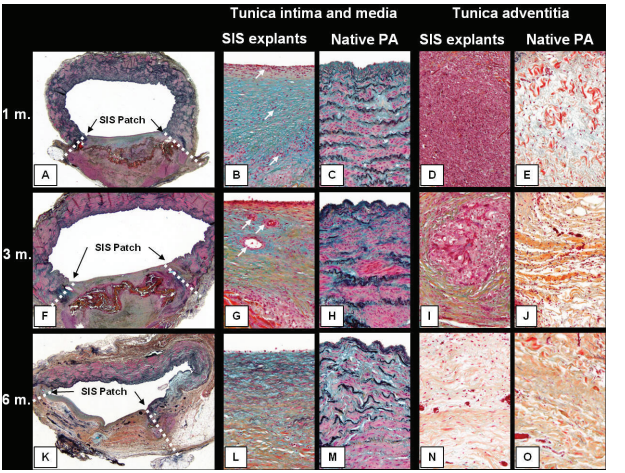
Invited Discussant: Frank A. Pigula

OBJECTIVE(S): To verify whether small intestine submucosa (SIS) implanted as a patch in the left pulmonary artery (LPA) of lambs leads to host cells repopulation and is replaced by autologus pulmonary arterial tissue, growing and maintaining the artery's patency.

METHODS: SIS patches as partial replacement of LPA were implanted in 6 lambs. Two animals were euthanized at 1, 3, and 6 months. Patency of the graft was macroscopically assessed at explant time. Animals in the 6 months group underwent angio-CT scan of the lungs to assess patency and arborization pattern of the pulmonary arteries. Scanning electron microscopy (SEM), histology and immunohistochemistry were performed on the explanted grafts.

RESULTS: No unforeseen deaths occurred. Mean animal weight increased from 17.5 kg to 23.9, 51.7, and 53.4 kg at 1, 3, and 6 months respectively. Macroscopically the patched area did not show any narrowing or aneurysm formation. A normal appearing intimal layer was covering the whole luminal surface of the LPA. SEM exam confirmed that the endoluminal aspect of the patch was covered with confluent cells with the morphological characteristics of endothelium. Angio-CT scan showed patency of LPA with no signs of stenosis or aneurisms. LPA and RPA sizes were normal and comparable to each other, as it was distal arborization. Histology showed recellularization of the patch starting after 1 month. Activation of repair process was confirmed by formation of neovessels in the medial layer of the patch. At 6 months the morphology of SIS patch mimicked the

structure of native arterial wall. Immunohistochemistry confirmed endothelialization of luminal side of SIS patch. Presence of smooth muscle cells in the medial layer was confirmed by expression of smooth muscle actin at all time-points. However, expression of elastin fibers required a longer period of time and was detectable only at 6 months. Existence of stem cell marker c-Kit within the grafted patch after 1, 3, and 6 months suggested a source of multipotent cells, which can differentiate to the required vascular cells for repopulation of SIS patch.



CONCLUSIONS: This study showed that SIS scaffolds implanted in the pulmonary artery of a growing organism support the replacement of the graft by host tissue with histological and immunohistochemical characteristics of native pulmonary arterial wall. This patch seems to be an optimal material for pulmonary artery augmentation, especially in the pediatric population.

F4. Complete Thymectomy During Cardiac Surgery in Early Infancy Reduces Circulating T-Cells and Vaccination-Induced IgG Responses: A Study of Three Year Tracing

Hirotsugu Kurobe[1,2], Takashi Tominaga[3,4], Masahisa Urata[1,3], Mikio Sugano[1,3], Yoichiro Hirata[5], Miho Sakata[6], Yasunobu Hayabuchi[6], Takashi Kitaichi[1], Takaki Hori[1], Yoshiyasu Egawa[3], Yousuke Takahama[2], Tetsuya Kitagawa[1]

1. Department of Cardiovascular Surgery, IHBS, the University of Tokushima Graduate School, Tokushima-shi, Tokushima, Japan. 2. Division of Experimental Immunology, Institute for Health Biosciences, Graduate School of Medical Sciences, Tokushima-shi, Tokushima, Japan. 3. Division of Cardiovascular Surgery, Kagawa Children's Hospital, Zentsuji-shi, Kagawa, Japan. 4. Division of Cardiovascular Surgery, Ehime Prefectural Central Hospital, Matsuyama-shi, Ehime, Japan. 5. Department of Pediatrics, Graduate School of Medicine, The University of Tokyo, Bunkyou-ku, Tokyo, Japan. 6. Department of Pediatrics, Institute for Health Biosciences, Graduate School of Medical Sciences, Tokushima-shi, Tokushima, Japan.

Invited Discussant: Joren C. Madsen

OBJECTIVE(S): The thymectomy has been often performed for securing operative field at the surgery of congenital heart defects (CHDs) in early infancy. However, how the neonatal thymectomy influences subsequent development of the immune system in human remains unclear. Here we monitored patients for three years from the time of thymectomy that was performed during cardiac surgery in early infancy.

METHODS: Thirty-two infants without chromosome abnormality who underwent surgery for CHDs at less than 3 months old were enrolled. 17 patients were with complete thymectomy (group C), and 15 were with partial extirpation of the thymus or without thymectomy (group P). The number of peripheral blood cells after surgery and clinical course were traced. All patients were vaccinated against rubella and measles viruses between 1 and 2 years of age. Vaccination-induced IgG responses and phytohemagglutinin (PHA) responses were also measured.

RESULTS: At half a year after the surgery, the numbers of total lymphocytes, CD3+CD19– cells, CD4+CD8– cells, and CD4–CD8+ cells decreased significantly in group C compared to those in group P. The reduction in the number of these cells in group C persisted for at least three years after the surgery. The number of CD4+CD25+Foxp3+ regulatory T cells, which was measured at three years after the surgery, also decreased significantly in group C compared to group P. On the other hand, the number of CD3–CD19+ B cells never decreased in group C. At three years after the surgery, the IgG antibody titers to measles and rubella viruses were significantly lower in group C patients than in group P patients. On the other hand, T cells isolated from groups C and P patients showed comparable response to PHA stimulation.

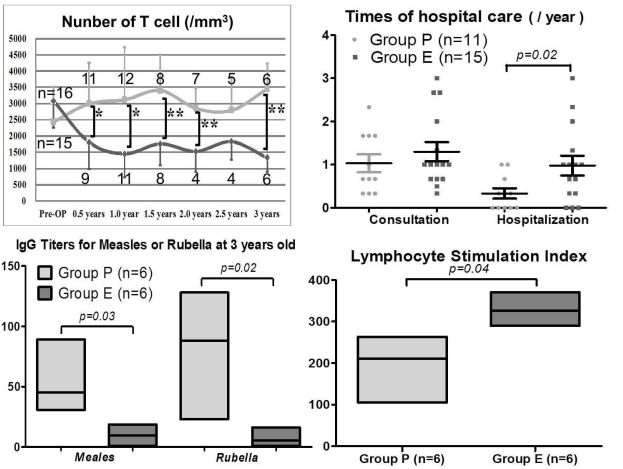


Figure: *The change of immune functions in the patients with/without complete thymectomy.*

No deaths were recorded during the three-year survey period. None of the patients required intensive care due to immunological complications, including acute or recurrent infectious diseases, such as bacteremia and mediastinitis. However, the frequency of hospitalization in group C patients, which was associated with infectious diseases, such as bronchitis and pneumonia, was significantly higher than in group P patients.

CONCLUSIONS: Patients with complete but not partial thymectomy exhibited reduction in T cell number and vaccination-induced IgG responses, in addition to an increase in hospitalization frequency associated with infectious diseases. The thymus should be at least partially conserved during cardiac surgery in early infancy to preserve protective immunity.

F5. Functional Protein Network Mapping of Cardiac Tissue Mitochondria Reveals Aberrant Activation of a Common Lipogenic-Glycogenic Signaling Axis in Patients with Atrial Fibrillation

Niv Ad[+1], Julie Wulfkuhle[2], Maryam Goudarzi[2], Jianghong Deng[2], Lisa M. Martin[1], Chidima Martin[1], Mark Ross[2], Lance Liotta[2], Emanuel Petricoin[2]

1. Cardiac Surgery Research, Inova Heart and Vascular Institute, Falls Church, VA, United States. 2. Center for Applied Proteomics and Molecular Medicine, George Mason University, Manassas, VA, United States.

Invited Discussant: Adam Saltman

OBJECTIVE(S): Atrial fibrillation (AF) in patients having cardiac surgery is linked with different comorbid conditions (valvular, coronary artery) An association between atrial remodeling, mitochondrial function and atrial morphology to AF was identified. Protein signaling events underpin much of mitochondrial function and mediate mitochondrial output and it is possible that AF involves specific derangements in mitochondrial-centered protein signaling. The aim was to interrogate the mitochondrial protein signaling architecture of human atrial tissue using a novel pathway mapping tool to determine whether AF shares common signaling pathways despite the heterogenous nature of AF clinically.

METHODS: Right atrial appendages (RAA) from non-AF patients (CABG & Valve n = 20) and RAA and left atrial appendages (LAA) from AF patients (concomitant maze procedure n = 23) were used. Functional protein signal pathway activation mapping was performed using Reverse Phase Protein Microarray analysis of the lysates. Quantitative measurement of activation/phosphorylation of 55 key signaling molecules involved in apoptosis, energy metabolism and cell growth were measured concomitantly. Statistical analysis (t-test or Wilcoxon rank sum) were performed along with pathway mapping visualization.

RESULTS: Twenty-eight signaling molecules involved in energy regulation and metabolic pathways were statistically elevated ($p < 0.05$) in mitochondrial isolates from RAA of AF patients. Pathway analysis showed systemic activation in the AF signaling architecture with proteins involved in lipogenesis, glycogenesis and mitogenesis. None were found to be specifically associated with type of AF or the associated cardiac pathology.

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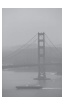


CONCLUSIONS: Protein pathway activation mapping techniques applied for the first time to human atrial tissue from patients with and without AF identified activation of key signaling networks in the mitochondrial-enriched fractions that control lipid/fat metabolism in patients with AF. These activations were independent of the type of AF or concomitant cardiac pathology and point to a commonly shared molecular network defects in cellular protein signaling despite the clinical heterogeneity of AF. Unmasking causally-associated signaling events within the affected heart myocytes could lead to new therapeutic modalities for AF.

F6. Resveratrol Preserves Myocardial Function and Reduces Glucose Intolerance by Activating the AMP-Activated Protein Kinase-Alpha Pathway in a Hypercholesterolemic Swine Model of Chronic Myocardial Ischemia

Michael P. Robich[1], Louis M. Chu[1], Tai Ho Shin[2], Warren J. Manning[3], Frank W. Sellke[+2]

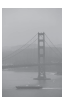
1. Surgery, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, United States. 2. Surgery, Warren Alpert School of Medicine, Brown University, Providence, RI, United States. 3. Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, United States.

Invited Discussant: Bruce R. Rosengard

OBJECTIVE(S): Hyperglycemia and impaired myocardial glucose utilization have been shown to lead to adverse outcomes in cardiac surgery. Resveratrol is a naturally occurring polyphenol found in grape skins and red wine. Previous studies by our laboratory have demonstrated improvements blood glucose control in a swine model of metabolic syndrome and chronic myocardial ischemia treated with resveratrol. We hypothesize that resveratrol improves myocardial tolerance of ischemia in part via the AMP-Activated Protein Kinase-α (AMPKα) pathway, a metabolic master switch that enhances glucose transport and metabolism in response to low ATP levels.

METHODS: Three groups of Yorkshire swine were fed either normal diet (CTL, n = 6), hypercholesterolemic diet (HCD, n = 7), or hypercholesterolemic diet with supplemental resveratrol (100 mg/kg/day orally, HCD-R, n = 6). At 8 weeks of age, an ameroid constrictor was placed on the left circumflex coronary artery to induce chronic ischemia. Seven weeks later, animals underwent IV glucose tolerance testing, functional cardiac magnetic resonance imaging (cMRI), and myocardial harvest. Tissue from the ischemic myocardium was analyzed for protein expression.

RESULTS: HCD animals demonstrated elevated total serum cholesterol, glucose intolerance and insulin resistance after a dextrose challenge. This effect was reversed by resveratrol supplementation. Regional wall motion analysis using cMRI circumferential strain demonstrated a significantly worsened inferolateral myocardial regional function from baseline



to 7 weeks in HCD compared to HCD-R. Expression of activated AMPKα, glucose transporter type 4 (GLUT4), and LKB1, an upstream activator of AMPKα were decreased in the HCD group, but similar to control in the HCD-R group. Expression of PPAR-γ coactivator-1α (PGC-1α), a downstream target inhibited by AMPK and indicator of cellular stress, was significantly decreased in the HCD-R group. Akt, an inhibitor of AMPKα, was downregulated in the HCD-R group compared to both control and HCD groups (Table 1).

Table 1.

Selected Results	CTL	HCD	HCD-R	p-value
Total Serum Cholesterol (mg/dL)	80 ± 4	390 ± 47	261 ± 51	< 0.01
Serum Glucose (mg/dL)	108 ± 7	171 ± 6	132 ± 14	0.002
Serum Insulin (mg/mL)	46 ± 2	100 ± 9	53 ± 9	0.002
Regional Myocardial Function (% change)		–42	–17	0.04
Protein Expression (fold change)				
Phospho-AMPKα	1.00	0.46	0.91	0.04
GLUT4	1.00	0.51	2.04	< 0.01
LKB1	1.00	0.31	0.86	< 0.01
PGC-1α	1.00	1.59	0.59	< 0.01
Akt	1.00	1.20	0.69	< 0.01

CONCLUSIONS: This study demonstrates that resveratrol improves components of metabolic syndrome, preserves myocardial function during chronic ischemia, and reverses several alterations in the AMPKα pathway induced by hypercholesterolemia. These findings offer a possible mechanism for resveratrol induced myocardial protection. In patients this may lead to optimized myocardial metabolism and function during ischemia.

F7. The Impact of Temperature and Pump Flow Rate During Selective Cerebral Perfusion on Regional Blood Flow in Piglets

Jian Wang[1], Richard M. Ginther[1], Matthew Riegel[2], Rong Huang[3], Mahesh S. Sharma[1], Kristine J. Guleserian[1], Joseph M. Forbess[+1]

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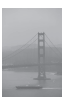
Invited Discussant: Christian Etz

OBJECTIVE(S): Selective cerebral perfusion (SCP) can provide cerebral blood flow during aortic arch repair. Ideal temperature and flow rates for SCP are not known. We examined regional organ perfusion using fluorescent microspheres in a piglet SCP model at different flow rates and temperatures.

METHODS: Three groups underwent SCP at 30 ml/kg/min at different temperatures (T15°C, T25°C and T32°C groups) and 4 groups remained at 25°C for SCP at different flow rates (Q10, Q30, Q50 and Q75 ml/kg/min groups). After cooling down to target temperature, SCP via the right carotid artery continued for 90 minutes. Animals were euthanized 2 hours after weaning from CPB. Fluorescent microspheres (2.5 million) were injected at 5 minutes normothermic CPB; immediately prior to SCP; 45 minutes SCP; 90 minutes SCP; and 2 hours after CPB. Brain tissue (bilateral neocortex, hippocampus, cerebellum, caudate nucleus and brain stem) and other organs (quadriceps, stomach, duodenum, liver and kidney) were collected to examine regional blood flow (RBF, ml/min/gram).

RESULTS: At 2 hours post CPB, RBF of T32°C group was higher than that of T15°C group ($p < 0.05$) at the caudate nucleus and hippocampus; RBF of T32°C group was higher than that of T25°C and T15°C groups ($p < 0.05$) at neocortex. No significant association was observed between SCP flow rate and RBF at a fixed temperature of 25°C. Also, there was no significant difference between left and right side of brain tissues in both Temperature and Flow Rate groups. RBF did significantly increase with temperature in



the liver and quadriceps during SCP ($p < 0.05$). At the kidney, the flow rate at "90 minutes SCP" was significantly higher than that at "45 minutes SCP" when all temperature groups were combined ($p < 0.05$).

CONCLUSIONS: SCP at 32°C provides higher brain RBF 2 hours after CPB. Increasing SCP flow rate does not increase RBF significantly at 25°C. During SCP, there is detectable blood flow to the lower body, and higher temperature during SCP results in improved RBF to the liver and quadriceps. Unilateral cerebral perfusion is evenly distributed to both hemispheres in this piglet model of SCP.

F8. Mechanical Preconditioning Enables Electrophysiological Coupling of Skeletal Myoblast Cells to Myocardium

Yeong-Hoon Choi[1], Klaus Neef[1], Suresh Kumar[1], Philipp Treskes[1], Roland Adelmann[3], Markus Khalil[3], Christof Stamm[2], Thorsten Wittwer[1], Thorsten C. Wahlers[1]

1. Department of Cardiothoracic Surgery, Heart Center University of Cologne, Cologne, Germany. 2. Department of Cardiothoracic Surgery, German Heart Institute Berlin, Berlin, Germany. 3. Department of Pediatric Cardiology Cardiothoracic Surgery, University of Cologne, Cologne, Germany.

Invited Discussant: Y. Joseph Woo

OBJECTIVE(S): Skeletal myoblasts (SMB) are being discussed controversially as a substrate for cardiac regenerative cell therapy. A major issue is that native SMB fail to couple electrically and functionally to the host myocardium. We present a novel approach using SM based engineered tissue constructs (ETC) resolving the issue of native conduction block between SMB and cardiomyocytes.

METHODS: SMB from skeletal muscle tissue of neonatal mice from cell culture expansion were used to generate ETC, either with or without application of directed mechanical strain. After submission to cell culture conditions enabling myotube formation, ETC were co-cultured for three days with viable slices of embryonic hearts. Electrophysiological measurements were performed by sharp electrodes to assess the electrical coupling between the ETC and the myocardium. Furthermore, pharmacological studies were performed to characterize the established underlying electrophysiological connection.

RESULTS: Our protocol for the isolation of SM from skeletal muscle tissue resulted in high yields of homogeneous cell populations (97.1 ± 0.1%) desmin positive cells. Mechanical strain was exerted on myotubes within ETC during polymerization of the matrix, generating preconditioned ETC (P-ETC). Electrophysiological measurements revealed electrical coupling between P-ETC and heart slices, but no coupling between ETC without directed mechanical strain and heart slices. Stimulation of cells within P-ETC and recording of resulting action potentials in cells within the heart slice showed delayed response, as compared to stimulation of cells within the heart tissue (P-ETC vs. heart: 16.6 ± 5.2 ms vs. 6.25 ± 2.9 ms, $p < 0.001$).

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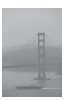

Furthermore, increasing frequency of stimulation up to 6 Hz from P-ETC resulted in coordinated response in the heart tissue, while stimulation up to 10 Hz was possible from the heart tissue. Sensitivity for reversible cardiac specific gap junction block was also higher for P-ETC stimulation (0.22 ± 0.6 mM heptanol) than for stimulation within the host tissue.

CONCLUSIONS: In contrast to the limited electrical coupling ability of native SMB, the presented approach allows the generation of SMB based ETC transplantable cellular grafts that couple electro-mechanically to myocardium. This represents a milestone for cardiac cell therapy and abolishes the paradigm against the application of SMB for the regeneration of the heart.

F9. A Novel Amiodarone-Eluting Biological Glue for the Prevention of Postoperative Atrial Fibrillation: First Animal Trials

Ziv Beckerman[1], Adi Azran[1], Oved Cohen[1], Ohad Kimhi[1], Robert W. Bolderman[2], Jos G. Maessen[2], Havazelet Bianco-Peled[3], Gil Bolotin[1]

1. Cardiac Surgery, Rambam Healthcare Campus, Haifa, Israel. 2. Department of Cardiothoracic Surgery, Maastricht University Medical Center, Maastricht, The Netherlands. 3. Chemical Engineering Department, Technion, Haifa, Israel.

Invited Discussant: Abe DeAnda

OBJECTIVE(S): Postoperative atrial fibrillation is the most common complication after cardiac surgery, leading to increased morbidity and mortality. Routine prophylactic use of amiodarone is not recommended due to associated systemic adverse effects. The aim of this study was to evaluate the efficacy of a novel local drug delivery system for the prevention of postoperative atrial fibrillation, while avoiding systemic distribution.

METHODS: Nine goats (5 study goats, 4 controls) underwent left thoracotomy and right atrial epicardial electrodes attachment. An alginate based novel proprietary glue with amiodarone (1 mg/kg bw) was applied to the right atrial epicardium of the study group. In the control group glue without amiodarone was applied. Atrial effective refractory period (AERP), and atrial response to burst pacing (rapid atrial response, RAR) were assessed at the following intervals: before and after application, and in the first, second and third postoperative days (PODs). Myocardial, plasma and extracardiac tissue amiodarone concentrations were analyzed by high-performance liquid chromatography (HPLC).

RESULTS: HPLC drug levels were found to be within the therapeutic window in the right atrium of all tested animals from the first postoperative day (23510.86 ± 5230.69 ng/g). Amiodarone concentrations in plasma, skeletal muscle, and thyroid gland were below detection level. AERP did not change in both groups during the study. Baseline RAR inducibility was comparable between both groups (P = 0.27). Within the study group, a significant reduction in RAR inducibility was observed on POD3 (65% vs. 27%; P = 0.019). No such differences were found among the control group (44% vs. 41%; P = 0.86).

CONCLUSIONS: The local delivery of amiodarone reduced atrial vulnerability to tachyarrhythmias, while extracardiac drug levels remained below detection. This novel technology should be further validated for the prevention of postoperative atrial fibrillation.

F10. Validation of a Mitral Valve Replacement Skills Trainer: A Simplified, Low-Cost Approach

David G. Greenhouse, Eugene A. Grossi+, Sophia Dellis, Joy Park, David W. Yaffee, Abe DeAnda+, Aubrey C. Galloway+, Leora Balsam

Cardiothoracic Surgery, New York University School of Medicine, New York, NY, United States.

Invited Discussant: James I. Fann

OBJECTIVE(S): Simulated mitral valve replacement (sMVR) may aid in the development of technical skills and procedural knowledge required for adequate performance in the operating room. We sought to design and validate a MVR skills training station (TS) that is low-cost, non-perishable, portable, and reproducible as a first step in developing a mitral valve surgical skills training curriculum.

METHODS: Sixteen physicians (5 general surgery residents [GS], 7 cardiothoracic surgery residents [CS], and 4 attending cardiothoracic surgeons [AS]) underwent sMVR testing. After watching an instructional video, sMVR was performed on a low-cost homemade TS consisting of a replaceable "mitral annulus" inside a restrictive "atrium" which was orientated anatomically within a model chest cavity. sMVRs were recorded using a head-mounted video camera and analyzed offline by two observers who were blinded to the training level of the surgeon. Eight components of performance (suture depth, suture spacing, needle driver facility, needle angle, follow-through, awareness of geometric constraints, accuracy, and knot tying) were graded on a 5-point scale. A composite score (out of 100 points) was calculated by weighting the grades by procedural time. The effect of training level was evaluated using ANOVA and post-hoc Tukey HSD.

RESULTS: The speed of sMVR varied between GS, CS, and AS (50.6 + 8.8 vs. 33.1 + 5.0 vs. 28.0 + 3.5 min respectively; $F = 17.8$, $p < 0.001$). Level of training significantly affected all 8 evaluation components ($p < 0.001$). Composite scores varied with experience (GS 34.4 + 12.7, CS 63.4 + 11.3, AS 88.3 + 7.8 out of possible 100 points; $F = 26.7$, $p < 0.001$). CS residents who reported having performed 10–50 MVRs had a composite score of 65.0 + 2.8 ($p < 0.01$ compared to AS). Inter-observer grade correlation was strong (ICC = 0.64).

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	General Surgery Residents (n = 5)	Cardiac Cardiac Surgery Residents (n = 7)	Attending Cardiac Surgeons (n = 4)	ANOVA
Time to Completion[§, †] (min)	50.6 ± 8.8	33.1 ± 5.0	28 ± 3.5	F = 17.8; p < 0.001
Needle Driver Facility[†,‡] (1–5 scale)	2.2 ± 0.6	3.1 ± 0.8	4.6 ± 0.3	F = 16.5; p < 0.001
Needle Angle Usage[§,†,‡] (1–5 scale)	1.6 ± 0.8	2.9 ± 0.7	4.3 ± 0.6	F = 15.3; p < 0.001
Awareness of Geometric Constraints[§,†,‡] (1–5 scale)	1.6 ± 0.5	2.8 ± 0.8	4.8 ± 0.3	F = 29.6; p < 0.001
Knot Tying[§,†,‡] (1–5 scale)	2.7 ± 0.8	3.7 ± 0.5	4.9 ± 0.3	F = 17.5; p < 0.001
Composite Score[§,†,‡] (1–5 scale)	34.4 ± 12.7	63.4 ± 11.3	88.3 ± 7.8	F = 26.7; p < 0.001

§p < 0.05 GS vs CS; †p < 0.05 GS vs AS; ‡p < 0.05 CS vs AS by Tukey HSD.

CONCLUSIONS: sMVR can be performed using this simple, affordable, portable setup. Performance scores correlate with level of training and experience with number of real MVRs performed, but residents who had performed 10–50 MVRs still failed to reach attending-level proficiency. This training simulator may facilitate skills practice and evaluation of competency in cardiac surgery trainees.

7:00 a.m. **GENERAL THORACIC SURGERY FORUM SESSION**

2007, 2009, 2011 Moscone West Convention Center
(5 minute presentation, 5 minute discussion)

Moderators: Dao M. Nguyen
Richard J. Finley

F11. Development of a Serum Biomarker Panel Predicting Recurrence in Node Negative Non-Small Cell Lung Cancer Patients

Daniel Rinewalt[1], Jeffrey A. Borgia[2,3], David D. Shersher[1], Sanjib Basu[4], Edward Hong[5], Gary Chmielewski[5], William H. Warren[+5], Michael J. Liptay[+5]

1. General Surgery, Rush University Medical Center, Chicago, IL, United States. 2. Biochemistry, Rush University Medical Center, Chicago, IL, United States. 3. Pathology, Rush University Medical Center, Chicago, IL, United States. 4. Preventative Medicine, Rush University Medical Center, Chicago, IL, United States. 5. Thoracic Surgery, Rush University Medical Center, Chicago, IL, United States.

Invited Discussant: Chuong D. Hoang

OBJECTIVE(S): Molecular diagnostics able to predict recurrence in node negative non-small cell lung cancer (NSCLC) patients would have practical implications for adjuvant chemotherapy trials to improve overall survival. The objective of this study was to develop a simple and cost-effective serum panel that is predictive of disease recurrence in NSCLC patients without lymph node positive disease.

METHODS: We used the Luminex immunobead platform to evaluate 47 circulating immunomodulatory biomarkers, growth factors, and auto-antibodies in a group of 73 patients with NSCLC. Peripheral blood was collected immediately before surgery and processed using standard phlebotomy techniques. All patients underwent anatomic resections with pathological staging and have had at least 2 years of follow up. Mann-Whitney rank-sum tests and receiver operator characteristics (ROC) curves were used to assess differences in biomarker concentrations in relation to recurrence. The Random Forest algorithm combined with a classification and regression tree (CART) analysis was then used to create an algorithm for classifying patients based on recurrence.

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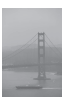
RESULTS: Of 73 enrolled patients who underwent surgical resection, 45 were pathologically node negative with 10 (22%) of these patients having recurrence within 2 years. 28 patients with positive lymph node disease were included as controls. Univariate analysis for all patients revealed 20 biomarkers with an area under ROC curve ≥0.60 related to overall survival (Table 1). Multivariate statistical methods were then used to further refine the classification scheme for the lymph node negative cohort and created a panel composed of TIMP-1 and autoantibodies against alpha enolase, p53, annexin A1, and peroxiredoxin. Performance of this 5 analyte biomarker panel to predict recurrence free survival revealed a sensitivity of 82% and specificity of 85% (AUC 0.8). The panel accurately prognosticates 83.3% of lymph node negative patients who had recurrence within 2 years.

Biomarker	P Value	Area Under Curve (ROC)	Median Value	Minimum Value	Maximum Value
IGF BP5	0.00024	0.744	229.73	2.515	10573.625
p53	0.0102	0.672	2106.3	231	20598
protein disulfide isomerase 3	0.01734	0.656	514.05	73.16	4000
heat shock protein 5a	0.01856	0.662	897.44	215.24	4000
recoverin	0.02679	0.632	1979.8	174.3	18603.5
peroxiredoxin	0.03298	0.628	1895	234	19334
stem cell factor	0.04354	0.637	50.85	13.18	246.44
NY-ESO	0.05285	0.62	2226.75	183.5	20353.25
Alpha enolase	0.05684	0.616	2033	561	13339
IGF 1	0.06461	0.588	46.1621	0.49122	586.54402
glyceraldehyde-3-phosphate DH	0.06467	0.617	4059	925	16595
triosephosphate isomerase	0.06842	0.598	1948.8	221.5	21755
3-oxoacid CoA transferase	0.07438	0.608	1191.25	302.75	12969.25
methylthioadenosine phosphorylase	0.07646	0.604	1171	317.25	11972.75
ubiquilin	0.07858	0.608	876	220	11739
Hydroxyacyl-CoA dehydrogenase	0.08522	0.606	384.07	70.18	4000
survivin	0.0864	0.618	2503	596	11243
isocitrate dehydrogenase	0.09478	0.606	483.85	128.94	4000
heat shock protein 9a	0.09994	0.624	691.97	119.88	4000
annexin A1	0.146	0.574	328.8000	49.46	4003.16

CONCLUSIONS: Here we report the development of a serum biomarker panel in node negative NSCLC patients that predicts recurrence previously undetected by standard imaging and pathology. Further refinement of this panel has the potential to accurately stratify patients for adjuvant therapy who would otherwise receive surgery alone. We are validating this algorithm using NSCLC patients from an independent multi-institutional cohort.



F12. The In Vitro and In Vivo Therapeutic Efficacy of the CXCR4 Antagonist BKT140 Against Human Non-Small Cell Lung Cancer (NSCLC)

Ori Wald[1,2], Duha Fahham[2], Michal Abraham[2,3], Katia Beider[2], Ido D. Weiss[2], Hanna Wald[2], Zippora Shlomai[4], Orly Eisenberg[3], Gideon Zamir[4], Uzi Izhar[1], Oz M. Shapira[+1], Amnon Peled[2]

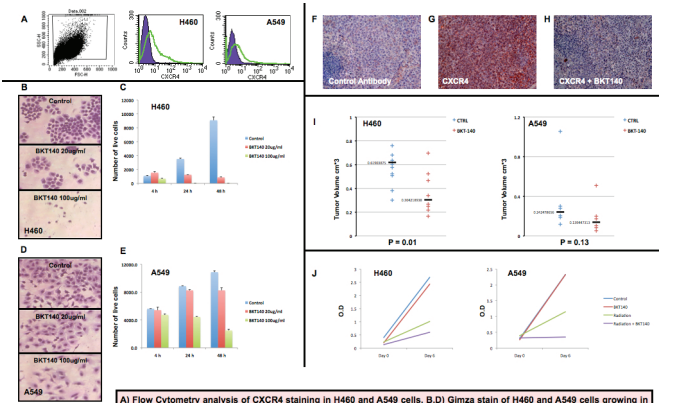
1. Cardiothoracic Surgery, Hadassah University Hospital, Jerusalem, Israel. 2. Goldyne Savad Institute of Gene Therapy, Hadassah University Hospital, Jerusalem, Israel. 3. Biokine Theraputics, Weizmann Science Park, Rehovot, Israel. 4. Laboratory for Surgical Research, Hadassah University Hospital, Jerusalem, Israel.

Invited Discussant: Chad Denlinger

OBJECTIVE(S): It is well established that CXCR4/CXCL12 interactions promote non-small cell lung cancer (NSCLC) growth and dissemination. In addition, evidence suggests that this axis plays an important role in promoting lung cancer cell resistance to chemo/radio therapy. Therefore, we propose that the CXCR4/CXCL12 axis may constitute an attractive therapeutic target for the treatment of NSCLC. In the current research, we characterize the therapeutic efficacy of the novel CXCR4 antagonist BKT140 against human NSCLC.

METHODS: We determined CXCR4 expression in 5 NSCLC cell lines (H358, A549, H460, H1299 and L4). We then tested the colony forming capacity and proliferation of these cells in the presence of CXCL12 and BKT140. Next, we measured in vivo the growth of A549 and H460 derived tumors in the presence or absence of systemically administered BKT140. Finally, we examined the potential additive effect of BKT140 in combination with 1) Cisplatin, 2) Paclitaxel, and 3) following radiation of NSCLC cells.

RESULTS: All cell lines tested expressed CXCR4 and showed increased colony formation in response to CXCL12 stimulation. BKT140 treatment reduced colony formation by NSCLC cells. Proliferation assays demonstrated both cyto-toxic and cyto-static properties for this peptide. H460 cells were the most sensitive to BKT140 while A549 cells were the least. Subcutaneous administration of BKT140 significantly delayed the development of orthotopically transplanted H460 cells and showed a similar trend for A549 tumors. The anti proliferative effects of BKT140 appears to be additive to those of chemotherapeutic drugs and radiation.



A) Flow Cytometry analysis of CXCR4 staining in H460 and A549 cells. B,D) Gimza stain of H460 and A549 cells growing in presence or absence of BKT140. C,E) Proliferation of H460 and A549 cells growing in presence or absence BKT140. F,G,H) CXCR4 immunohistochemistry staining of orthotopicaly implanted H460 tumors: F) Control antibody, G) Anti-CXCR4 antibody H) Anti-CXCR4 antibody in animals treated with systemic injection of BKT140. I) *In vivo* tumor growth of orthotopically implanted H460 and A549 cells in mice, with or without systemic administration of BKT140. J) Proliferation of H460 and A549 cells growing in presence or absence BKT140 and with or without radiation pretreatment. Blue line - Control, Red line - BKT140 (10ug/ml), Green line - Radiation, Purple line - Radiation + BKT140 (10ug/ml).

CONCLUSIONS: Our findings indicate that the targeting of the CXCL12/CXCR4 axis with BKT140 significantly attenuates NSCLC tumor growth and may augment the effects of chemo/radio-therapy. These promising results suggest that future research will benefit from delineating the downstream mechanism of BKT140 action and defining BKT140 cell susceptibility markers.

F13. Lung Cancer Lymph Node Micrometastasis Detection Using RT-PCR—Correlation with Vascular Endothelial Growth Factor (VEGF) Expression

Chukwumere Nwogu[1,3], Sai Yendamuri[1,3], Wei Tan[2], Carl Morrison[2], Richard Cheney[2], Paul Bogner[2], Elisabeth U. Dexter[1,3], Alan Hutson[2], Mary Reid[2], Alex Adjei[2], Todd L. Demmy[+1,3]

1. Department of Thoracic Surgery, Roswell Park Cancer Institute, Buffalo, NY, United States. 2. Roswell Park Cancer Institute, Buffalo, NY, United States. 3. Department of Surgery, State University of New York, Buffalo, NY, United States.

Invited Discussant: Michael A. Maddaus

OBJECTIVE(S): Lymph node (LN) staging provides critical prognostic information in patients with non-small cell lung cancer (NSCLC). We hypothesized that: 1) Gamma emission detection using an intra-operative hand held probe following intravenous 18F-fluorodeoxyglucose (FDG) injection would select LNs containing micrometastases that could be identified using immunohistochemistry (IHC) and RT-PCR for epithelial markers. 2) Presence of micrometastases positively correlates with VEGF A, C, D and VEGF receptor-3 expression in LNs.

METHODS: Twenty-nine patients with resectable NSCLC were enrolled in a prospective lymph node mapping study. Every patient had pre-operative positron emission tomography-computed tomography (PET-CT) and mediastinoscopy. Following FDG injection, the probe detected increased FDG uptake within thoracic LNs as they were harvested during pulmonary resection procedures. The LNs that were FDG-avid, but were non-malignant by conventional hematoxylin & eosin (H&E) staining underwent IHC staining using cytokeratin AE1/AE3 and RT-PCR for CK-7, CEACAM5 and PLUNC (epithelial markers). An equal number of nodes with low FDG uptake were similarly studied (controls). All the primary tumors, FDG-avid and control LNs had VEGF A, C, D and VEGF receptor-3 expression levels measured. The Wilcoxon rank sum test was used to test the association between the RT-PCR results for the epithelial markers and VEGF expression levels in the LNs.

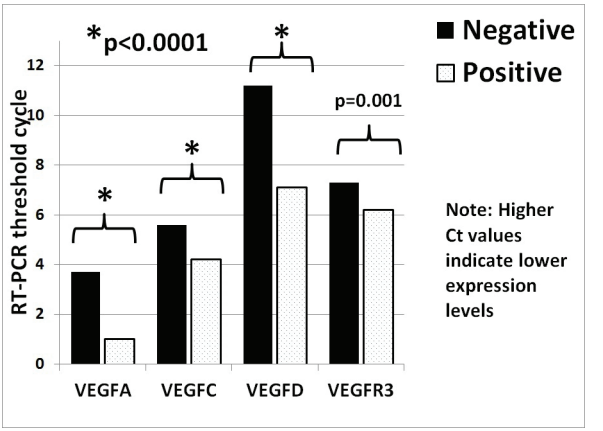


Figure: *Association between Positive Lymph Nodes and VEGF RT-PCR threshold cycles (Ct) in LNs.*

RESULTS: Positive LNs were found in 2 patients (7%) by PET-CT and in 22 patients (76%) by the gamma probe. 2 patients had positive LNs on H&E. IHC identified LN disease in 2 more patients. RT-PCR for CK-7, CEACAM5 or PLUNC was positive in 17 (59%) patients. Sensitivity and specificity for detection of metastases by RT-PCR were 12% and 100%, respectively for PET-CT. Corresponding values were 76.5% and 25%, respectively for the gamma probe. There was a highly positive correlation between RT-PCR detection of micrometastases and VEGF A, C, D or VEGF receptor 3 expression levels in LNs (Figure1). Median follow-up was 12.6 (Range 3–20) months.

CONCLUSIONS: The gamma probe was more sensitive but less specific than PET-CT in detecting lymph node metastasis from lung cancer. RT-PCR analysis of FDG-avid LNs for epithelial markers may result in up-staging. Detection of micrometastases is positively correlated with the expression of VEGF in LNs in NSCLC patients. This may reflect the role of lymphangiogenesis in promoting lymphatic metastases.

F14. Paclitaxel Cytotoxicity in Non-Small Cell Lung Cancer Is Significantly Enhanced by a Novel Small Molecule by Direct Activation of Procaspase-3

Syed S. Razi[1], Gary Schwartz[1], David Y. Lee[1], Koji Park[1], Scott Belsley[1,2], Faiz Y. Bhora[1,2], Cliff P. Connery[1,2]

1. Thoracic Surgery, St. Luke's Roosevelt Hospital, New York, NY, United States. 2. Columbia University College of Physicians and Surgeons, New York, NY, United States.

Invited Discussant: Jack A. Roth

OBJECTIVE(S): Paclitaxel is a first line agent in the treatment of non-small cell lung cancer (NSCLC) and induces tumor cytotoxicity via apoptosis. We have previously demonstrated inhibition of lung cancer growth by a novel small molecule procaspase-activating compound 1 (PAC-1), a synthetic compound that induces apoptosis. We hypothesized that PAC-1 in combination with paclitaxel would induce synergistic tumor inhibition via direct activation of apoptosis

METHODS: Human adenocarcinoma cell lines A-549 and H-322 m were exposed to graded concentrations of PAC-1 and paclitaxel for 72 hours. Colorimetric dose response assays were used to determine half-maximal inhibitory concentrations (IC50) and an isobologram method was employed to study the drug interactions. Western blot and flow cytometry were used ito estimate the levels of caspase-3 (C-3) and apoptosis activation. An in-vivo subcutaneous model of human lung adenocarcinoma was established in nude mice using the A-549 cell line. Paclitaxel was given intraperitoneally at 12 mg/kg/day for 5 days and PAC-1 was administered orally at 100 mg/kg for 21 days. Tumor volumes were assessed to estimate growth rate (mm3) up to 28 days.

RESULTS:

1. Cytotoxicity assays demonstrated significant synergy of paclitaxel in combination with PAC-1 ($p < 0.01$).
2. C-3 levels and apoptosis activity were significantly enhanced at low-dose combinations of PAC-1 and paclitaxel as compared to controls ($p < 0.01$).
3. Tumor growth was significantly reduced in mice receiving both PAC-1 and paclitaxel ($p < 0.01$; Figure 1).

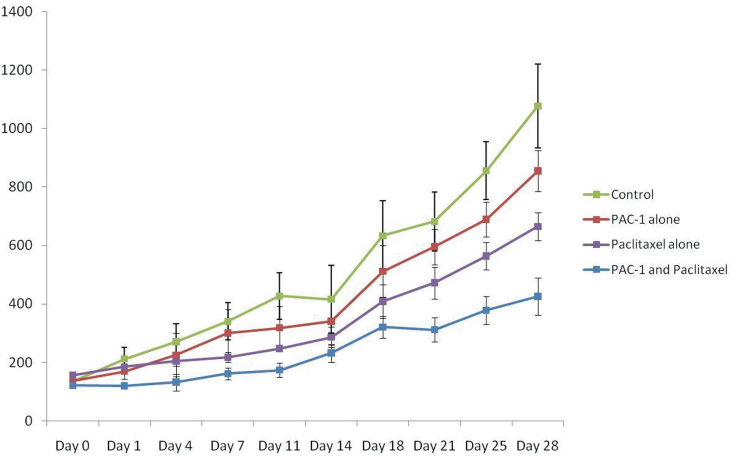


Figure 1. *Rate of tumor growth (mm3) over time.*

CONCLUSIONS: PAC-1 demonstrates significant synergy in combination with paclitaxel. The synergistic activation of the apoptotic pathway using targeted agents may serve as a potential strategy in the treatment of human lung cancer.

F15. Altered Protein Homeostasis in Lung Adenocarcinoma

Chuong D. Hoang, Manhong Wu, Yue Xu, William Fitch, Ming Zheng, Robert Merritt, Richard I. Whyte+, Joseph B. Shrager+, Gary Peltz
Cardiothoracic Surgery, Stanford University, Stanford, CA, United States.

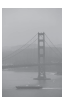
Invited Discussant: Dennis Wigle

OBJECTIVE(S): We hypothesized that altered expression of genes regulating protein assembly in NSCLC promote aberrant protein destruction manifesting as increased intracellular dipeptide levels. We integrated functional genomics with metabolomic analysis to elucidate the relationship between dipeptide metabolites and the malignant phenotype of human lung adenocarcinoma.

METHODS: Profiling of 25 matched pairs of tumor and normal tissue was performed simultaneously at metabolomic and transcriptomic levels. Metabolites were extracted using a dansyl-derivatization method. LC/MS analysis was performed on a mass spectrometer—liquid chromatography system. Matched pairs t-test identified biochemicals significantly altered between tumor and normals. RNA was extracted from a specimen subset and genomic data were generated on Illumina BeadChips. Profiles were grouped by k-means clustering into coexpressed gene clusters, functionally annotated with gene set enrichment analysis. The false discovery rate method assessed for significance; p-value ≤0.05 and q-value <0.10.

RESULTS: We found 220 dipeptides significantly altered in tumors. Certain combinations of these dipeptides could comprise a distinct metabolic biosignature for lung adenocarcinoma. Our gene array data suggested an explanation for the elevated dipeptides. We found in all 6 pairs tested, there were 22 significantly underexpressed genes and 1 overexpressed gene (>2-fold). The caveolin 1 (CAV1) gene was underexpressed in tumors. Gene ontology showed that CAV1 is a candidate tumor suppressor gene in diverse tumor types, but that its role in NSCLC remains undefined. CAV1 is an important component of the protein homeostasis network, maintaining proper levels of functional proteins. A loss of CAV1 (6.9-fold underexpressed in tumors; p = 0.0013) in lung tumors may promote increased protein destruction manifesting as increased dipeptides levels. Similarly, other genes in the CAV axis were significantly underexpressed in tumors.

CONCLUSIONS: Metabolomic analysis identified dipeptide metabolites that were uniquely found in lung adenocarcinomas. An integrated analysis incorporating metabolomics, enabled identification of genes/pathways not recognized before in lung cancer pathology. Our analytic system represents an efficient method to generate novel hypotheses about cancer biology. Altered protein homeostasis may have translational applications in lung cancer such as biomarker(s) or therapeutic target(s).



F16. Identification and Characterization of Stem-Like Cells in Human Esophageal and Adenocarcinoma Cell Lines

Alan G. Casson+, Ronghua Zhao

Surgery, University of Saskatchewan, Saskatoon, SK, Canada.

Invited Discussant: Jules Lin

OBJECTIVE(S): Recent studies have suggested that human solid tumors may contain subpopulations of cancer stem cells (CSCs) with capacity for self-renewal and potential to initiate and maintain tumor growth. The aim of this study was to utilize human esophageal cell lines to identify and characterize putative esophageal CSC populations.

METHODS: To enrich stem-like cells, Het-1A (derived from immortalized normal esophageal epithelium), OE33 and JH-EsoAd1 (each derived from primary esophageal adenocarcinomas) were cultured using serum-free media to form spheres. A comprehensive analysis of parent and spheroid cells was performed by flow cytometry, Western blot analysis, immunohistochemistry and PCR-array to study CSC-related genes; colony formation assays to assess clonogenicity, xenotransplantation to assess tumorigenicity, and MTT assays to assess chemosensitivity to 5-Fluorouracil (5-Fu) and Cisplatin (CDDP).

RESULTS: For all cell lines, clonogenicity (Table), tumorigenicity, and chemoresistance to 5-Fu and CDDP were significantly greater than for spheroid cells compared with parent cells. Flow cytometry revealed significant differences in integrin α6 bri/CD71 dim staining for parent cells (Het-1A, 0.11%; OE33, 0.01%; JH-EsoAd1, 0.21%) compared with spheroid cells (Het-1A, 21.3%; OE33, 5.73%; JH-EsoAd1, 11.3%). PCR array of 253 CSC-related genes revealed only one, the Achaete-schute complex homolog 2 (Ascl2) gene, to be consistently up-regulated in spheorid cells (Het-1A, +2.5 fold; OE33, +10.2 fold; JH-EsoAd1 +4.8 fold) relative to parent cells. Similarly, Ascl2 mRNA and protein were also significantly overexpressed in spheroid cells compared with parent cells (Het-1A: 1.71 ± 0.42 vs. 1.00 ± 0.00, $P < 0.05$; OE33: 4.70 ± 1.05 vs. 2.74 ± 0.63, $P < 0.05$; JH-EsoAd1: 1.29 ± 0.25 vs. 0.27 ± 0.09, $P < 0.01$).

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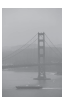
Clonogenicity of Het-1A, OE33 and JH-EsoAd1 Parent and Spheroid Cells Determined by Extreme Limiting Dilution Assay

Cell Line	Parent Cells Median Frequency (95% CI)	Spheroid Cells Median Frequency (95% CI)	P-Value
Het-1A	1/51.46 (1/92.80–1/28.50)	1/8.13 (1/15.20–1/4.30)	<0.01
OE33	1/49.40 (1/85.80–1/28.50)	1/15.10 (1/27.50–1/8.60)	<0.01
JH-EsoAd1	1/196.20 (1/409.00–1/94.20)	1/72.40 (1/124.00–1/42.20)	<0.05

CONCLUSIONS: The higher clonogenicity, tumorigenicity and drug resistance exhibited by spheroids derived from Het-1A, OE33 and JH-EsoAd1 reflects an enrichment of stem-like cell populations within each esophageal cell line. Esophageal cells enriched for integrin α6 bri/CD71 dim and /or overexpressing Ascl2 would appear to represent at least a subpopulation of stem-like cells in Het-1A, OE33 and JH-EsoAd1. In addition to enhancing our knowledge of esophageal cancer biology, these fundings have potential clinical application in the development of novel therapeutic strategies to target CSC populations in human esophageal malignancy.



F17. Inhibiting CXCL12 Blocks Fibrocyte Migration and Differentiation and Attenuates Bronchiolitis Obliterans in a Murine Heterotopic Tracheal Transplant Model

David A. Harris[1], Yunge Zhao[1], Damien J. LaPar[1], Abbas Emaminia[1], John Steidle[1], Mark Stoler[1], Joel Linden[2], Irving L. Kron[+1], Christine L. Lau[+1]

1. University of Virginia, Charlottesville, VA, United States. 2. La Jolla Institute for Allergy and Immunology, La Jolla, CA, United States.

Invited Discussant: Yolonda L. Colson

OBJECTIVE(S): Fibrocytes are integral in the development of fibroproliferative disease leading to bronchiolitis obliterans syndrome (BOS) post lung transplantation. Undifferentiated fibrocytes (CD45+Col1+CXCR4+) preferentially traffic via the CXCR4/CXCL12 axis and differentiate into smooth muscle actin producing (CD45+CXCR4+αSMA+) cells. We postulated that an antibody directed against CXCL12 would attenuate fibrocyte migration and fibro-obliteration of heterotopic tracheal transplant allografts.

METHODS: A total alloantigenic mismatch, murine heterotopic tracheal transplant model of BOS was used. Animals were treated with either goat-anti-human CXCL12 F (ab')2 or Goat IgG F (ab')2. Buffy coat, bone marrow, and trachea allografts were collected and analyzed by flow cytometry. Tracheal luminal obliteration was assessed via hematoxylin/eosin and Direct Red 80 collagen stain.

RESULTS: Compared to controls, anti-CXCL12 treated animals showed a significant decrease in tracheal allograft fibrocyte populations at 7 and 21 days post-transplantation. Bone marrow and buffy coat aspirates showed the same trend at 7 days. At 21 days, bone marrow aspirates showed a significant decrease in undifferentiated fibrocytes. In anti-CXCL12 treated mice, there was a 35% significant decrease in luminal obliteration at 21 days (65.00 [interquartile range = 38]% vs. 100 [10]% obliterated; $p = 0.010$) and decreased luminal collagen deposition at 21 and 28 days post-transplantation ($p = 0.042$ and 0.012, respectively). Figures 1a and b shows that there was a more rapid and ultimately more significant decease in fibrocyte numbers in anti-CXCL12 treated mice and a more rapid and ultimately more significant increase in tracheal fibrosis in control animals post tracheal transplantation.

[+]AATS Member

Figure 1

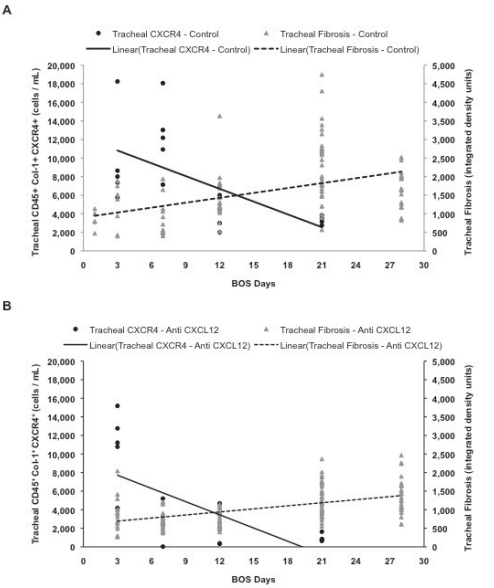


Figure 1: *Combined kinetics of trafficking of undifferentiated, CD45+Col1+CXCR4+ fibrocytes to tracheal allografts as determined by flow cytometry, and tracheal tissue collagen deposition as determined by Direct Red 80 densitometry. Control, Goat IgG F (ab')2 treated animals (A) show a more gradual and less complete decrease in tracheal allograft undifferentiated fibrocyte number with a concomitant more rapid and greater increase in tracheal collagen deposition as compared to experimental, anti-CXCL12 F (ab')2 treated animals (B).*

CONCLUSIONS: Understanding the role of fibrocytes in BOS post lung transplantation may lead to a paradigm shift in treatment strategy. Anti-CXCL12 antibody afforded protection against infiltrating fibrocytes and reduced deterioration of tracheal allografts. Thus, the CXCR4/CXCL12 axis is a novel target for the treatment of BOS and quantification of fibrocyte populations may provide clinicians with a biomarker of fibrosis allowing individualized drug therapy.

F18. Adenosine A3 Receptor Activation Attenuates Lung Ischemia-Reperfusion Injury via a Neutrophil-Dependent Mechanism

Ashish K. Sharma, Daniel P. Mulloy, Matthew L. Stone, Lucas G. Fernandez, Vanessa A. Hajzus, Heesung S. Kim, Victor E. Laubach, Irving L. Kron+

Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Thomas Waddell

OBJECTIVE(S): Adenosine receptors modulate inflammatory activity and have shown promise in limiting lung ischemia-reperfusion (IR) injury. The adenosine A3 receptor (A3R) is found in high levels in lung tissue and circulating bone-marrow-derived cells, however its role in IR injury is not well characterized. This study tests the hypothesis that selective activation of the A3R attenuates lung IR injury via a neutrophil-dependent mechanism.

METHODS: Wild-type (WT) C57BL/6J and A3R knockout (A3R-/-) mice underwent 60 min of left lung ischemia followed by 120 min reperfusion (IR) using an established in vivo, hilar-clamp model. Cl-IB-MECA, a highly selective A3R agonist, was administered via i.v. injection at 100 µg/kg five minutes prior to ischemia. Study groups included sham (thoracotomy + 2 hrs perfusion), IR, and IR + Cl-IB-MECA in WT and A3R-/- mice (n = 6/group). Lung injury was assessed through measurements of lung function, wet/dry weight, and proinflammatory cytokine and myeloperoxidase (MPO) levels in bronchoalveolar lavage fluid. MPO was used as an indicator of neutrophil infiltration into pulmonary airways. Parallel in vitro experiments were performed using neutrophils isolated from WT or A3R-/- mouse bone marrow. Neutrophil activation was assessed by measuring MPO levels in media following exposure of cells to normoxia or acute hypoxia (3 hrs)/reoxygenation (1 hr).

RESULTS: Treatment of WT mice with Cl-IB-MECA resulted in significantly improved lung function (lower airway resistance, higher compliance, lower pulmonary artery pressure), decreased wet/dry weight, decreased pro-inflammatory cytokine expression, and decreased MPO levels after IR when compared to untreated WT mice (all $p < 0.05$) (Table). IR injury was similar between A3R-/- and WT mice. Cl-IB-MECA had no protective effects in A3R-/- mice after IR, indicating the specificity of the compound.

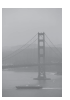
Similarly, Cl-IB-MECA treatment significantly decreased MPO production by WT neutrophils after acute hypoxia-reoxygenation (HR) but not by A3R-/- neutrophils ($p < 0.01$) (Table).

Table:

In-Vivo Mouse Data	WT Sham	A3R-/- Sham	WT IR	WT IR+ Cl-IB-MECA	A3R-/- IR	A3R-/- IR+ Cl-IB-MECA
Airway Resistance (cm H20/uL/sec)	0.96±0.03	0.84±0.09	1.51±0.23*	0.89±0.02#	1.18±0.07*	1.39±0.21*
Pulmonary Compliance (uL/cm H20)	6.91±0.59	6.05±0.61	3.47±0.22*	6.97±0.31#	2.81±0.40*	3.02±0.41*
PA Pressure (cm H20)	5.45±0.15	6.03±0.19	10.97±1.19*	6.47±0.30#	10.05±0.92*	9.77±0.83*
Wet/Dry Weight	4.29±0.17	4.42±0.19	5.85±0.28*	4.52±0.13#	5.24±0.17*	5.74±0.22*
IL-6 (pg/ml)	971±93	835±155	3029±387*	1962±175*#	2837±220*	2567±213*
KC (pg/ml)	2755±300	3081±331	6785±765*	4704±202*#	7691±520*	6792±600*
MIP1-alpha (pg/ml)	330±23	418±84	656±98*	514±38#	794±177*	743±116*
MCP-1 (pg/ml)	2402±342	2287±224	5638±1006*	3445±360*#	6070±765*	5779±371*
MPO (ng/mL)	7.3±2.0	7.25±2.2	20.4±3.4	12.4±1.8*#	26.8±5.3*	26.4±3.4*
***In-Vitro* Neutrophil Data**	**WT Normoxia**	**A3R-/- Normoxia**	**WT HR**	**WT HR+ Cl-IB-MECA**	**A3-/- HR**	**A3R-/- HR+ Cl-IB-MECA**
MPO (ng/mL)	26.0±1.0	24.7±1.8	36.5±2.3*	30.6±0.9*#	42.2±0.8*	39.2±2.2*

*p<0.05 vs. WT Sham, #p<0.05 vs. WT IR. Data reported as mean±SEM

CONCLUSIONS: Selective activation of A3R by Cl-IB-MECA attenuates lung dysfunction, inflammation, and neutrophil infiltration after IR in WT but not A3R-/- mice. Results with isolated neutrophils suggest that the protective effects of Cl-IB-MECA are due, in part, to direct prevention of neutrophil activation. Thus, the use of A3R agonists may be a novel therapeutic strategy to prevent lung IR injury after transplantation.



F19. Piglet Model of Chronic Thrombo-Embolic Pulmonary Hypertension

Olaf Mercier[1], Francois Haddad[2], François Raoux[1], Julien Guihaire[1], David Boulate[1], Benoit Decante[1], Saadia Eddahibi[1], Philippe G. Dartevelle[1], Elie Fadel[1]

1. Marie Lannelongue Hospital, Le Plessis Robinson, France.

2. Stanford University, San Francisco, CA, United States.

Invited Discussant: Patricia A. Thistlethwaite

OBJECTIVE(S): Chronic thrombo-embolic pulmonary hypertension (CTEPH) is a progressive disease that often leads to right ventricular (RV) failure. CTEPH is due a partial obstruction of the pulmonary arterial bed by unresolved and organized clots associated with a vasculopathy in the non obstructed pulmonary territories. Both of these changes leads to an increase of pulmonary vascular resistances and RV dysfunction. So far, no animal model accurately reproduces all the aspects of this disease. The aim of this study was to develop a reliable animal model of CTEPH.

METHODS: CTEPH was induced in piglet by ligation of the left pulmonary artery (PA) through a midline sternotomy followed by a weekly embolization of the right lower lobe arteries by tissue adhesive under fluoroscopic control for 5 weeks. This CTEPH group (n = 5) was compared to Sham operated animals (n = 5). Hemodynamics, right ventricle function on echocardiography, lung morphometry and quantification of Endothelin-1 (ET-1) pathway (ET-1 and its receptors ETA and ETB) gene expression were assessed at 5 weeks.

RESULTS: Compared to sham, CTEPH animals had increased mean PA pressure (29 ± 2 mmHg vs. 12 ± 2 mmHg, p = 0.0001) and total pulmonary resistances (10 ± 2 WU vs. 6 ± 1 WU, p = 0.05). On echocardiography, they had enlarged right ventricle (RV area relative: 0.81 ± 0.35 vs. 0.43 ± 0.03, p = 0.037), increased right ventricle wall thickness (56 ± 5 mm vs. 30 ± 4 mm, p = 0.0003), decreased TAPSE (14.4 ± 0.4 mm vs. 11.3 ± 0.9 mm, p = 0.01) and a paradoxical septal motion. Morphometric studies demonstrated in the obstructed territories an increase of the number of bronchial arteries per bronchus (8.7 ± 0.9 vs. 2 ± 0.17 p < 0.0001) and of distal PA media thickness (60% ± 2.8 vs. 29% ± 0.9 p < 0.0001) consistent with a postobstructive vasculopathy. In the non obstructed territories,

an increase of distal PA media thickness was found (70% ± 2.4 vs. 29% ± 0.9, $p < 0.0001$). ET1 was overexpressed in the non-obstructed territories when compared to sham group and to the postobstructed lung ($p = 0.03$).

CONCLUSIONS: For the first time, we developed a reliable piglet model of CTEPH reproducing all the aspects of this disease: increased mean PA pressure and pulmonary resistances, increased bronchial circulation, pulmonary vasculopathy and RV dysfunction.

F20. Modified In Vivo Lung Perfusion Technique Allows for Prolonged Perfusion Without Acute Lung Injury

Pedro Reck dos Santos, Ilker Iskender, Tiago Machuca, David M. Hwang, Shaf Keshavjee+, Thomas K. Waddell+, Marcelo Cypel

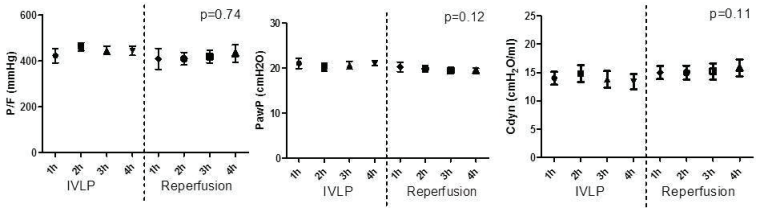
Thoracic Surgery, University of Toronto, Toronto, ON, Canada.

Invited Discussant: Paul E. Van Schil

OBJECTIVE(S): Previous studies have explored the use of short-term (30–60 min) in vivo lung perfusion (IVLP) with high dose chemotherapy to treat pulmonary metastases. However, questionable efficacy and variable toxicity have hindered the broad application of the technique. We hypothesize that a modified IVLP strategy based on our success with prolonged ex vivo lung perfusion would not induce lung injury. Our objective was to demonstrate the feasibility and safety of 4 h protective IVLP.

METHODS: Yorkshire pigs (35 kg) were used for the experiments. After anesthetic induction a 28 Fr double-lumen tube was inserted to allow for functional evaluation of the perfused lung. A left thoracotomy was performed and the left pulmonary artery (PA) and pulmonary veins (PV's) were cannulated. Pressure catheters were inserted in the PA and PV. After heparinization and clamping of the PA and PV's, IVLP was performed at 37°C for 4 h using Steen Solution (Vitrolife) as perfusate. Target flow rate was 20% of estimated cardiac output and left atrial pressure was kept between 3–5 mmHg. The perfusate was deoxygenated and supplied with CO_2 to physiologic levels prior to entering the lungs. A protective mode of ventilation was utilized. After 4 h of IVLP and a single pass washout, cannulas and clamps were removed and the left lung was allowed to reperfuse for additional 4 h. Peak airway pressure (Pawp), plateau pressure (Pplat), dynamic compliance (Cdyn), pulmonary artery pressure (PAP), and PV PO2 were used to assess left lung physiology. Lung tissue biopsies were obtained before and after IVLP and 4 h after reperfusion for histological assessment of lung injury (score range 0–12). India ink perfusion was performed to assess distribution of the perfusate during IVLP.

RESULTS: All lung function parameters were stable throughout 4 h IVLP period and during reperfusion (Figure 1). No significant acute lung injury was observed in lung tissue biopsies, median acute lung injury scores were 3, 2, and 4 before IVLP, after IVLP and after 4 h reperfusion respectively (p = 0.08). India ink staining demonstrated homogenous distribution of the perfusate by 4 h of IVLP.



CONCLUSIONS: Four hours IVLP is feasible without adding significant lung injury. Prolonged perfusion time and a protective perfusion protocol might provide safer and more efficacious localized chemotherapy to treat pulmonary metastases.

PLENARY SCIENTIFIC SESSION

8:45 a.m. **PLENARY SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Craig R. Smith
Thoralf M. Sundt, III

28. Aortic Valve Replacement in Neonates and Infants—Contemporary Outcomes in the STS Congenital Heart Surgery Database

Ronald K. Woods[1], Sara Pasquali[2], Marshall L. Jacobs[+3], Erle H. Austin[+4], Jeffrey P. Jacobs[+5], Mary Krolikowski[1], Michael E. Mitchell[1], Christian Pizarro[+6], James S. Tweddell[+1]
1. Cardiothoracic Surgery, Children's Hospital of Wisconsin, Medical College of Wisconsin, Milwaukee, WI, United States. 2. Pediatrics, Duke Clinical Research Institute, Duke University Medical Center, Durham, NC, United States. 3. Pediatric and Congenital Heart Surgery, Cleveland Clinic, Cleveland, OH, United States. 4. Division of Thoracic and Cardiovascular Surgery, University of Louisville, Louisville, KY, United States. 5. Congenital Heart Institute of Florida, All Children's Hospital and Children's Hospital of Tampa, University of South Florida College of Medicine, St. Petersburg and Tampa, FL, United States. 6. Nemours Cardiac Center, Alfred I. duPont Hospital for Children, Wilmington, DE, United States.

Invited Discussant: Christopher A. Caldarone

OBJECTIVE(S): Previous reports of aortic valve replacement (AVR) in children have included limited numbers of neonates and infants. We sought to describe early neonatal and infant outcomes across a large multi-center cohort using a national registry.

METHODS: Neonates and infants (age 0–365 days) in the Society of Thoracic Surgeons Congenital Heart Surgery Database (STS-CHSD) undergoing non-truncal AVR with the Ross-Konno procedure (RKP), Ross procedure (RP), or homograft replacement (HR) from 2000–2009 were included. Pre-operative characteristics, operative data, and early outcomes were described.

[+]AATS Member

Table 1. Patient Pre-Operative Characteristics, Operative Data, and Outcomes[1]

	Overall (n = 160)	Ross-Konno (n = 101)	Ross (n = 44)	Homograft (n = 15)
Pre-operative				
Age (days)	87[23,185]	63[16,194]	96[52,171]	98[79,171]
Neonates (0–30d)	43 (27%)	35 (35%)	7 (16%)	1 (7%)
Weight (kg)	4.8[3.6,6.4]	4.0[3.4,6.2]	5.2[4.4,7.0]	4.8[4.3,5.4]
Non-CV/genetic abnormality	33 (21%)	24 (24%)	6 (14%)	3 (20%)
STS-CHSD risk factors				
Any risk factor	76 (48%)	47 (46%)	15 (34%)	14 (93%)
Mechanical ventilation	42 (26%)	29 (29%)	7 (16%)	6 (40%)
Shock or acidosis	13 (8%)	9 (9%)	1 (2%)	3 (20%)
Operative				
CPB time (min)	202[150,270]	212[159,280]	192[136,249]	196[133,226]
Clamp time (min)	132[96,167]	143[106,174]	118[74,156]	108[86,139]
Concurrent arch repair	30 (19%)	25 (25%)	4 (9%)	1 (7%)
Concurrent mitral surgery	19 (12%)	14 (14%)	3 (7%)	2 (13%)
Outcomes				
In-Hospital Mortality				
Overall	29 (18%)	19 (19%)	4 (9%)	6 (40%)
Neonates (0–30d)	12 (28%)	10 (29%)	2 (29%)	0 (0%)
Length of stay (days)				
Overall	12[6,26]	15[8,28]	8[5,14]	10[5,28]
Neonates (0–30d)	20[14,39]	20[15,39]	17[9,72]	75[75,75]
Post-op mechanical circulatory support				
Overall	17 (11%)	12 (12%)	3 (7%)	2 (13%)
Neonates (0–30d)	8 (19%)	6 (17%)	2 (29%)	0 (0%)

[1]Data are presented as medians and interquartile range, or numbers and percentages.

RESULTS: A total of 160 patients (43 neonates, 117 infants) from 47 centers were identified. Characteristics of the cohort and outcomes are shown in Table 1. Procedure and age-specific data were reported for descriptive purposes only, with no intent to imply comparability of procedures or specific patient subgroups. STS-CHSD-defined pre-operative risk factors were present in 76 (48%) patients; and were most prevalent in neonates (67%) and patients undergoing HR (93%). In the overall cohort, concomitant arch repair or mitral valve surgery was performed at the time of AVR in 30 (19%) and 19 (12%) patients, respectively. Post-operative mechanical circulatory support was used in 17 patients (11%). Overall in-hospital mortality was 18% (29 patients); and was highest for neonates (28%) and patients undergoing HR (40%). Concomitant arch repair was associated with higher in-hospital mortality: 33% (10 of 30 patients with repair) vs 15% (19 of 130 patients without repair) ($p = 0.02$); while concurrent mitral valve surgery was not: 21% (4 of 19 patients with surgery) vs. 18% (25 of 141 patients without surgery) ($p = 0.73$). Postoperative mechanical circulatory support was also associated with increased in-hospital mortality: 65% (11 of 17 patients with support) vs. 13% (18 of 143 patients without support) ($p < 0.001$).

CONCLUSIONS: Neonates and infants undergoing AVR are a high-risk group, with hospital mortality comparable to some of the highest-risk procedures in this age group. The requirement for arch repair or post-operative mechanical circulatory support was associated with an increased risk of death in this cohort. A multi-institutional effort to collect additional data regarding morphology and other patient factors may enable more detailed analysis and facilitate elucidation of strategies to improve outcomes.

29. Efficacy of Extracorporeal Membrane Oxygenation as a Bridge-to-Lung Transplantation

Yoshiya Toyoda[+1,2], Jay K. Bhama[2], Norihisa Shigemura[2], Aditya Bansal[2], Diana Zaldonis[2], Joseph Pilewski[2], Maria Crespo[2], Christian Bermudez[2]

1. Temple University, Philadelphia, PA, United States. 2. University of Pittsburgh, Pittsburgh, PA, United States.

Invited Discussant: Joseph B. Zwischenberger

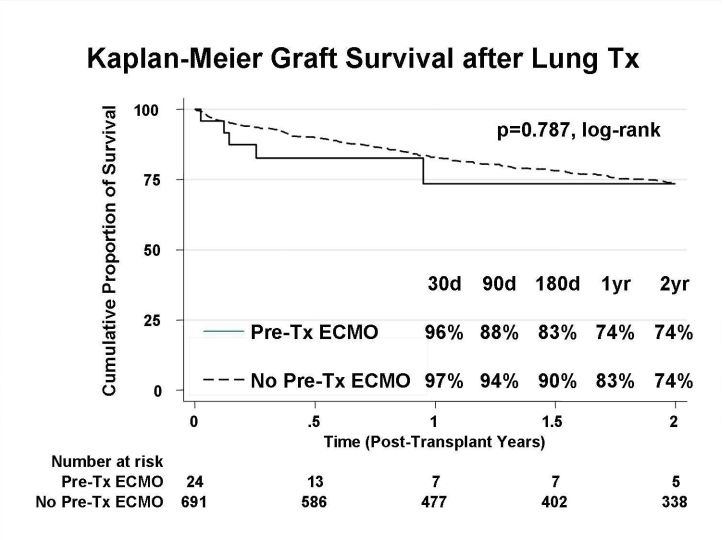
OBJECTIVE(S): Preoperative extracorporeal membrane oxygenation (ECMO) is a risk factor for poor outcomes and currently considered a contraindication to lung transplantation (tx). The lung allocation score (LAS) was introduced in 2005 and prioritizes lung allocation to those with the greatest respiratory impairment. The purpose of this study is to determine whether ECMO as a bridge to lung tx is an acceptable option.

METHODS: Retrospective review for 715 consecutive lung tx performed from May, 2005 to September, 2011, was conducted using prospectively collected institutional registry database. Twenty four lung tx (3.4%) were performed for patients with pre-tx ECMO.

RESULTS: The duration of pre-tx ECMO was 171 ± 242 hours (median 91 hours). Veno-venous ECMO was used for respiratory failure in 15 patients whereas veno-arterial ECMO was used for circulatory collapse due to pulmonary hypertension in 9. Pre-tx ECMO patients were younger (46 ± 15 vs. 57 ± 14 years, $p < 0.01$) compared to no pre-tx ECMO, with no difference in recipient gender (male/female: 10/14 vs. 380/311), donor age (33 ± 14 vs. 36 ± 15 years) or donor gender (10/14 vs. 352/339). Emphysema was less common (1, 4% vs. 260, 38%, $p < 0.01$), and cystic fibrosis (5, 21% vs. 72, 10%, $p = 0.09$), redo lung tx (3, 13% vs. 28, 4%, $p = 0.08$) and bronchiectasis (2, 8% vs. 6, 1%, $p = 0.03$) were more common in pre-tx ECMO patients. Pre-tx ECMO patients had significantly ($p < 0.01$) higher LAS (87 ± 9 vs. 44 ± 15). All pre-tx ECMO patients underwent double lung tx on pump (cardiopulmonary bypass and/or ECMO) whereas single lung tx was performed in 171 (25%) and pump was used in 243 (35%) of no pre-tx ECMO patients. The cardiopulmonary bypass time was longer ($p = 0.02$) in pre-tx ECMO patients (277 ± 69 vs. 225 ± 89 min) with no difference in ischemic time (343 ± 93 vs. 330 ± 98 min, $p = 0.54$). Cadaveric lobar lung tx was performed due to urgency to overcome size mismatch with oversized donor

[+]AATS Member

more frequently ($p < 0.01$) in 25% (n = 6, no mortality with the longest follow-up at 6 years) of pre-tx ECMO vs. 0.3% (n = 2) of no pre-tx ECMO. Post-tx ECMO was used for primary graft dysfunction in 13 (54%) of pre-tx ECMO patients and in 41 (6%, $p < 0.01$) of no pre-tx ECMO patients. The median hospital stay was 46 days in pre-tx ECMO vs. 27 days in no pre-tx ECMO ($p = 0.16$).



CONCLUSIONS: ECMO can be used as a bridge to lung tx with acceptable outcomes. Although the graft survival is good, the incidence of primary graft dysfunction requiring post-tx ECMO appears higher and hospital stay longer in pre-tx ECMO patients.

30. Error: Is There a Performance Gap in HLHS?

Frederic Jacques[1], Vijay Anand[2], Edward J. Hickey[1], Yasuhiro Kotani[1], Mrinal Yadava[1], Abdullah A. Alghamdi[1], Christopher A. Caldarone[+1], Glen Van Arsdell[+1]

1. Division of Cardiovascular Surgery, The Hospital for Sick Children, Toronto, ON, Canada. 2. Division of Critical Care Medicine, The Hospital for Sick Children, Toronto, ON, Canada.

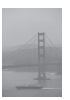
Invited Discussant: Emile A. Bacha

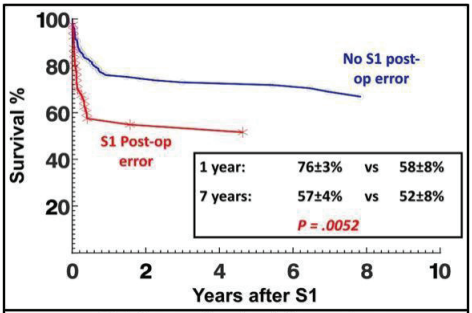
OBJECTIVE(S): Morphologic risks are well defined in HLHS, and are generally immutable. We instead explored frequency and impact of medical errors during staged palliation to identify potential performance gaps.

METHODS: All infants (N = 191) with HLHS who underwent staged palliation at our institution (2001–2011) were included. Clinical records for stage-1 (S1), interstage and stage-2 (S2) episodes were scrutinized to identify technical, judgement and management errors. Errors were classified as pre-, intra-, or post-operative. Errors were noted when a decision/intervention led to an early/late revision (intra), or rescue management strategy (post). The impact of errors on transplant-free survival was examined by parametric competing risks methodology and risk-adjusted regressions used bootstrapping.

RESULTS: S1 (N = 191)

Errors (114, 60%) were common and predominantly intra- (83; 73%) or post-operative (48; 42%). Post-operative errors were reliable risk-adjusted predictors of death/transplant (HR 1.8, P = .003), whereas technical (65; 34%) and other errors were not. However, technical errors significantly delayed recovery and discharge (~ extra 15 days, P = .01). HYBRID S1 was associated with significantly fewer intra-operative errors (42% vs 10%, P < .0001), but comparable post-operative errors and similar survival. Overall, 1-year survival decrements were ~15% in infants who sustained post-operative S1 errors (Figure).





Risk factors for death/transplant

Risk factor	*P*	*Reliability*
DILV	.0036	84%
CPB min	.0169	81%
Any post-operative error	.0034	67%

S2 (N = 134)

Errors during S2 occurred in 70 (52%). Intra-operative errors were most prevalent (61; 87%), but did not compromise survival. Post-operative errors (11; 16%) were important determinants of death/transplant (HR 2.3, P = .02). Earlier S1 errors did not "carry forward" to compromise survival after S2. However, infants experiencing interstage errors (21; 16%) had twice ICU (16 vs 7, P < .0001) and hospital (30 vs 17 days, P < .02) stay when later undergoing S2. HYBRID S2 was associated with more intra-operative technical errors (68% vs 35%, P < .0001), but comparable post-operative errors and similar survival.

Finally, a child presenting with low-risk morphology and managed with no post-op errors at either S1 or S2 would have predicted late survival in excess of 80%.

CONCLUSIONS: Technical errors are common and do delay recovery—but their effects on survival seem mitigated. The clinical performance gap instead lies in post-operative management errors. This performance gap (and late survival) is comparable for HYBRIDS versus NORWOODS—despite markedly different technical error profiles.

31. Valve-Sparing Aortic Root Replacement: Equivalent Long-Term Outcome for Different Valve Types with or Without Connective Tissue Disorders

John-Peder E. Kvitting[1], Fabian A. Kari[1], Michael P. Fischbein[+1], David H. Liang[2], R. Scott Mitchell[+1], D. Craig Miller[+1]

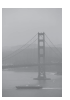
1. Cardiovascular and Thoracic Surgery, Stanford University School of Medicine, Stanford, CA, United States. 2. Cardiovascular Medicine, Stanford University School of Medicine, Stanford, CA, United States.

Invited Discussant: Allan S. Stewart

OBJECTIVE(S): The role of valve-sparing aortic root replacement (V-SARR) in bicuspid aortic valve (BAV) disease and connective tissue disorders (CTD) such as Marfan syndrome (MFS) is still debated; therefore, we analyzed the late results of a consecutive series of patients after T. David reimplantation V-SARR examining this question.

METHODS: From 1993 to 2009, 233 patients (27% BAV, 43% MFS) underwent T. David (TD)-I (n = 26, 11%), TD-V (n = 21, 9%) and TD-V-Stanford modification (V-Smod, n = 186, 80%, utilized exclusively since December 2002). Mean patient follow-up (F/U) was 4.7 ± 3.3 years (cumulative F/U = 1.102 patient-years). Time-to-event analyses were performed using Kaplan-Meier method, and freedom from adverse outcome (including early and late death, reoperation, structural valve deterioration [SVD], and type B dissection) using log-rank tests. Data reported as mean ± 1 SD.

RESULTS: Survival at 5, 10, 15 years was 98.7 ± 0.7%, 93.5 ± 5.1%, 93.5 ± 5.1%, respectively; there were 2 in-hospital deaths and 2 late deaths (one suicide and one dilated cardiomyopathy). Overall freedom from reoperation (all causes) on the aortic root was 92.2 ± 3.6% at 15 years (Figure, dashed lines are 95% confidence intervals), with only three AVR reoperations due to SVD (freedom from SVD at 15 years was 96.1 ± 2.1%). There were no significant differences in survival (p = 0.819, p = 0.844), reoperation (p = 0.210, p = 0.421), SVD (p = 0.686, p = 0.329) or any other valve function or clinical endpoints when patients were stratified for valve type (tricuspid aortic valve (TAV) vs. BAV) or associated CTD. At latest echo F/U (cumulative 879 patient-years, 95% complete) 196 (92.5%) patients had either trace or mild aortic regurgitation (AR), 15 (7%) had moderate, and



1 (0.5%) had severe. Freedom from >2+ AR at 5, 10 and 13 years was 97.4 ± 1.5%, 95.3 ± 2.5% and 95.3 ± 2.5%, respectively. Six patients (all MFS) sustained an acute type B aortic dissection (89.4 ± 5.1% free at 15 years), all of which were managed medically.

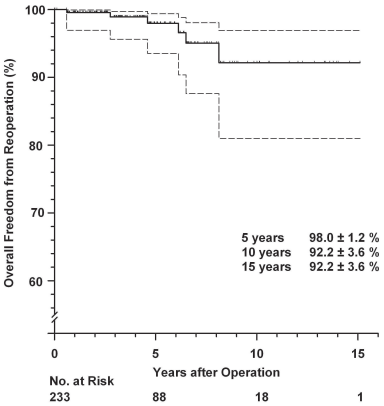


Figure: *Freedom from reoperation on the aortic root after valve-sparing aortic root replacement. Dashed lines are 95% confidence intervals.*

CONCLUSIONS: The T. David V-SARR procedure is associated with excellent 10-year clinical and valve functional outcome in patients with TAV, and is comparable for those with BAV or associated CTD. The incidence of more than 2+ AR late postoperatively is very low. The question remaining now is what will the overall freedom from valve-related mortality and morbidity be at 15 and 20 years?

10:05 a.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

10:40 a.m. **PLENARY SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center
(8 minute presentations, 12 minute discussion)

Moderators: Craig R. Smith
Thoralf M. Sundt, III

32. Should All Moderate Coronary Lesions Be Grafted During Primary Coronary Bypass Surgery? An Analysis of Disease Progression During Angiographic Surveillance in a Trial of Conduits

Philip A. Hayward[2], Trong Thien Nguyen[1], Ying Y. Zhu[1], David L. Hare[3], Brian F. Buxton[2]
1. Melbourne Medical School, University of Melbourne, Parkville, VIC, Australia. 2. Cardiac Surgery, Austin Hospital, Heidelberg, VIC, Australia. 3. Cardiology, Austin Hospital, Heidelberg, VIC, Australia.

Invited Discussant: Joseph F. Sabik

OBJECTIVE(S): The decision to graft a moderately stenosed coronary vessel remains contentious, particularly in a patient undergoing valve surgery or already requiring multiple grafts for more severe disease. We investigated whether grafting such vessels is truly warranted based on angiographic outcome.

METHODS: Among 619 patients who underwent CABG in an ongoing randomised radial artery trial, 405 have at least one follow-up angiogram at a mean of 6.2 ± 0.1 years (range 0–13.7) after surgery. Percent diameter stenosis in each major native vessel was reported by 3 cardiac specialists and classified into moderate (40–70%) or severe (>70%) stenosis. Both progression of native vessel disease and graft patency were determined by comparison of pre-operative and follow-up angiography.

RESULTS: A total of 3816 native vessels (receiving 1242 grafts) were analysed, amongst which 414 moderate lesions were identified, 286 of which were grafted. Moderate lesions were more likely than severe lesions to remain unchanged on follow-up angiography (36% vs. 26% at 7 years, $p < 0.001$). Overall, grafted vessels had greater risk of disease progression than ungrafted ones (41% vs. 30% at 8 years, $p < 0.001$), but this was

not true for moderate lesions (42% vs. 39% at 8 years, p = 0.224). Table 1 shows the likelihood of progression, regression or stability of a moderate coronary lesion in each coronary territory at mean follow up.

Table 1

	Left Anterior Descending Territory Vessels		Left Circumflex Artery Territory Vessels		Right Coronary Artery Territory Vessels	
	Grafted (n = 89)	**Non-Grafted (n = 22)**	**Grafted (n = 97)**	**Non-Grafted (n = 44)**	**Grafted (n = 75)**	**Non-Grafted (n = 62)**
Prevalence of disease	44 (49.4%)	9 (40.9%)	33 (34.0%)	19 (43.2%)	44 (58.7%)	19 (30.6%)
Progression	6 (6.7%)	3 (13.6%)	10 (10.3%)	4 (9.1%)	2 (2.7%)	3 (4.8%)
Regression	39 (43.8%)	10 (45.5%)	54 (55.7%)	21 (47.7%)	29 (38.7%)	40 (64.5%)
No change						
Graft patency rate (at 7 years)	91.2 ± 4.3		86.7 ± 5.7		79.2 ± 9.3†	
Arterial grafts	83.3 ± 15.2		83.7 ± 6.2		93.9 ± 3.4	
Vein grafts						

†graft patency rate at 4 years

CONCLUSIONS: Moderately stenosed vessels appear more stable than more severely diseased counterparts, and may be less likely to require future intervention. In the left coronary system, the likelihood of progression approaches 50% and patency of both arterial and vein grafts, even in these moderate lesions, is excellent, suggesting that the balance of clinical judgement probably lies in favour of grafting. In the right coronary system however, a lesion is more likely to remain moderate if left ungrafted, and with a likelihood of progression only 30% and the patency of an arterial graft inferior at this site, it may be reasonable to leave these lesions ungrafted, given that only a minority of patients will go on to require intervention.

33. Hyperthermic Intraoperative Pleural Cisplatin Chemotherapy (HIOC) Extends Time to Recurrence Among Patients with Epithelial Mesothelioma Categorized as Low Risk and Undergoing Macroscopic Complete Resection

David J. Sugarbaker[+1], Ritu R. Gill[3], Beow Y. Yeap[2], Andrea Wolf[1], Brian Burt[1], Syed O. Ali[1], Brian Goodman[1], Marcelo Dasilva[1], Raphael Bueno[+1], William Richards[1]

1. Thoracic Surgery, Brigham and Women's Hospital, Boston, MA, United States. 2. Biostatistics, Massachusetts General Hospital, Boston, MA, United States. 3. Radiology, Brigham and Women's Hospital, Boston, MA, United States.

Invited Discussant: James D. Luketich

OBJECTIVE(S): We developed and validated a pre-operative risk assessment algorithm based on radiographic tumor volume, hemoglobin level and gender for patients diagnosed with epithelial malignant pleural mesothelioma (MPM) based on pleural biopsy (J Thorac Oncol 2011; 6(6) supplement; S486-7). We used this algorithm to retrospectively identify a cohort of patients with presumed local disease (Risk1) who underwent macroscopic complete resection and explored the effect of hyperthermic intraoperative pleural cisplatin chemotherapy (HIOC) that had been applied to a subset of cohort patients.

METHODS: Patients treated with cytoreductive surgery between 2001–2008 with or without HIOC (cisplatin 175–225 mg/m2; 42C; 1 hr; J Clin Oncol 2006, 24:1561–7; JTCVS 2009, 138:405–11) who had epithelial MPM on biopsy and were categorized Risk1 (i.e. had available CT scan with computed tumor volume <500 cc and were either male with hemoglobin ≥13 g/dL or female) were identified. Time to recurrence and overall survival were calculated from surgery. Descriptive, Kaplan-Meier with logrank comparison and Cox proportional hazards statistical analyses were performed.

RESULTS: Ninety-nine qualifying patients were identified of which 68 were treated with HIOC and 31 were not (Table). Most patients also received neoadjuvant or adjuvant chemotherapy and/or adjuvant radiation therapy prior to recurrence. Gender, age, type of surgery (EPP = extrapleural pneumonectomy; PDC = pleurectomy/decortication) and length of stay (LOS) were similar in both subgroups. Median time to recurrence was 27.2

months among patients receiving HIOC versus 15.8 months among others (p = 0.027). A similar but non-significant trend was observed for overall survival: HIOC 35.3 months; others 22.8 months (p = 0.085). Multivariate adjustment for chemo- and/or radiation therapy yielded hazard ratios for HIOC of 0.59 (p = .060) for recurrence-free survival and 0.67 (p = 0.1) for overall survival.

	N	Sex M/F	Median Age	Chemo and/or Radiation	Surgery Type EPP/ PDC	Mortality	LOS Median (Range)
All	99	66/33	62	87 (87%)	68/31	3 (3%)	11 (6–84)
HIOC	68	45/23	61	59 (87%)	48/20	3 (4.4%)	11 (6–84)
no HIOC	31	21/10	66	28 (90%)	20/11	0	12 (6–62)

CONCLUSIONS: Cisplatin HIOC extends the recurrence-free interval following surgery for patients with low risk epithelial MPM, does not appear to diminish the effectiveness of their adjuvant management, and can be accomplished with acceptable mortality.

34. Nadir Hematocrit and Morbidity After Cardiac Surgery: A Focus on End-Organ Function and Mortality

Gabriel Loor[1], Eugene H. Blackstone[+1,2], Liang Li[2], Joseph F. Sabik[+1], Jeevanantham Rajeswaran[2], Colleen G. Koch[3]

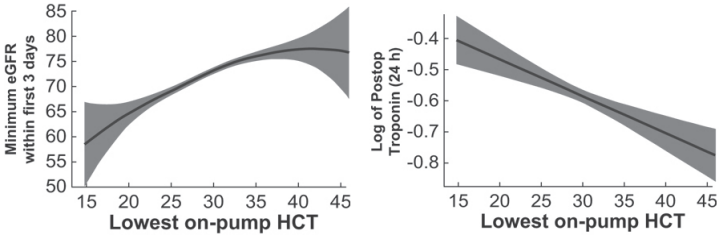
1. Thoracic and Cardiovascular Surgery, Cleveland Clinic, Cleveland, OH, United States. 2. Department of Quantitative Health Sciences, Cleveland Clinic, Cleveland, OH, United States. 3. Department of Cardiothoracic Anesthesia, Cleveland Clinic, Cleveland, OH, United States.

Invited Discussant: Paul Kurlansky

OBJECTIVE(S): To discern effects of lowest (nadir) hematocrit (HCT) during cardiopulmonary bypass (CPB) on end-organ function and mortality in patients who did not receive perioperative blood transfusion, and to identify predictors of nadir hematocrit.

METHODS: From 11/1/2004 to 10/1/2009, 7,957 patients underwent cardiac surgery procedures requiring CPB and were not transfused. The relationship between nadir HCT and outcomes was studied using generalized propensity-score analysis. Factors associated with nadir HCT were identified by linear regression.

RESULTS: Median nadir HCT was 30% (25^{th}–75^{th} percentiles, 27%–33%). The lower the nadir HCT, the higher was maximum intraoperative lactic acid (intra-subject correlation, –0.44). Following risk adjustment, nadir HCT was associated with worse renal function (lower eGFR, $P = 0.01$), more myocardial injury (higher troponin, ($P = 0.005$), longer postoperative ventilator support ($P < 0.0001$), longer length of stay ($P < 0.0001$), and higher late mortality ($P = 0.04$). Female gender, older age, lower body mass index (BMI), higher New York Heart Association (NYHA) class, and combined valve and coronary artery bypass were associated with lower nadir HCT, but the strongest correlate was preoperative HCT ($r = 0.74$).



CONCLUSIONS: There must be a trade-off between adverse effects of low HCT during cardiac surgery, herein demonstrated, and those of transfusion. However, the strong association of nadir HCT with preoperative HCT suggests a need for investigation and optimization of red cell mass before elective cardiac surgery.

11:40 a.m. **HONORED SPEAKER LECTURE**

"Medicine in Media"
Mehmet C. Oz
Columbia University

Introduced By: Craig R. Smith

12:30 p.m. **ADJOURN FOR LUNCH – VISIT EXHIBITS**
Exhibit Hall, Moscone West Convention Center

2:00 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

Ballroom Level 3, Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: Harold L. Lazar
David C. McGiffin

35. Chordal Replacement with PTFE Sutures for Mitral Valve Repair: A 25-Year Experience

Tirone E. David+, Susan Armstrong, Joan Ivanov
Toronto General Hospital, Toronto, ON, Canada.

Invited Discussant: David H. Adams

OBJECTIVE(S): Gore-Tex sutures have been clinically used for replacement of chordae tendineae for more than 25 years in our institution. This study examines the results of mitral valve (MV) repair for myxomatous mitral regurgitation (MR) with chordal replacement with Gore-Tex sutures.

METHODS: From 1986 to 2004, 606 patients underwent MV repair with chordal replacement with Gore-Tex sutures. There were 446 men and 160 women whose mean age was 57.2 ± 13.4 years. Concomitant aortic valve/root repair or replacement was performed in 64 patients, tricuspid repair in 22, maze procedure in 48, and CABG in 88. Isolated prolapse of the anterior leaflet was present in 106 patients, posterior in 177 and bileaflet in 323. Two to 38 new chords (mean of 13 ± 9) were implanted. Patients were followed prospectively at bi-annual intervals from 0 to 23 years, mean of 10.1 years. The follow-up was 99.4% complete and 96% had echocardiography.

RESULTS: There were 5 operative and 107 late deaths (23 cardiac and 30 valve-related). Independent predictors of mortality were age, hypertension, ejection fraction <40% and NYHA functional classes 3 and 4. Thromboembolic events occurred in 61 patients and endocarditis in 5. Reoperation on the mitral valve was performed in 35 patients. Echocardiography disclosed moderate MR in 60 patients and severe MR in 22 during follow-up. Independent predictors of recurrent moderate or

severe MR were female gender, ejection fraction <40% and concomitant aortic valve/root surgery. Table 1 shows Kaplan-Meier estimates of long-term survival, freedom from reoperation, and freedom from moderate or severe MR. At the latest follow-up, 91% of the patients were in NYHA classes 1 and 2.

Kaplan-Meier Estimates of Late Survival and Freedom from Reoperation on the MV and Recurrent Moderate and Severe MR (Shown as mean ± S.E. Percent)

Time interval/event	1 year	5 year	10 year	15 year	20 year
Survival	98.1 ± 0.5	98.1 ± 0.5	85.7 ± 1.5	72.5 ± 2.7	62.4 ± 5.3
Freedomg from reoperation	98.6 ± 0.4	97.3 ± 0.6	94.7 ± 0.9	93.0 ± 1.4	87.6 ± 3.4
Freedom from MR ≥3+	98.4 ± 0.5	96.5 ± 0.7	87.9 ± 1.6	76.0 ± 2.9	65.0 ± 4.7

CONCLUSIONS: Chordal replacement with Gore-Tex sutures expands the use of MV repair to patients with prolapse of multiple segments ofthe leaflets and MV function remains satisfactory in most patients during the first two decades of follow-up but the degenerative process is progressive and approximately one-third of patients develop recurrent MR at 20 years.

36. Results of Treatment of Severe Mitral Regurgitation with the MitraClip Device in High Surgical Risk Patients

Michael Argenziano[+1], Michael J. Mack[+2], Paul Grayburn[3], Alfredo Trento[+4], W. Randolph Chitwood[+5], Ted Feldman[6], Donald D. Glower[+7]

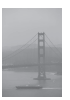
1. Adult Cardiac and Thoracic Surgery, New York Presbyterian Hospital/Columbia University, New York, NY, United States. 2. Surgery, Baylor Health Care System/The Heart Hospital, Plano, TX, United States. 3. Cardiology and Echocardiography, University Medical Center, Dallas, TX, United States. 4. Cardiothoracic Surgery, Cedars-Sinai Medical Center, Los Angeles, CA, United States. 5. Cardiothoracic and Vascular Surgery, East Carolina Heart Institute, Greenville, NC, United States. 6. Cardiac Catheterization, Evanston Hospital, Evanston, IL, United States. 7. Surgery, Duke University Medical Center, Durham, NC, United States.

Invited Discussant: Steven F. Bolling

OBJECTIVE(S): Patients with severe mitral regurgitation (MR) at high risk of surgical mortality constitute a population of patients in whom percutaneous treatment of MR may be an attractive therapeutic option. Clinical outcomes in a limited cohort of EVEREST II High Surgical Risk patients following MitraClip therapy have been previously reported. The objective of this analysis is to describe the results observed in a larger cohort of high surgical risk patients 1 year following treatment with the MitraClip device.

METHODS: EVEREST II High Surgical Risk patients had severe MR (3+ or 4+) and were deemed high surgical risk as predicted by the STS risk algorithm or by surgeon estimate of risk based on pre-specified surgical risk factors. One year clinical outcomes including MR reduction, change in LV volumes and function, NYHA Class, quality of life (QOL) measures, and hospitalizations for CHF were analyzed.

RESULTS: 211 high surgical risk patients underwent a MitraClip procedure with a 95% successful implant rate. The majority of patients had functional MR (71%), prior cardiac surgery (58%) and atrial fibrillation (64%). The mean STS mortality risk was 12.2 ± 7.9%. Mortality at 30 days and 1 year was 5.2% and 24.1%, respectively. 82% of patients achieved MR



grade of 2+ or less at 1 year, and 36% of patients maintained at least a 2 grade reduction of MR at 1 year. Significant improvements in LV volumes, NYHA Class, CHF hospitalizations and QOL (Table) were observed at 1 year.

					SF-36 Quality of Life	
	LVEDV (ml) (n=131)	LVESV (ml) (n=131)	NYHA Class I/II (%) (n=143)	CHF Hospitalizations (Rate per patient-year)	PCS Score (n=118)	MCS Score (n=118)
Baseline	161 ± 52	84 ± 43	15.4	0.79 ǂ	33 ± 10	44 ± 14
1 year	140 ± 48	75 ± 41	80.4	0.34	38 ± 11	50 ± 13
Change from baseline	-21 ± 31	-9 ± 24	65.0	0.45	5 ± 11	6 ± 13
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

ǂ based on 12 months pre-procedure
PCS = Physical Component Summary, MCS = Mental Component Summary

CONCLUSIONS: EVEREST II High Surgical Risk patients are a cohort with multiple co-morbidities who are at high risk of surgical mortality and frequently not offered surgery. Treatment with the MitraClip device resulted in significant improvements in MR severity, left ventricular remodeling, CHF hospitalizations, and clinical outcomes at one year. Percutaneous reduction of MR with the MitraClip device offers an important therapeutic option for select patients with significant MR who are at high risk of surgical mortality.

37. Very Long-Term Results (Up to 17 Years) with the Double Orifice Mitral Valve Repair Associated to Ring Annuloplasty for Degenerative Mitral Regurgitation

Michele De Bonis[1], Elisabetta Lapenna[1], Roberto Lorusso[2], Nicola Buzzatti[1], Sandro Gelsomino[3], Maurizio Taramasso[1], Enrico Vizzardi[4], Ottavio R. Alfieri[+1]

1. Department of Cardiac Surgery, San Raffaele University Hospital, Milan, Italy. 2. Cardiac Surgery Unit, Community Hospital, Brescia, Italy. 3. Cardiac Surgery Unit, Careggi Hospital, Florence, Italy. 4. Cardiology Unit, Community Hospital, Brescia, Italy.

Invited Discussant: Donald D. Glower

OBJECTIVE(S): The very long-term results of the double orifice mitral valve repair are unknown. The aim of this study was to assess the clinical and echocardiographic outcomes of this technique in patients with degenerative mitral regurgitation up to 17 years after surgery.

METHODS: From 1993 to 2000, out of 710 patients submitted to mitral repair for degenerative mitral regurgitation, 174 (24.5%) were treated with the double orifice (Alfieri) technique associated to ring annuloplasty. Patients who did not receive a ring annuloplasty were excluded. Mean age of the study population was 52 ± 12.8 years, NYHA class I or II was present in 71% of the cases, atrial fibrillation in 17.2% and preoperative LVEF was 59.5 ± 7.5%. Mitral regurgitation was due to anterior leaflet prolapse in 36 patients (20.6%), bileaflet prolapse in 128 (73.5%) and posterior leaflet prolapse in 10 (5.7%).

RESULTS: There were no hospital deaths. At hospital discharge, mitral regurgitation was absent or mild in 169 (97.1%) patients and moderate (2+/4+) in 5 (2.8%). Mitral stenosis requiring reoperation was detected in one patient (0.6%). Clinical and echocardiographic follow-up was 97.1% complete. Mean follow-up length was 11 ± 3.1 years (median 11.4 years). The longest duration of follow-up was 17.6 years. Actuarial survival at 14 years was 86.2 ± 3.6% and freedom from cardiac death 95.7 ± 1.5%. NYHA functional class I or II was documented in 95% of the cases. At the last echocardiographic exam, mitral regurgitation was absent or mild in 125 patients (73.9%), moderate in 21 (12.4%), moderate-to-severe in 6 (3.5%) and severe in 17 (10%). Recurrence of MR ≥ 3+ occurred at a median of

8.2 years after the initial repair. Freedom from re-operation at 14 years was 89.6 ± 2.5%. Freedom from the combined end point of reoperation and MR ≥3+ at 14 years was 85.6 ± 2.9% (87.2 ± 3.4 for bileaflet prolapse and 79 ± 7% for anterior leaflet prolapse, p = 0.2). The only predictor of the combined end-point of reoperation and MR ≥3+ was the presence of residual MR greater than mild at hospital discharge (HR 4.7, 95% CI 1.2–17.9, p = 0.02).

CONCLUSIONS: The double orifice repair associated to ring annuloplasty provides very satisfactory long-term results in patients with degenerative mitral regurgitation, even in the difficult setting of Barlow's disease with bileaflet prolapse.

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:45 p.m. **ADULT CARDIAC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**
Ballroom Level 3, Moscone West Convention Center

Moderators: Harold L. Lazar
David C. McGiffin

38. Blood Product Conservation Is Associated with Improved Outcomes and Reduced Costs Following Cardiac Surgery

Damien J. LaPar[1,5], Ivan K. Crosby[+1,5], Bruce D. Spiess[+4,5], Jeffrey B. Rich[+3,5], Vigneshwar Kasirajan[4,5], Edwin Fonner[5], Alan M. Speir[+2,5]

1. Surgery, University of Virginia, Charlottesville, VA, United States. 2. Inova Heart and Vascular Institute, Fairfax, VA, United States. 3. Surgery, Sentara Heart Hospital, Norfolk, VA, United States. 4. Surgery, Virginia Commonwealth University Pauley Heart Center, Richmond, VA, United States. 5. Virginia Cardiac Surgery Quality Initiative, Charlottesville, VA, United States.

Invited Discussant: Edward D. Verrier

OBJECTIVE(S): Efforts to reduce blood product utilization have the potential to avoid transfusion related complications and to reduce health care costs. The purpose of this investigation was to determine whether a multi-institutional effort to reduce blood product use through the implementation of transfusion guidelines impacts postoperative events following cardiac operations and to determine the influence of intraoperative and postoperative product transfusion on risk-adjusted outcomes.

METHODS: A total of 14,259 patients (2006–2010) undergoing non-emergent, primary, isolated coronary artery bypass grafting operations at 17 different statewide cardiac centers were stratified according to transfusion guideline era: pre-guideline (n = 7,059,age = 63.7 ± 10.6 yr) vs. post-guideline (n = 7,200, age = 63.7 ± 10.5 yr). Primary outcomes of interest were observed differences in postoperative events and mortality risk-adjusted associations as estimated by multiple regression analysis.

RESULTS: Overall intraoperative (18% [n = 1274] vs. 24% [n = 1697],p < 0.001) and postoperative (33% [n = 2363] vs. 39% [n = 2761], p < 0.001) blood product transfusion was significantly reduced in the post-guideline era. As a result, post-guideline patients demonstrated reduced morbidity with decreased pneumonia (p = 0.01), prolonged ventilation (p = 0.05), renal failure (p = 0.03), new onset hemodialysis (p = 0.004) and composite incidence of major complications (p = 0.001, Table). Operative mortality (1.0% [n = 71], vs. 1.8% [n = 135], p < 0.001) and postoperative ventilation time (22 h vs. 26 h, p < 0.001) were similarly reduced in the post-guideline era. Importantly, after mortality risk-adjustment, operations performed in the post-guideline era were associated with a 47% reduction in the odds of death (AOR = 0.57, p < 0.001), while the risk of major complications and mortality were significantly increased following intraoperative (AOR = 1.86 and 1.25, both p < 0.001) and postoperative (AOR = 4.61 and 4.50, both p < 0.001) transfusion. Intraoperative and postoperative transfusions were also associated with increased adjusted additive total costs ($4,408 and $10,479, respectively).

Outcome	Pre-Guideline Era (n = 7,059)	Post-Guideline Era (n = 7,200)	p
Intraoperative Transfusion	1,697 (24.0%)	1,274 (17.7%)	< 0.001
Postoperative Transfusion	2,761 (39.1%)	2,363 (32.8%)	< 0.001
Pneumonia	189 (2.7%)	147 (2.0%)	0.01
Prolonged Ventilation	670 (4.7%)	627 (4.4%)	0.05
Renal Failure	270 (3.8%)	225 (3.1%)	0.03
Hemodialysis	106 (1.5%)	69 (1.0%)	0.004
Major Complication (Composite)	1068 (15.1%)	950 (13.2%)	0.001
Operative Mortality	125 (1.8%)	71 (1.0%)	< 0.001

CONCLUSIONS: Implementation of a blood utilization initiative significantly improves postoperative morbidity, mortality and resource utilization. Limiting intraoperative and postoperative blood product transfusion decreases adverse postoperative events and reduces health care costs. Blood conservation efforts are bolstered by collaboration and guideline development.

39. Relevance of the Surgical Care Improvement Project on Glycemic Control in CABG Patients Receiving Continuous Insulin Infusions

Marie E. McDonnell[2], Sarah M. Alexanian[2], Ana Junquiera[2], Howard Cabral[1], Harold L. Lazar[+1]

1. Cardiothoracic Surgery, Boston Medical Center, Boston, MA, United States. 2. Endocrinology, Boston Medical Center, Boston, MA, United States.

Invited Discussant: Anthony P. Furnary

OBJECTIVE(S): The Surgical Care Improvement Project (SCIP) has benchmarked 6:00 AM blood glucose <200 mg/dl on postoperative day 1 and 2 as a quality measure of glycemic control in cardiac surgery to be used for reporting of operative outcomes and monetary reimbursement. However, the relevance of SCIP in patients receiving continuous insulin infusions is unknown. This study was therefore undertaken to:(1)determine the incidence of SCIP outliers in CABG patients receiving a continuous insulin infusion targeted to maintain a perioperative serum glucose <180 mg/dl (2)identify the profile of patients who are more likely to be SCIP outliers, and (3)determine whether SCIP outliers already on an insulin protocal have increased morbidity and mortality following CABG surgery.

METHODS: Between January, 2006; and April,2011; 833 patients underwent CABG surgery and received continuous insulin infusions to maintain serum blood glucose <180 mg/dl.Patients were divided into 2 groups: patients compliant with SCIP and those who were outliers.

RESULTS: The incidence of SCIP outliers was 6.6% (55/833).Patients more likely to be SCIP outliers had diabetes mellitus (42,76% vs 250, 33%; $p < 0.0001$), a higher HbA1c (8.7 ± 2.25SD vs 7.59 ± 1.90; $p < 0.0009$), a higher body mass index (31.1 ± 6.5 vs 29.2 ± 5.7; $p = 0.03$) and a lower ejection fraction (49 ± 14 vs 53 ± 13; $p = 0.06$). However, SCIP outliers had no increase in morbidity, mortality or hospital length of stay (see Table).

[+]AATS Member

Outcomes

	SCIP Compliant	SCIP Outlier	p Value
N	778	55	
30 day Mortality (%)	12(1.5)	1(1.8)	0.55
Permanent Stroke (%)	7(0.9)	1(1.8)	0.39
Deep Sternal Infection (%)	4(0.5)	0(0)	1.00
Myocardial Infarction(%)	11(1.3)	1(1.8)	0.52
Prolonged Ventilation >24 hours (%)	52(6.7)	5(9.0)	0.38
Multi-System Failure (%)	7(0.9)	1(1.8)	0.43
Mean Length of Stay (Days)	9.75 ± 7.83SD	11.69 ± 11.02	0.20

CONCLUSIONS: Patients undergoing CABG may still be SCIP outliers despite continuous insulin infusions targeted to maintain serum glucose <180 mg/dl; however SCIP outliers have no increase in morbidity, mortality, or length of stay. These results suggest that achieving SCIP benchmarks for glycemic control may be irrelevant in CABG patients when perioperative continuous insulin infusion protocals are implemented.

40. A Prospective Randomized Comparison of Three Contemporary Bioprosthetic Aortic Valves—Should Hemodynamic Performance Influence Device Selection?

Rakesh M. Suri[+1], Hector Michelena[2], Harold M. Burkhart[+1], Kevin Greason[1], Richard C. Daly[+1], Lyle D. Joyce[+1], Soon J. Park[+1], John M. Stulak[1], Joseph A. Dearani[+1], Thoralf M. Sundt[+3], Zhou Li[1], Hartzell V. Schaff[+1]

1. Cardiovascular Surgery, Mayo Clinic, Rochester, MN, United States.
2. Cardiology, Mayo Clinic, Rochester, MN, United States.
3. Massachusetts General Hospital, Boston, MA, United States.

Invited Discussant: Tirone E. David

OBJECTIVE(S): Latest generation biologic aortic valve prostheses were designed to improve hemodynamic performance and decrease the need for postoperative anticoagulation. It is unclear however, whether there are real and clinically important differences between these devices.

METHODS: Three hundred adults with severe aortic valve stenosis undergoing aortic valve replacement were randomized to receive the St. Jude Epic, Edwards Magna or Sorin Mitroflow bioprostheses (N = 98, 101, 101). We excluded those who had emergent operation, prior prosthetic heart valve, concomitant non-aortic valve replacement, active endocarditis or severe aortic insufficiency. Aortic annulus size was measured both by echocardiogram (echo) and directly at operation with a universal sizer. Early hemodynamic performance of aortic valve prostheses was examined by echo.

RESULTS: The mean age was 76 ± 8 yr and there were 205 (68%) men. The mean aortic valve gradient was 49.1 ± 14.9 mmHg and the mean aortic valve area was 0.9 ± 0.3 cm^2. Prior cardiac surgery had been performed in 14 (4.7%). There were no significant differences in baseline characteristics between implant groups. The correlation of echo annulus measurement with both universal and implant size was 0.7 ($P < 0.001$). The median universal annular size was 23 mm for all groups ($P = 0.26$) as was the median commercial valve size implanted. Mean cross clamp time was 64 ± 31 min and bypass time was 84 ± 54 min. Concomitant CABG was performed in 108 (36%). Early mortality was 2.3%. There were no differences in early adverse events between groups. Postoperative echo demonstrated significant differences between the Epic, Magna and Mitroflow respectively,

in mean gradient (16.5 ± 6.5, 14.1 ± 5.5, 16.0 ± 5.9 mmHg, P = 0.011), aortic valve area (1.9 ± 0.5, 2.0 ± 0.5, 1.9 ± 0.5 cm2, P = 0.028) and indexed aortic valve area (0.95 ± 0.26, 1.04 ± 0.25, 0.98 ± 0.26 cm^2/m^2, P = 0.015). These trends persisted when data were stratified by a)echo annulus diameter, b) universal annulus size and c)implant size (Table).

	Aortic Valve Area (cm^2)				Mean Gradient (mmHg)			
	Epic	Magna	Mitroflow	*P*	Epic	Magna	Mitroflow	*P*
Echo Annulus (mm)								
19-21	1.59	1.69	1.83	0.14	18.19	15.57	15.19	0.28
22-23	1.87	2.04	1.80	0.07	16.51	14.87	16.30	0.4
>23	**2.02**	**2.40**	**2.12**	**0.02**	**15.47**	**11.68**	**16.46**	**0.001**
Universal Sizer (mm)								
19-21	1.56	1.62	1.67	0.63	16.45	17.00	16.38	0.94
23	1.68	1.90	1.81	0.13	16.93	14.00	15.63	0.12
>23	2.11	2.35	2.16	0.08	**16.21**	**12.66**	**16.03**	**0.007**
Implant Size								
19-21	1.55	1.60	1.58	0.85	17.04	16.54	16.40	0.92
23	**1.77**	**1.99**	**1.84**	**0.05**	16.48	14.26	16.93	0.14
>23	**2.17**	**2.53**	**2.26**	**0.01**	**16.08**	**11.41**	**14.81**	**0.003**

CONCLUSIONS: This prospective randomized comparison reveals that there are small but consistent hemodynamic differences amongst current generation bioprosthetic aortic valves. Patients with impaired ventricular function and larger annular size may benefit from the Magna valve in order to optimize prosthetic valve area. Longitudinal follow up will be essential to determine late clinical implications.

5:00 p.m. **EXECUTIVE SESSION**
(*AATS Members Only*)
Ballroom Level 3, Moscone West Convention Center

2:00 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: V. Mohan Reddy
Christopher A. Caldarone

41. Poor Aortic Distensibility Following Norwood Procedure Is Associated with Reduced Ventricular Function

Alessandro Giardini, Giovanni Biglino, Silvia Schievano, Jennifer A. Steeden, Catriona Baker, Martin Kostolny, Victor T. Tsang+, Tain-Yen Hsia, Andrew Taylor
Cardiac Unit, Great Ormond Street Hospital for Children, NHS Trust, London, United Kingdom.

Invited Discussant: William DeCampli

OBJECTIVE(S): Palliation of hypoplastic left heart syndrome (HLHS) requires extensive aortic reconstruction. However, the interaction between the mechanical properties of the reconstructed aorta and the right ventricle is poorly understood. Accordingly, we assessed the elastic properties of the aorta in single ventricle patients to test the hypothesis that altered aortic elastic properties in HLHS are associated with adverse ventricular systolic performance.

METHODS: 20 patients with single ventricle physiology were studied before Fontan operation. 10 had HLHS after Norwood procedure with aortic arch reconstruction using a homograft patch, and 10 patients had undergone first stage palliation without aortic arch surgery (control group). HLHS patients were younger (3.4 ± 1.0 vs. 4.7 ± 1.5 years) than controls, but there was no difference in body surface area. No HLHS patient had residual aortic arch obstruction.

Aortic distensibility was calculated in the mid ascending aorta (AA) by analyzing the wave speed of systolic flow propagation from gradient-echo cine MRI (Figure). This technique does not require blood pressure measurement for estimation of aortic distensibility. In addition, ventricular ejection fraction was obtained from MRI measurements. Values are reported as mean ± standard deviation.

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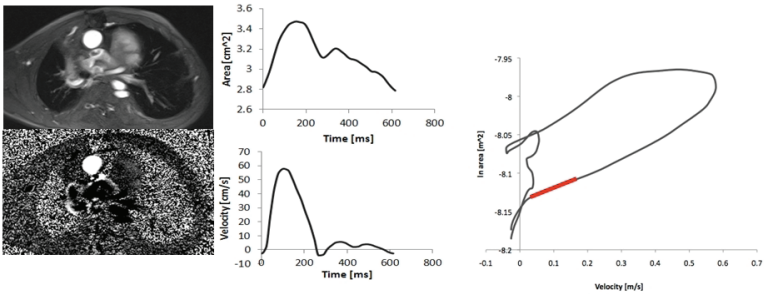


Figure: *Gradient-echo cine MRI of a HLHS patient prior to Fontan completion. Data acquisition plane is in the AA, above the DKS. Area and velocity signals derived from magnitude and phase images are combined to calculate wave speed and estimate distensibility.*

RESULTS: AA systolic wave speed was significantly higher in the HLHS patients (8.4 ± 2.4 vs. 4.5 ± 0.9 m/s, $p < 0.001$), which corresponded to 3-fold lower AA distensibility (2.3 ± 1.5 vs. 6.81 ± 2.93 10–3/mmHg, $p < 0.001$). Both cardiac output 3.3 ± 0.6 vs. 4.8 ± 2.0 L/min, $p < 0.05$) and ejection fraction (52.2 ± 6.3 vs. 60.1 ± 4.7 %, $p < 0.01$) were significantly lower in HLHS patients.

CONCLUSIONS: The application of novel wave speed analysis from advanced MRI demonstrates that the reconstructed aorta in HLHS exhibits substantial loss of wall elasticity, which is associated with worse ventricular systolic function. This unique aspect of ventricular-arterial interaction in HLHS patients may promote adverse modelling of the systemic right ventricle in this condition, potentially affecting long-term performance even in patients with optimal aortic arch reconstruction.

42. Ductal-Associated Pulmonary Artery Stenosis with Neonatal Blalock-Taussig Shunt: Incidence and Management

Kirk R. Kanter[+1,2], Brian E. Kogon[+1,2], Paul M. Kirshbom[+1,2]

1. Pediatric Cardiac Surgery, Emory University School of Medicine, Atlanta, GA, United States. 2. Pediatric Cardiac Surgery, Children's Healthcare of Atlanta, Atlanta, GA, United States.

Invited Discussant: Richard G. Ohye

OBJECTIVE(S): Infants who require a modified Blalock-Taussig shunt (MBTS) can have stenosis at the ductal insertion site on the pulmonary artery (PA) which requires surgical intervention. We examined the incidence and management of this at our institution.

METHODS: From 2002–11, 310 infants aged <90 d (0–87 days, mean 17.4 ± 21.2; weight 1.4–6.2 kg, mean 3.1 ± 0.7) had a primary MBTS; 160 (52%) had univentricular (UniV) and 150 (48%) had biventricular (BiV) anatomy. 4 diagnoses each with >10% of the total number of shunts accounted for 59% of the shunts: pulmonary atresia with intact ventricular septum (PA/IVS; n = 65, 21%), pulmonary atresia with ventricular septal defect (PA/ VSD; n = 47, 15%), tricuspid atresia (n = 38, 12%) and tetralogy of Fallot (n = 33, 11%). PA stenosis at the ductal insertion site was identified by preoperative echocardiogram or catheterization or at direct intraoperative inspection and was repaired at the time of the MBTS.

RESULTS: Although pts with a PA plasty were younger, hospital mortality and incidence of UniV vs. BiV anatomy were not different (Table). A diagnosis of PA/VSD or double-inlet left ventricle (DILV) was associated with an increased incidence of PA stenosis. 71 (23%) had patch enlargement of the left (n = 65) or right PA (n = 6 pts with situs inversus). 61 (86%) had PA plasty performed without cardiopulmonary bypass (CPB). 17 (5.5%) had late recognition of PA stenosis repaired as an isolated procedure (n = 6, 0–49 days after MBTS), during a bidirectional Glenn (n = 6, 135–182 days after MBTS), or during BiV repair (n = 5, 155–420 days after MBTS). 21 of 88 PA plasty pts (24%) had recurrent PA stenosis including 5 of 6 with situs inversus and right PA plasty.

Results

		LPA or RPA Stenosis			
	No PA Stenosis (n = 222)	**Primary PA Plasty (n = 71)**	**Delayed PA Plasty (n = 17)****	**All PA Plasty (n = 88)**	**P–Value***
Age at MBTS (days)	19.8 ± 22.7	12.1 ± 16.5	7.6 ± 6.1	11.3 ± 15.1	0.0012
Weight at MBTS (kg)	3.1 ± 0.78	3.0 ± 0..55	3.0 ± 0.49	3.1 ± 0.53	0.25
Hospital Mortality (n, %)	16 (7.2%)	2 (2.8%)	1 (5.9%)	3 (3.4%)	0.30
Univentricular Anatomy (n, %)	118 (53%)	34 (48%)	8 (47%)	42 (48%)	0.45
Biventricular Anatomy (n, %)	104 (47%)	37 (52%)	9 (53%)	46 (52%)	0.45
Diagnosis of PA/VSD (n, %)	17 (36%)	23 (49%)	7 (15%)	30 (64%)	< 0.001
Diagnosis of DILV (n, %)	4 (36%)	6 (55%)	1 (9%)	7 (64%)	0.0142
Diagnosis of Heterotaxy (n, %)	9 (53%)	7 (41%)	1 (6%)	8 (47%)	0.097

PA = pulmonary artery; LPA = left pulmonary artery; RPA = right pulmonary artery; MBTS = modified Blalock-Taussig shunt; PA/VSD = pulmonary atresia with ventricular septal defect; DILV = double-inlet left ventricle *Comparing patients with no PA plasty vs. all patients with PA plasty (early and late) **Values at time of original MBTS

CONCLUSIONS: PA stenosis at the ductal insertion site is frequent in infants needing a MBTS, especially with PA/VSD or DILV. It usually can be managed successfully without CPB during the initial MBTS. Operative mortality is not different from patients with MBTS alone. Delayed recognition and late recurrence after PA plasty are not infrequent; ongoing vigilance is necessary.

43. Arrhythmia Surgery for Atrial Fibrillation Associated with Atrial Septal Defect: Right-Sided Maze Versus Biatrial Maze

Tae-Jin Yun, Yumi Im, Joon Bum Kim
Pediatric Cardiac Surgery, Asan Medical Center, Seoul, Korea, Republic of.

Invited Discussant: Christian Pizarro

OBJECTIVE(S): While it has been inferred that biatrial maze procedure (BA) for atrial fibrillation (Af) in left-heart lesions may lead to better outcomes compared to limited left atrial maze procedure, it is still controversial whether BA is superior to right-sided maze procedure (RA) in right-heart lesions.

METHODS: A retrospective review of 62 adults with Af and ASD who underwent surgical closure of ASD and various maze procedures between June 1998 and February 2011 was performed. Median age at operation was 59 years (34–79 yeas). Manifestation of Af was paroxysmal in 8 and persistent in 54. Three types of maze procedures were performed: RA in 23 (group 1), RA plus pulmonary vein isolation in 6 (group 2), and BA in 33 (group 3). Cox proportional hazard model was used to identify risk factors for decreased time to the first episode of Af recurrence.

RESULTS: During the median follow-up of 54 months (3–149 months), there was no early death and one late non-cardiac death. On Cox survival model, group 1 showed significantly decreased time to Af recurrence in comparison to group 3 (HR: 3.104, 95% CI 1.09–8.85, P = 0.0341). Maintenance of normal sinus rhythm without any episode of Af recurrence at postoperative 2 and 5 years were 57% and 45% in group 1, 67% and 50% in group 2, and 82% and 69% in group 3, respectively.

CONCLUSIONS: Left-sided ablation in addition to right-sided maze procedure improves electophysiologic outcome in patients with ASD.

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:45 p.m. **CONGENITAL HEART DISEASE SIMULTANEOUS SCIENTIFIC SESSION**

2001, 2003, 2005 Moscone West Convention Center

Moderators: V. Mohan Reddy
Christopher A. Caldarone

44. Surgical Technical Performance Scores Are Predictors for Late Mortality and Unplanned Reinterventions in Infants After Cardiac Surgery

Meena Nathan[1], John Karamichalis[1], Hua Liu[1], Sitaram Emani[1], Christopher Baird[1], Frank A. Pigula[+1], Steven Colan[1], Ravi Thiagarajan[1], Emile A. Bacha[+2], Pedro J. del Nido[+1]

1. Department of Cardiovascular Surgery and Department of Cardiology, Children's Hospital, Boston, Boston, MA, United States.
2. Division of Congenital and Pediatric Heart Surgery, Morgan Stanley Children's Hospital, New York, NY, United States.

Invited Discussant: David M. Overman

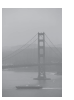
OBJECTIVE(S): We have previously shown that Surgical Technical Performance Scores (TPS) are an important predictor for early postoperative morbidity across a wide spectrum of procedures, and that intraoperative recognition and intervention on residual defects, resulted in improved outcomes. We hypothesized that these scores would also be important predictors of midterm outcomes.

METHODS: Neonates and infants <6 months of age were prospectively followed from index surgery for a minimum of one year. TPS were calculated based on previously published criteria, including intra-operative course, pre-discharge echocardiograms or catheterizations and clinical data, and graded as optimal, adequate or inadequate. RACHS-I category was used to determine case complexity. Our primary outcome was mortality, and our secondary outcome was need for unplanned reinterventions. Outcomes were analyzed using non parametric methods and a logistic regression model.

RESULTS: 166 patients were included in our study with 7 early deaths (in hospital/<30 days post discharge). The remaining 159 [RACHS 4–6: 76, (48%), Neonates: 78 (49%)] were followed out to a minimum of one year

following surgery. There were 13 late deaths and 55 late re-interventions. By univariate analysis, TPS were associated with mortality ($p < 0.0001$) and reintervention ($p = 0.034$). On logistic regression, inadequate TPS was associated with late mortality ($p = 0.017$), while RACHS-1 category ($p < 0.0001$) and age ($p = 0.008$) at index surgery were associated with need for late unplanned re-intervention.

CONCLUSIONS: Technical performance affects midterm survival following infant heart surgery. Inadequate TPS can be used to prospectively identify patients at risk for ongoing demise and need for reinterventions. An aggressive approach to diagnosing and treating residual lesions at initial operation is warranted.



45. Rapid Two-Stage Norwood I for High-Risk Hypoplastic Left Heart Syndrome

Marcello Gomide[1], Barbara Furci[2], Branko Mimic[1], Tain-Yen Hsia[1], Kate L. Brown[1], Martin Kostolny[1,2], Marc R. de Leval[+1,2], Victor T. Tsang[+1,2]

1. Cardiothoracic Surgery, Great Ormond Street Hospital, London, United Kingdom. 2. Cardiothoracic Surgery, Harley Street Clinic, London, United Kingdom.

Invited Discussant: Glen Van Arsdell

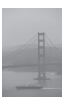
OBJECTIVE(S): Preoperative comorbidities (PCM) are known risk factors for stage 1 Norwood (NW1). We tested the hypothesis that a short term bilateral pulmonary arterial banding (bPAB) prior to NW1 could improve the prognosis of those patients.

METHODS: Because of the referral pattern of our practice, we treated a subset of HLHS, often coming from abroad and older than the usual population of HLHS, frequently with significant PCM. Between January 2007 and October 2011, we admitted 17 higher risk HLHS patients, defined as having at least 3 of the following PCM: prolonged (>2 weeks) mechanical ventilation (100%), sepsis (64,7%), necrotizing enterocolitis (47%), renal failure (47%), hepatic failure (29,4%), coagulopathy (35,2%), pulmonary edema (35,2%), large inotropic requirements (29,4%), anasarca (70%) and cardiac arrest (11,7%). Among those patients, 3 (17,6%) had 3 PCM, 5 (29,4%) had 4 PCM and 9 (53%) had 5 or more PCM. In addition, three patients (17,6%) were premature, 4 (23,5%) weighted <2.5 kg and 2 (11,7%) were syndromic.

Along with the conventional treatments of the PCM, they underwent a bPAB at the age of 13 to 43 days (median 25 days) for a period of 3 to 68 days (median 8 days) prior to the NW1. BPAB was done with silastic slings and calibrated with ligaclips to a luminal diameter of 3 mm. The patency of the ductus arteriosus was maintained with IV infusion of prostaglandin. NW1 was done in a standard fashion with a right modified B-T shunt. Those patients were retrospectively reviewed and the early mortality and 1-year survival were compared with the population submitted to NW1 with 2 or less PCM in the same period.

RESULTS: Twelve patients (70,6%) survived the bPAB and proceeded to NW1. Among the 5 who died prior to NW1, 4 (80%) had 5 or more PCM. There was 1 early death after the NW1 (8,3%). The 1-year survival rate was 66,6%. During the same period, we performed 130 NW1 in patients with no or less than 2 PCM, with an early mortality of 10% and 1-year survival rate of 77%.

CONCLUSIONS: Mechanical optimization of the pulmonary and systemic blood flows is helpful to reduce the PCM and to move those patients to a lower risk category. Those who survived the bPAB and underwent NW1 had early mortality and 1-year survival rates comparable to the "low risk" category, despite the severity of their condition. We think that the short time of the bPAB allows to maintain the ductus patency by pharmacological means to avoid the risks of vascular injuries produced by the hardware of the hybrid procedures.



46. Bilateral Pulmonary Artery Banding for Resuscitation in High-Risk Single Ventricle Neonates and Infants: Single Center Experience

Kristine J. Guleserian[1], Mahesh S. Sharma[1], Gregory Barker[2], Joy Macaluso[1], Alan Nugent[2], Joseph M. Forbess[+1]

1. Cardiovascular and Thoracic Surgery, UT Southwestern Medical Center/Children's Medical Center of Dallas, Dallas, TX, United States.
2. Pediatrics, UT Southwestern Medical Center/Children's Medical Center of Dallas, Dallas, TX, United States.

Invited Discussant: Thomas Yeh

OBJECTIVE(S): Bilateral pulmonary artery banding (bPAB) ± ductal stenting has been performed at our institution as a resuscitative intervention for patients considered too high risk (profound metabolic acidosis, ventricular dysfunction, significant AV valve regurgitation, and/or end organ dysfunction) for conventional single ventricle (SV) palliation. The purpose of this study was to determine outcomes using this strategy.

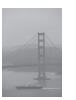
METHODS: Retrospective review of all patients with SV <3 months of age who underwent bPAB and either ductal stenting or maintenance of ductal patency with PGE1 infusion from January 2007–October 2011 at our institution. Echocardiographic, angiographic, operative and clinical data was reviewed. Follow-up was complete in 100%.

RESULTS: Twenty-four patients (13 male) underwent bPAB at a median age of 8 days (range, 2–44 d), gestational age of 38-weeks (range, 27–41 wk), and weight of 3.01 kg (range, 1.5–4.4 kg). Cardiac diagnoses included hypoplastic left heart syndrome (HLHS) or variant HLHS in 18, unbalanced AV canal in 4 (3 RV, 1 LV-dominant), and tricuspid atresia in 2. In the HLHS group, 38.9% (7/18) had intact or highly restrictive atrial septum requiring open (N = 1) or transcatheter (N = 6) atrial septostomy ± atrial stent placement. Ductal stenting was performed simultaneously in 7, pre-bPAB in 1, and post-bPAB in 6. The remaining 11 patients were maintained on PGE1 therapy. Fifteen patients (62.5%) survived to either conventional Norwood (N = 7), comprehensive stage 2 (N = 1), cardiac transplantation (N = 6), or are currently awaiting transplantation (N = 1). Of the 9 non-survivors, support was withdrawn in 5 patients with an absolute contraindication to transplantation, 1 patient with sepsis/multi-organ system failure, and 1 patient for whom palliative care was desired. Two

patients died while awaiting transplantation. All patients who underwent conventional Norwood operation (7/7) survived and 4 have since undergone bidirectional Glenn shunt. Five of 6 patients who underwent cardiac transplantation (83.3%) are alive at median follow-up of 34 months.

CONCLUSIONS: Bilateral pulmonary artery banding (bPAB) ± ductal stenting is an effective means of resuscitation for high-risk SV neonates and infants allowing for reasonable survival to first-stage palliation or cardiac transplantation when appropriate.

5:00 p.m. **EXECUTIVE SESSION**
(AATS Members Only)
Ballroom Level 3, Moscone West Convention Center



2:00 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

2007, 2009, 2011 Moscone West Convention Center
(8 minute presentation, 12 minute discussion)

Moderators: David J. Sugarbaker
David R. Jones

47. Omental Reinforcement of the Thoracic Esophagogastric Anastomosis—An Analysis of Leak and Reintervention Rates in Planned and Salvage Esophagectomy Patients

Boris Sepesi, Stephen G. Swisher+, Garrett L. Walsh+, Arlene M. Corea, Reza J. Mehran+, David C. Rice+, Jack A. Roth+, Ara A. Vaporciyan+, Wayne L. Hofstetter+

Thoracic and Cardiovascular Surgery, University of Texas MD Anderson Cancer Center, Houston, TX, United States.

Invited Discussant: Gail Darling

OBJECTIVE(S): An uncontained intrathoracic anastomotic leak may cause severe morbidity or mortality and often requires additional procedures with prolonged hospitalization. Historically, salvage esophagectomy has been associated with even higher leak incidences. The greater omentum has a natural tendency to isolate infectious and inflammatory processes. Although omental reinforcement of esophageal anastomoses has been described, widespread adoption of the procedure is lacking. Thoracic transposition of an omental flap along with the gastric conduit at the time of esophagectomy may decrease the incidence, severity and associated reoperations in patients with intra-thoracic leak after planned or salvage esophagectomy.

METHODS: We identified 611 consecutive patients from a prospectively maintained database who underwent esophagectomy with intrathoracic anastomosis with or without omental reinforcement between January 2001 and August 2011. All patients were studied for leak post-operatively. Four grades of leak severity were defined ranging from radiographic leak to conduit loss. Univariate and multivariate analysis were performed to identify variables associated with anastomotic leak.

RESULTS: Omental reinforcement was used in 216/611 (35%) intra-thoracic anastomoses. Salvage resections comprised 69 of that total, 22/69 (32%) received an omental flap. Leak occurred in 44/542 (8.1%) planned and 8/69 (11.6%) salvage esophagectomies. Planned esophagectomy patients with anastomotic omental buttress had a significantly lower leak rate than patients without omentum (4.6% vs 10%; p = 0.03, OR 0.43). In salvage esophagectomy, the leak rate with omentum was 4.5% compared to 15% without (p = 0.23, OR 0.27). Overall, there was a significantly lower need for reoperation (grade 3 leak) observed in patients with omental reinforcement (p = 0.026, OR 0.25). Multivariate analysis identified proximal tumor location (p = 0.03, OR 2.5) and minimally invasive esophagectomy (p = 0.001, OR 4.1) to be independent predictors of high leak rate; and a trend towards low leak rate was observed with the use of omental buttress (p = 0.08, OR 0.504).

Total Leak Rate and Leak Grade—Groups with and without Omentum

	Omentum	No Omentum	p-Value	Odds Ratio	95% CI
	N = 216	N = 395			
Total Leaks	10 (4.6%)	42 (10.6%)	0.013	0.41	0.2–0.83
Grade 1—Radiographic leak	2 (0.9%)	13 (3.3%)	0.091	0.28	0.06–1.2
Grade 2—Minimal intervention/ stent	1 (0.5%)	6 (1.5%)	0.269	0.30	0.04–2.52
Grade 3—Major intervention/ reoperation	3 (1.4%)	21 (5.3%)	0.026	0.25	0.07–0.85
Grade 4—Conduit loss	4 (1.9%)	2 (0.5%)	0.132	3.7	0.67–20.4
Leak associated mortality	1 (0.5%)	3 (0.8%)	0.667	0.61	0.06–5.88

CONCLUSIONS: Omental flap reinforcement of thoracic esophago-gastric anastomoses decreases the overall leak rate and need for reoperation. However, if the loss of gastric conduit is imminent, omentum may not influence that outcome. We recommend pedicled omental transposition to reinforce all thoracic anastomoses. Endoscopic evaluation of significant anastomotic leaks is still warranted.

48. The Effect of Center Volume on the Incidence of Postoperative Adverse Events and Their Impact on Survival After Lung Transplantation

Arman Kilic[1], Christian A. Merlo[2], John V. Conte[+1], Ashish S. Shah[+1]

1. Division of Cardiac Surgery, Johns Hopkins Hospital, Baltimore, MD, United States. 2. Division of Pulmonary and Critical Care Medicine, Johns Hopkins Hospital, Baltimore, MD, United States.

Invited Discussant: Matthew Bacchetta

OBJECTIVE(S): The aim of this study was to evaluate the effect of center volume on the incidence of postoperative adverse events and their impact on survival following lung transplantation (LTx).

METHODS: United Network for Organ Sharing (UNOS) data was used to identify adult patients undergoing first-time, single-organ LTx between 1995–2009. Patients were equally distributed into tertiles based on annual LTx volume (low <19.4/year, intermediate 19.4–30.5/year, and high volume centers >30.5/year). Postoperative adverse events were defined as occurring prior to discharge post-LTx, and included infection, rejection, stroke, reoperation, and renal failure requiring dialysis. Risk-adjusted multivariable Cox proportional hazards models were constructed incorporating significant univariate covariates. Kaplan-Meier survival was calculated after stratification based on center volume and type of adverse event.

RESULTS: A total of 6,362 (40.5%) of 15,726 eligible LTx recipients during the study period had a postoperative adverse event, including 4,833 (30.7%) patients with infection, 761 (4.8%) with rejection, 318 (2.0%) with stroke, 2,155 (13.7%) with reoperation, and 829 (5.3%) with renal failure requiring dialysis. Except for stroke, low volume centers had the highest incidences of each adverse event, and intermediate volume centers consistently had the lowest (Figure). Each adverse event was associated with an independent increase in post-LTx mortality risk (each $p < 0.001$). Risk-adjusted multivariable Cox analysis demonstrated that in patients with an adverse event, low volume center was a significant risk factor for increased post-LTx mortality (OR: 1.21, 95% CI 1.09–1.35; $p < 0.001$). Moreover, the significant adverse impact of each individual complication on 90-day and 5-year survival was of the least magnitude in high volume centers, and most profound in low volume centers (Figure).

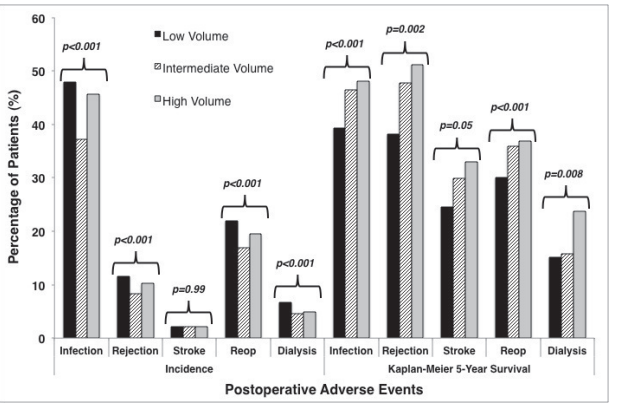


Figure: *Incidence of postoperative adverse events and their impact on survival stratified by center volume.*

CONCLUSIONS: Low volume centers have the highest incidences of infection, rejection, reoperation, and renal failure following LTx, and the adverse impact on survival of each of these complications is most profound in these lower volume centers. This large-cohort study also suggests that although high volume centers do not have the lowest incidences of individual early complications following LTx, they are best able to minimize the adverse effects of these complications on short and longer-term survival.

49. Pleural Perfusion Thermochemotherapy (PPTCT) for Stage IVa and Pleural Relapses of Thymic Epithelial Tumors: Long-Term Outcome

Alon Yellin[1], David A. Simansky[1], Ronny Ben-Avi[1], Marina Perelman[2], Alon Ben Nun[1]

1. Thoracic Surgery, Sheba Medical Center, Ramat Gan, Israel.
2. Pathology, Sheba Medical Center, Ramat Gan, Israel.

Invited Discussant: Joshua R. Sonett

OBJECTIVE(S): To evaluate whether PPTCT may emerge as the best treatment for stage IVa thymoma (DNT) and thymic carcinoma (TC) and for thymoma with pleural relapse (TPR).

METHODS: A prospective historical study of patients undergoing resection and PPTCT in one center. PPTCT with CDDP (100 mg/m^2) and w/wo Duxorubicin (50 mg total dose) was performed for 60 minutes using a standard roller pump and a modified heat exchanger to a maximal intrapleural temperature of 43C. Histopathological was revised and all cases were reclassified according to the latest WHO ckassification. All patients, but one, were followed with at least one annual CT until death, or 9/2011. Survival was calculated with the Kaplan-Meyer method and statistical analysis with unianova.

RESULTS: A total of 32 patients (m:f 24:8), 16 with DNT, 12 TPR, and 4 TC completed 40 intended treatments and were follow-up for 6–200 months. The 3 groups were similar in age, gender, previous treatments, side and extent of surgery, perfusion temperature and agents used. They differed in WHO classification, completeness of resection and prevalence of myasthenia. Eight patients had a repeated PPTCT at an interval of 2–12 yrs. There was no renal, hematological, neurological, or cardiac toxicity. There was one in hospital mortality. Major and minor morbidity occurred 5 times (12%) each.

5, 10 and 15 yrs overall survival rates for DNT, TPR and TC were: 79%, 61%, 49%; 64%, 51%, 25%; and 0% respectively. 5 and 10 yrs disease free survival rates were 67%, 44% for DNT and 49%, 32% for TPR. 15 yrs disease specific survival was 81% for DNT and 91% for TPR. Presently, 10/16 DN patients are alive and 8 defined as NED, and 6/12 TPR are alive and 5 are NED. Only WHO classification ($p = 0.045$) and relapse ($p = 0.025$) were predictors of long term overall survival.

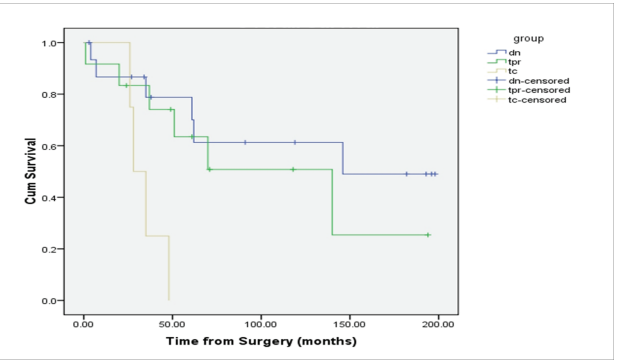


Figure: *Overall survival.*

CONCLUSIONS: 1) Resection & PPTCT is feasible and safe. 2) In patients with DNT and TPR, who have pleural spread, It offers favorable long term survival in spite of moderate regional control. 3) PPTCT is not beneficial for stage IVa TC.

3:00 p.m. **INTERMISSION – VISIT EXHIBITS/ COFFEE BREAK**
Exhibit Hall, Moscone West Convention Center

3:45 p.m. **GENERAL THORACIC SURGERY SIMULTANEOUS SCIENTIFIC SESSION**

2007, 2009, 2011 Moscone West Convention Center

Moderators: David J. Sugarbaker
David R. Jones

50. Safety of Thoracic Surgery in Patients with Pulmonary Hypertension

Julissa E. Jurado, Matthew D. Bacchetta, Mark E. Ginsburg, Lyall A. Gorenstein, Frank D'Ovidio, Alexis Newmark, Matthew Lavelle, Gopal Singh, Joshua R. Sonett[+]

Division of Thoracic Surgery, Columbia University Medical Center—New York Presbyterian Hospital, New York, NY, United States.

Invited Discussant: Alexander S. Krupnick

OBJECTIVE(S): Pulmonary artery hypertension (PAH) is considered a relative contraindication for most thoracic surgery including lung cancer resection. This study reviews the safety of thoracic surgery in patients with a diagnosis of PAH.

METHODS: Retrospective study of a single institution's experience with patients that had thoracic noncardiac surgery from 1997 to 2011 with a coexistent diagnosis of mild, moderate or severe PAH, as determined by preoperative echocardiogram. Mild PAH was defined as a pulmonary systolic pressure between 25–44 mmHg; moderate PAH was defined as a pressure between 45–59 mmHg; severe PAH was defined as a pressure ≥60 mmHg.

RESULTS: Using univariate analysis, data was reviewed for a total of 96 patients with PAH (41 male, 55 female) with a mean age of 58 (SD ± 16) who had undergone the following thoracic procedures: wedge resection 49% (46/96), lobectomy 5% (5/96), lung volume reduction 11% (11/96), Nissen 2% (2/96), decortication/pleurodesis/pleural biopsy 11% (11/96), mediastinoscopy/bronchoscopy with biopsy 14% (13/96), pericardial window 6% (6/96) and pneumonectomy 2% (2/96).

Using Kaplan-Meier survival analysis, mortality was compared among the three grades of PAH demonstrating 100% survival at 30-days in the mild and moderate group. The 30-day mortality in the severe group was

[+]AATS Member

14% (4/28), 3 of 4 deaths were in patients with end-stage interstitial lung disease (ILD) and one pericardial window in end-stage PAH. There was statistical significance in the 30-day mortality for patients with severe PAH when compared to the mild and moderate groups combined ($p = 0.001$). Diagnosis of cancer was not associated with 30-day mortality or significant difference in 1-year mortality ($p = 0.73$) when compared to other non-terminal disease processes.

CONCLUSIONS: Patients with mild to moderate PAH who require thoracic surgical procedures are not at an increased risk of 30-day mortality. An increase in 30-day mortality was observed solely in those patients with end-stage ILD and concomitant PAH with no upfront mortality in lung cancer resection observed even in severe PAH. The prior consensus that severe PAH is a contraindication to surgery requires reevaluation in order to accurately stratify the risk associated with these procedures.

51. Preoperative Pathologic Evaluation of Hilar (N1) Lymph Nodes with Endobronchial Ultrasound and Transbronchial Needle Aspiration: A Potential Application to Clinical Trials

David D. Odell, Bryan A. Whitson, Mara B. Antonoff, Jonathan D'Cunha+, Michael A. Maddaus+, Rafael S. Andrade+
Division of Thoracic and Foregut Surgery, University of Minnesota, Minneapolis, MN, United States.

Invited Discussant: Kazuhiro Yasufuku

OBJECTIVE(S): Endobronchial Ultrasound/Transbronchial Needle Aspiration (EBUS-TBNA) offers the ability to sample hilar (N1) lymph node stations inaccessible by traditional mediastinoscopy, with potential applications in clinical trial development. However, no descriptions of the technical feasibility or accuracy of hilar EBUS-TBNA are available. Our objective is to evaluate the utility of EBUS/TBNA as a diagnostic and staging tool for N1 disease in patients with non-small cell lung cancer (NSCLC).

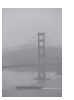
METHODS: We reviewed all EBUS-TBNA cases performed at our institution between 9/2006 and 6/2011 to identify patients who underwent attempted hilar lymph node biopsy. Rapid on-site pathological evaluation (ROSE) was available in the operating room for all cases. Samples were defined as adequate by the presence of 40 lymphocytes per high-power field and/or the presence of pigmented macrophage clusters. The primary outcome measure was acquisition of diagnostic material from a given lymph node station. Agreement between intra-operative (ROSE) and permanent pathology was assessed. Sensitivity and specificity were calculated for specimens verified by surgical biopsy.

RESULTS: During the study period, 341 EBUS-TBNA cases were performed, with biopsies of 98 hilar lymph nodes (station 10, n = 35; station 11, n = 63) obtained in 89 patients. Adequate diagnostic material was obtained in 95% of biopsy attempts (92/98). Concordance between final pathologic interpretation and ROSE was 92% (87/92) and was consistent across nodal stations (station 10, 32/35 [91%]; station 11, 56/60 [93%]). 43 patients had additional operative specimens allowing for confirmatory pathologic evaluation. For this group, sensitivity was 88%, specificity 100%, positive predictive value 100%, and negative predictive value 73% (Table).

Table 1: Measures of test performance and accuracy for hilar EBUS/TBNA

Lymph Node Station	Adequate Diagnostic Specimen	Concordance with ROSE	Sensitivity	Specificity	PPV	NPV
Station 10	91% (32/35)	91% (29/32)	87.50%	100%	100%	80%
Station 11	95% (60/63)	97% (58/60)	87.50%	100%	100%	70%
Overall N1 Nodes	94% (92/98)	95% (87/92)	87.50%	100%	100%	73%

CONCLUSIONS: EBUS-TBNA is an accurate diagnostic tool that can be used to sample hilar (N1) lymph nodes and identify stage IIa/IIb NSCLC prior to surgical resection. Accurate preoperative N1 status identification is of significance for the implementation of neoadjuvant clinical trials for IIa/IIb NSCLC patients. Further, preoperative determination of hilar lymph node status may guide the selection of NSCLC patients for sublobar resection.



52. Differences in Reported Esophageal Cancer Resection Outcomes Between National Clinical and Administrative Databases

Damien J. LaPar, Christine L. Lau, David R. Jones+, Benjamin D. Kozower+
Surgery, University of Virginia, Charlottesville, VA, United States.

Invited Discussant: Antoon Lerut

OBJECTIVE(S): The Society of Thoracic Surgeons (STS) General Thoracic Surgery Database (GTDB) is the largest clinical thoracic surgical database in the United States. However, it is not known whether the outstanding outcomes for esophageal cancer resection from the GTDB are representative of nationwide results. The purpose of this study was to determine if GTDB esophagectomy outcomes are representative of nationwide outcomes by comparing them to other national clinical and administrative databases.

METHODS: From 2002–2008, esophageal cancer resection outcomes from the GTDB were compared with the National Surgery Quality Improvement Program (NSQIP) and the Nationwide Inpatient Sample (NIS, n = 22,758), the largest all payer, inpatient care database in the United States. Primary outcomes were the number of procedures reported from each database and differences in mortality and resource utilization. Observed differences in patient characteristics and postoperative events were also analyzed.

RESULTS: Annual esophageal resection volume has increased over time. However, the GTDB (n = 6,740) and NSQIP (n = 1,030) only capture a small proportion of resections performed nationally (30% [6,740/22,758] and 5% [1,030/22,758], respectively, Figure 1). Median patient age (GTDB: 64 vs. NSQIP: 65 vs. NIS: 64 years) and female gender (GTDB: 18% [1,213/6,740] vs. NSQIP: 21% [216/1.030]] vs. NIS: 17% [3,969/22,758]) were similar in all three databases. Mortality was significantly lower within the GTDB (3.2% [215/6,740]) and NSQIP (2.6% [26/1,030]) compared to the NIS (6.1% [1,388/22,758], $p < 0.001$). Median length of stay was lower in the GTDB (10 d) compared to both NSQIP (12 d) and NIS (12 d, $p < 0.001$).

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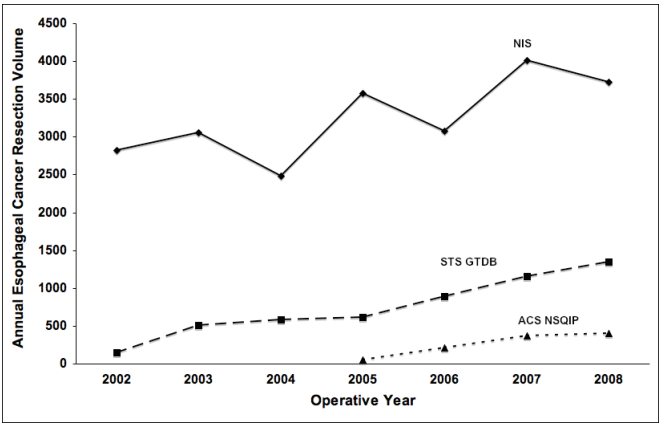


Figure: *Annual esophageal cancer resection volume by operative year as recorded in the STS GTDB, ACS NSQIP and NIS databases.*

CONCLUSIONS: The STS GTDB reports outstanding mortality results and hospital resource utilization for esophageal cancer resection. However, surgical outcomes from the STS GTDB are not representative of national results from programs not participating in the database. These results establish a reference for future esophagectomy comparisons and highlight the importance of increased participation and utilization of the STS GTDB.

5:00 p.m. **EXECUTIVE SESSION**
(AATS Members Only)
Ballroom Level 3, Moscone West Convention Center

WEDNESDAY, MAY 2, 2012

PLENARY AND CONTROVERSIES SESSIONS

7:00 a.m. **EMERGING TECHNOLOGIES AND TECHNIQUES FORUM**

Ballroom Level 3, Moscone West Convention Center

(6 minute presentation, 5 minute discussion)

Moderators: Charles R. Bridges
Tomislav Mihaljevic

T1. Multi-Center Rapid-Deployment Aortic Valve Replacement Trial: 1-Year Results of the First 150 Patients

Alfred Kocher[1], Guenther Laufer[+1], Axel Haverich[+2], Malakh Shrestha[2], Thomas Walther[+4], Martin Misfeld[5], Joerg Kempfert[4], Christoph Schmitz[6], Thorsten C. Wahlers[+3], Jens Wippermann[3], Friedrich W. Mohr[+5], Dominik Wiedemann[1], Michael A. Borger[+5]

1. Department of Cardiac Surgery, Vienna Medical University, Vienna, Austria. 2. Medical University Hannover, Hannover, Germany. 3. Medical University of Cologne, Cologne, Germany, 4. Kerckhoff Klinic, Bad Nauheim, Bad Nauheim, Germany. 5. University of Leipzig, Leipzig, Germany. 6. University of Munich, Munich, Germany

OBJECTIVE(S): A rapid deployment aortic valve (RD-AVR) can be useful in reducing cross-clamp (XCL) and cardiopulmonary bypass (CPB) times. Initial safety has been previously reported. We now present the 1-year clinical outcomes of a RD-AVR trial

METHODS: 16 surgeons from 6 European centers treated 150 consecutive patients with aortic stenosis in a prospective, single-arm trial (mean age 75.4 ± 6.8; age range 51–89; 52% females). A stented tri-leaflet bovine pericardial bio-prosthesis with a balloon expandable cloth-covered stent frame at the inflow aspect was delivered via a full sternotomy (55%), mini upper sternotomy (44%), or right lateral thoracotomy (1%). Five valve sizes (19–27 mm) were evaluated. Patients underwent either isolated AVR

(55%) or AVR with concomitant procedures (CABG 35%, other 10%). After standard aortotomy and leaflet excision, the valve was positioned supra-annularly using three guiding sutures after frame expansion with the balloon catheter the sutures were tied and the aortotomy was closed.

RESULTS: Overall technical success was 96% (144/150). Operative outcomes are depicted in table 1. XCL times for isolated AVR, AVR plus CABG, and AVR plus other were 41 ± 11 min, 60 ± 19 min and 42 ± 13 min, respectively with CPB times of 67 ± 19 min, 95 ± 31 min and 71 ± 21 min, respectively. Mean EOA and gradient were 1.7 ± 0.1 cm^2 and 8.4 ± 0.7 mmHg at three months and remained unchanged with 1.7 ± 0.1 cm^2 (EOA) and 8.8 ± 0.9 mmHg (mean gradient) at 1-year follow-up. All data was CEC-adjudicated and Echo Core Lab reviewed.

Table 1

Outcome	≤30d	>30d
Mortality	2	1
Thromboembolic events	4	1
Paravalvular leakage (>2+)	1	1
Valve releated re-operation	0	1
Re-operation for bleeding, non-valve related	11	0
Permanent Pacemaker implantation, valve related	8	0

CONCLUSIONS: Implantation of a novel, balloon expandable valve is feasible, safe and efficacious. XCL and CBP times were favorable. Early hemodynamic performance was excellent and remained so at 3 months and 1-year follow-up.

T2. Early Single-Center Experience in Sutureless Aortic Valve Implantation in More Than 70 Patients

Otto E. Dapunt, Jerry Easo, Harald C. Eichstaedt
Department for Cardiac Surgery, Klinikum Oldenburg, Oldenburg, Germany.

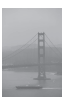
OBJECTIVE(S): To evaluate the intra and 6-month postoperative period performance of a sutureless aortic valve prosthesis made of equine pericardium and mounted on a specially designed nitinol stent frame implanted in pts with severe aortic valve stenosis

METHODS: Between July 2010 and September 2011, a total of 72 pts (mean age 77.3 ± 5.6 yrs) underwent isolated aortic valve replacement with a sutureless pericardial prosthesis (SAVR) or in combination with other cardiac surgical procedures. Logistic euroscore (log ES) was used to determine the operative risk in these mostly high-risk patients. Peak (PP) and mean pressure (MP) gradients were measured by TEE at the time of discharge and at 6 months follow-up.

RESULTS: 49 pts were male, 23 pts were female. 34 pts received isolated SAVR. Other procedures included: CABG in 27 pts, surgical ablation for atrial fibrillation in 8 pts, ASD closure in 1 pt, and mitral valve surgery in 2 pts. In 5 pts redo surgery was performed for various preconditions. Mean log. ES was 20.5% (3.5–66.6%). In isolated SAVR cases mean aortic cross clamp time was 29 mins (18–41 mins), mean bypass time 49 mins (41–62 mins). There was no intraoperative death. Two pts had to be reoperated on due to severe paravalvular leakage (PVL) caused by iatrogenic valve dislocation and malpositioning, respectively. At time of discharge mean PP was 14 mmHg (8–22 mmHg), mean MP was 9 mmHg (4–13 mmHg). Early postoperative TEE revealed four trivial PVLs. 5 pts died during the observation period due to non-valve related causes. At 6-month follow-up PP was 15 ± 7 mmHg, MP was 9 ± 4 mmHg. At that time no leakage enlargement was measured. In 5 pts (6,9%) permanent pacemaker implantation was necessary. We did not observe any thromboembolic events/bleedings.

CONCLUSIONS: In this large single center experience with SAVR the surgical procedure was shown to be safe and time saving. In the view of excellent hemodynamic results and significant shortening of aortic cross clamp and bypass time we could demonstrate significant advantages especially in high-risk patients with small aortic annulus and calcified

aortic root. Implantation through a narrow and heavily calcified sinutubular junction is feasible and results in superior hemodynamics. Trivial leakages detected initially do not enlarge in the following months. There is no increased risk of pacemaker implantation. Due to less invasive anticoagulation the risk of thromboembolic complications is low. Long-term durability of this prosthesis has yet to be determined.



T3. Combined Proximal Stent Grafting Plus Distal Bare Metal Stenting for Management of Aortic Dissection: Superior to Standard Endovascular Repair?

Sophie C. Hofferberth[1], Andrew E. Newcomb[1,2], Michael Y. Yii[1,2], Ian K. Nixon[1,2], Peter J. Mossop[3]

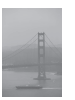
1. Department of Medicine (St. Vincent's), The University of Melbourne, Fitzroy, VIC, Australia. 2. Department of Cardiac Surgery, St. Vincent's Hospital, Melbourne, Melbourne, VIC, Australia. 3. Department of Medical Imaging, St. Vincent's Hospital, Melbourne, Melbourne, VIC, Australia.

OBJECTIVE(S): This report tests whether combined proximal endografting with distal true lumen bare metal stenting decreases late distal aortic complications compared to conventional proximal endograft repair in Type A and Type B aortic dissection.

METHODS: Between January 2003 and December 2010, 63 consecutive patients underwent endovascular treatment for acute (Type A = 24, type B = 21) and chronic (Type B = 18) aortic dissection. Of these, 40 (Type A = 16, Type B = 24) patients underwent proximal endografting combined with bare metal stent implantation in the distal true lumen (group 1), while 23 (Type A = 8, Type B = 15) underwent proximal stent grafting alone (group 2). All patients with type A aortic dissection underwent open surgical intervention plus adjunctive retrograde endovascular repair.

RESULTS: Patients were comparable for baseline characteristics and treatment indicators, but more group 1 patients had undergone previous aortic surgery (p = 0.03) and were active smokers (p = 0.03). Intraoperative characteristics were similar, while postoperatively Group 2 (n = 4) demonstrated a higher incidence of malperfusion syndrome versus group 1 (n = 0, p = 0.02). Overall hospital morality was 6% (2(9%) for group 2 versus 2(5%) for group 1). At a mean follow-up time of 54 months for group 1 versus 32 months for group 2 (p = 0.003), 10 (43%) group 2 patients required unplanned secondary intervention (3 surgical, 7 endovascular) versus 4 (13%) in group 1 (1 surgical, 3 endovascular), p = 0.004. Reintervention for thoracoabdominal aortic aneurysm or visceral ischaemia was performed in 4 (17%) group 2 and 0 group 1 patients, p = 0.03. One (2%) and 3 (13%) late aortic-related deaths occurred in group 1 and group 2, respectively.

CONCLUSIONS: The use of combined proximal endografting plus bare metal stenting to treat acute and chronic aortic dissection gives favorable short-term outcomes and decreases late distal aortic complications compared with standard endovascular repair. These results provide important evidence to support a more universal application of this treatment approach in the management of aortic dissection. A multicenter, prospective, randomized trial is warranted to get a definite answer on this treatment strategy.



T4. Thoracoscopic Localization of Intraparenchymal Pulmonary Nodules Using Direct Intracavitary Thoracoscopic Ultrasound Prevents Conversion of VATS Procedures to Thoracotomy

Mohamed Khereba[1,2], Pasquale Ferraro[+1,2], Andre C. H. Duranceau[+1,2], Jocelyne Martin[1,2], Eric Goudie[1,2], Mehdi Tahiri[1,2], Vicky Thiffault[1,2], Moishe Liberman[1,2]

1. Thoracic Surgery, University of Montreal, Montreal, QC, Canada.
2. CHUM Endoscopic Tracheobronchial and Oesophageal Center (C.E.T.O.C.), University of Montreal, Montreal, QC, Canada.

OBJECTIVE(S): To investigate the feasibility, accuracy and effect on conversion rates of intracavitary video assisted thoracoscopic surgery ultrasound (VATS-US) for localization of difficult to localize pulmonary nodules.

METHODS: The study consists of a prospective cohort study of VATS-US for the localization of intraparenchymal peripheral pulmonary nodules. Patients with pulmonary nodules not touching the visceral pleura on CT scan who were scheduled for VATS wedge procedures were prospectively enrolled. Standard VATS incisions (3 x 1 cm, triangulated) were performed. Following ipsilateral lung deflation, the lobe of interest was examined visually, using finger palpation when possible, and using the instrument sliding method. The nodule was then sought using a sterile, flexible, linear (10 mm diameter, 5–10 MHz) ultrasound transducer. VATS-US results were compared with preoperative CT findings and pathology reports. Primary outcome measure was the prevention of conversion to thoracotomy or lobectomy secondary to positive VATS-US in patients with nodules not identifiable using standard VATS techniques.

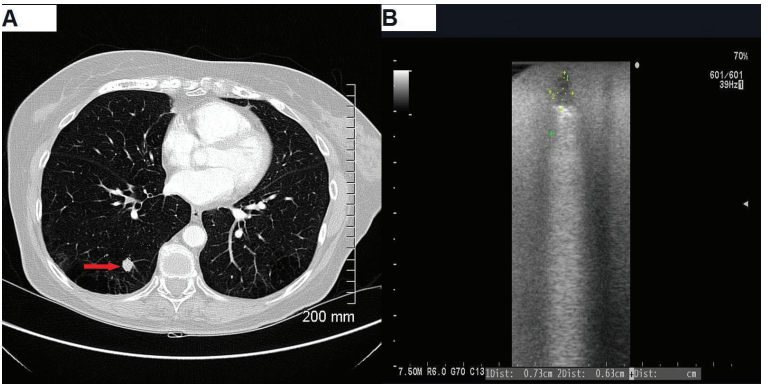


Figure: *A: CT scan image demonstrating 11 x 10 mm right lower lobe intraparenchymal pulmonary nodule B: Corresponding intraoperative VATS-US image.*

RESULTS: Forty-five individual VATS-US procedures were performed by four different surgeons over a 13 month period. Mean dimensions of pulmonary nodules were 13 mm long axis (range: 5–51 mm), and 12 mm short axis (range: 5–24 mm). Distance from the visceral pleura ranged from 1–24 mm. Mean time required for the VATS-US portion of procedure was 4 minutes (range: 1–13 minutes). Intracavitary VATS-US was able to detect 44 out of 46 nodules. The sensitivity of VATS-US was 96% and the positive predictive value was 100%. The results were confirmed by pathology with negative margins in all cases. Lung nodules were visualized by thoracoscopic lung examination in 12 cases (27%), palpable by finger in 18 cases (40%), and palpable by instrument sliding technique in 17 cases (38%). In 20 cases, lung nodules were not identifiable using any of the traditional techniques and were found only using VATS-US. VATS-US therefore prevented conversion to thoracotomy or unnecessary lobectomy in 43% of cases. Furthermore, VATS-US confirmed nodule location prior to wedge resection in cases where the location of the nodule was believed to be found using a traditional technique.

CONCLUSIONS: Intracavitary VATS-US is a real-time, feasible, reliable, and effective method of localization of intraparenchymal pulmonary nodules during VATS resection and can decrease conversion rates from VATS wedge procedures to thoracotomy or lobectomy.

T5. Expanded Experience Using the Transaortic Approach for Transcatheter Valve Implantation

Rizwan Q. Attia[1], Martyn Thomas[2], Simon Redwood[2], Jane Hancock[2], Kirsty Macgillivary[2], Karen Wilson[2], Christopher Young[1], Vinayak Bapat[1]

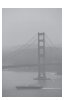
1. Cardiothoracic Surgery, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom. 2. Cardiology, Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom.

OBJECTIVE(S): We report our up-to-date series for an alternative approach through the ascending aorta to implant Edwards SAPIEN THV valve in aortic position. We discuss in detail the technical aspects, the surgical advantages and future application of this novel approach. That might revolutionise surgical perspective on TAVI.

METHODS: All patients were accepted through the multidisciplinary team. Conventional approach i.e., Transfemoral (TF) or Transapical (TA) was either not possible or desirable and ascending aorta was deemed suitable for cannulation. Procedure was performed under GA guided by fluoroscopy and 3-D transesophageal echo (TEE). We will describe the procedure in detail.

RESULTS: 33/237 (13.9%) patients underwent the procedure. Mean age was 81.7 (67–96) with mean Logistic EuroSCORE of 24.4%. All patients had critical stenosis with mean AVA 0.67 cm^2, PG 72.5 mmHg and LVEF 49%. Successful device implantation was achieved in all cases without any post-operative complications directly related to the approach. The incidence of chest sepsis, renal failure and stroke was 6.06%, 12.1% and no strokes compared to 12.2%, 12.8% and 4.85% compared to the TA and TF groups. This is despite higher incidence of co morbidities (COPD, 12/33 (36.3%) vs. 23/204 (11.2%) p0.01; severe extra-cardiac arteriopathy, 7/33 (18.7%) vs. 25/204 (12.2%) p0.02 and >50% internal carotid artery occlusion 12/33 (34.3%) vs. 37/204 (18.1%) p0.001 in this cohort compared to the TA and TF routes. There were no procedure deaths. Kaplan-Meier analysis showed survival at 81.8%, 70%, 60% and 55% at 1 month, 6 months, 1 year and 2 years which followed the survival curve for TF patients with slightly higher overall survival in the TA group.

CONCLUSIONS: We have successfully used the trans-aortic route in patients deemed unsuitable for conventional approaches. TA approach is technically always feasible but not necessarily desirable in patients with severe chest deformity, poor lung function, previous pulmonary complications and extremely poor ventricular function. Thoracotomy is associated with pain and risk of pleural effusion which can complicate recovery. The advantages of partial sternotomy are the avoidance of these complications and preservation of respiratory dynamics, as the pleura remain intact. LV function is preserved by avoidance of ventricular purse-stings. Future modification of delivery devices might make this procedure more amiable as route for TAVI.



T6. Durable Staged Hybrid Ablation with Thoracoscopic and Percutaneous Approach for Treatment of Long Standing Atrial Fibrillation: Results at 30 Months Assessed with Continuous Monitoring

Claudio Muneretto[+1], Gianluigi Bisleri[1], Luca Bontempi[2], Antonio Curnis[2]

1. Division of Cardiac Surgery, University of Brescia Medical School, Brescia, Italy. 2. Division of Cardiology, University of Brescia Medical School, Brescia, Italy.

OBJECTIVE(S): Electrophysiologic and Surgical procedures to treat standalone atrial fibrillation (AF) procedures have evolved but disappointing results in patients with long standing persistent (LSP) AF have challenged the durability of these procedures. We investigated combining the two methods to improve outcomes and used implantable loop recorders (ILRs) for continuous monitoring.

METHODS: Lone AF patients (n = 36) with either LSP-AF (28) or persistent AF (8) were prospectively enrolled in the study and consecutively treated by thoracoscopic ablation followed by EP mapping and additional ablation at 30 days. Mean age was 62.3 ± 10 yrs., left atrial dimension was 50.3 ± 5.5 mm, and average AF duration was 72.8 months (range: 7–240). The thoracoscopic procedure was a right monolateral approach to create a box lesion using a temperature controlled radiofrequency device with suction adherence. Recurrencies were defined according to the HRS guidelines.

RESULTS: Thoracoscopic ablation was successfully completed without morbidity or mortality. Total procedural and ablation times were 90 ± 16 and 32 ± 7 min respectively. Intraoperative exit block was achieved in 100% of patients and entrance block in 88.8% (32/36) of patients. An ILR was implanted at the end of surgery. No ICU stay was required; hospital length of stay was 4 ± 1.8 days

At 33 ± 2 days post surgery, an EP study was performed: entry-exit block was confirmed in 83.3% (30/36) while gaps in the box lesion were observed in 16.7% (6/36) of patients. Additional transcatheter lesions were performed in 61.1% of cases (22/36 pts.). At a mean follow-up of

30 months (range: 1–58), 91.6% (33/36) of patients are in sinus rhythm (Figure 1.) with 77.7% (28/36) of these patients off antiarrhythmic drugs and 88.8%(32/36) free of warfarin. Long term incidence of left atrial flutter was 0%.

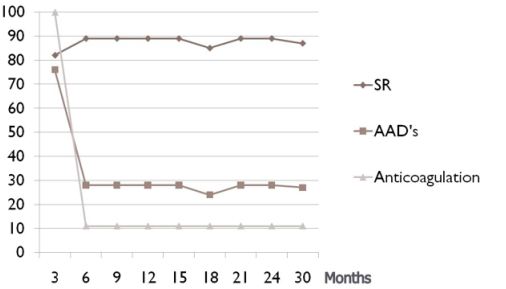


Figure 1

CONCLUSIONS: The combination of a surgical box lesion and transcatheter ablation in a hybrid approach provided excellent durable clinical outcomes in patients with long-standing, persistent AF.

T7. Initial Experience with a New Technique Using EUS Access for Biopsy of Para-Aortic (Station #6) Mediastinal Lymph Nodes

Moishe Liberman[1,2], Andre C. H. Duranceau[+1,2], Etienne Grunenwald[1,2], Vicky Thiffault[1,2], Mohamed Khereba[1,2], Pasquale Ferraro[+1,2]

1. Thoracic Surgery, University of Montreal, Montreal, QC, Canada.
2. CHUM Endoscopic Tracheobronchial and Oesophageal Center (C.E.T.O.C.), University of Montreal, Montreal, QC, Canada.

OBJECTIVE(S): Endoscopic and Endobronchial Ultrasound with transluminal biopsy of mediastinal lymph nodes has revolutionized the diagnosis and staging of the mediastinum in patients with lung and esophageal cancer. All lymph node stations, except for the para-aortic lymph node station, are accessible by a combination of endoscopic ultrasound (EUS) and endobronchial ultrasound (EBUS). We have recently described an echo-endoscopic technique for the biopsy of para-aortic (station #6) lymph nodes without traversing the thoracic aorta. The objective of this study was to review the initial experience with this new technique.

METHODS: Retrospective case series design. A first-in-human evaluation of the biopsy of station #6 mediastinal lymph nodes using curvilinear EUS without arterial puncture. The study reports on twelve consecutive patients having undergone this new technique. Station #6 lymph nodes were approached via a long fine needle aspiration approach (7–8 cm) through the proximal esophagus. The needle is passed through the esophagus into the mediastinum just medial to the left subclavian artery. It is then directed towards the para-aortic location using a 6–8 cm trajectory in order to reach and enter the para-aortic lymph node(s) without piercing the aorta or great vessels.

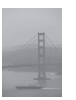
RESULTS: Successful cytological diagnosis of station #6 lymph nodes were obtained in all twelve consecutive patients (lymphocytes in all samples). Accuracy and sensitivity were both 100%. No morbidity resulted from the procedure, nor was observed at 30 days post-procedure. Patient anatomy may preclude safe access in certain situations. Deep sedation or general anesthesia is necessary.

EUS Station #6 Lymph Node Biopsy—Patient Characteristics

Patient	Diagnosis	EUS #6 Result
1	Esophageal Cancer	Positive
2	Cervical Cancer	Positive
3	NSCLC	Positive
4	SCLC	Positive
5	NSCLC	Positive
6	Breast Cancer	Positive
7	NSCLC	Positive
8	Colon Cancer	Negative
9	Anal Cancer	Negative
10	NSCLC	Positive
11	NSCLC	Negative
12	NSCLC	Positive

NSCLC—Non Small Cell Lung Cancer SCLC—Small Cell Lung Cancer

CONCLUSIONS: EUS access of para-aortic (station #6) lymph nodes—allows complete, minimally invasive mediastinal lymph node staging and diagnosis without traversal of the aorta. This technique is the final piece of the puzzle required to completely stage the mediastinum with non-surgical endoscopic techniques. The technique is reproducible and safe.



T8. Promise of Unrestricted Mobility with Innovative, Portable Wireless Powering of a Mechanical Circulatory Assist Device

Pramod Bonde[1], Benjamin Waters[2], Alanson Sample[2], Joshua R. Smith[2,3]

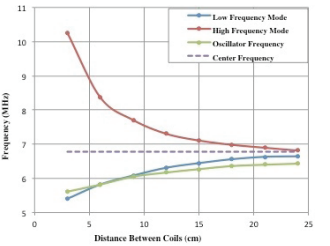
1. Section of Cardiac Surgery, Yale School of Medicine, New Haven, CT, United States. 2. Department of Electrical Engineering, University of Washington, Seattle, WA, United States. 3. Department of Computer Sciences and Engineering, University of Washington, Seattle, WA, United States.

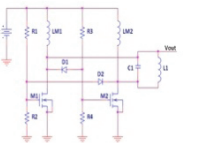
OBJECTIVE(S): Technological improvements of smaller, frictionless, single moving part in the Left Ventricular Assist Devices (LVAD) has an advantage over earlier large pulsatile LVADs prone to mechanical failure. But drivelines still limits the potential of newer pumps and act as source for infection, increases morbidity, and lead to re-hospitalizations. We have previously demonstrated the feasibility of powering LVAD devices over large distances in a home based wireless powering system based on resonant coupling. A portable wireless powering system will greatly improve the range and safety of an implantable LVAD. Any potential areas not covered by a home based wireless powering system can be effectively mitigated by the portable wireless powering system. It will also allow an effective recharging of an implanted battery and extend the battery life. The design innovations have now enabled us to power the device using a portable, battery operated wireless powering allowing freedom from drivelines.

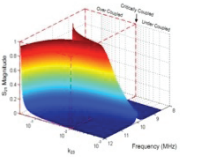
METHODS: The portable FREE-D (Free Resonant Electrical Energy Transfer Delivery) system has been tested at both high power levels using 2 $\times$ 12V nickel metal hydride (NiMH) and Lithium-ion batteries to power a centrifugal LVAD pump and from a signal level using a vector network analyzer (VNA). An oscilloscope was used for tracking the frequencies with the portable FREE-D system while sweeping the entire range of rpms for an implantable centrifugal LVAD pump.

RESULTS: Using the battery-powered system, the entire portable FREE-D system provides sufficient power to operate a centrifugal LVAD. Figure 1 confirms that the FREE-D tracks the in-phase mode, corresponding to the frequencies at which the maximum efficiency is observed. Also, both the low frequency mode, high frequency mode and the oscillator frequency

curves converge on the expected resonant frequency of the transmitting and receiving coils, which are both tuned to resonate at 6.78 MHz. This allows power transfer over a 25 cm range with high reliability. The LVAD pump was operated continuously with no power fluctuations over a range of varying speeds. This is in contrast of a traditional TETS based systems which are ineffective beyond 5 cm.







The plot compares the peak frequency data taken from the network analyzer (red and blue curves) with the oscillating frequency data that was measured during the full-power operation of the portable FREE-D (green curve). The center frequency (purple line) indicates the frequency that each coil was initially tuned to resonate (6.78MHz). The circuit schematic and efficiency plot of the portable FREE-D system.

Figure 1

CONCLUSIONS: The portable FREE-D system has the potential to allow for a completely tether free existence with unrestricted mobility and freedom and will add a third layer of security in addition to an implanted battery and external home based wireless powering system.

The plot compares the peak frequency data taken from the network analyzer (red and blue curves) with the oscillating frequency data that was measured during the full-power operation of the portable FREE-D (green curve). The center frequency (purple line) indicates the frequency that each coil was initially tuned to resonate (6.78 MHz). The circuit schematic and efficiency plot of the portable FREE-D system.

T9. A High-Volume Transcatheter Valve Program Within a Surgical Department—Is "Transfemoral First" Still Reasonable?

Sabine Bleiziffer, Domenico Mazzitelli, Anke Opitz, Nicolo Piazza, Rudiger S. Lange+

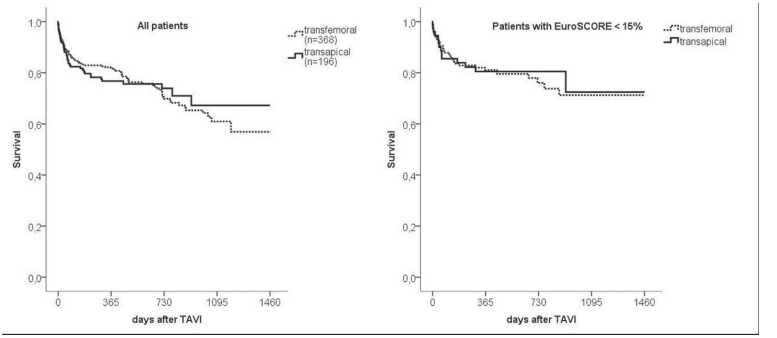
German Heart Center Munich, Munich, Germany.

OBJECTIVE(S): Within the surgical community, there is criticism that a "transfemoral first" concept for transcatheter aortic valve implantation (TAVI) might understate the results after transapical TAVI, e.g. a reduced stroke rate. Aim of our study was to elucidate outcomes after both transfemoral and transapical TAVI up to 4 years.

METHODS: With a "transfemoral first" concept, 615 high-risk patients with aortic stenosis have been treated successfully with TAVI since 06/2007 (n = 368 (60%) transfemoral, n = 196 (32%) transapical; n = 51 (8%) other access sites, not included in the analysis) within a surgical department by a multidisciplinary team. Procedural and annual follow-up data are collected in an institutional database. Survival data were analysed with respect to the patient risk profile.

RESULTS: Survival was statistically not different between groups with a 30-day, one-year, two-years, three-years, and four-years survival of 91.8%, 76.8%, 73.9%, 67.2%, and 67.2% after transapical TAVI, and 92.2%, 81.7%, 69.8%, 60.9%, and 56.9% after transfemoral TAVI ($p = 0.971$, see Figure). Patients in the transapical group exhibited a higher incidence of cardiovascular comorbidities. Comparing patients with a similar risk profile (EuroSCORE <15%), no difference in survival up to four years could be detected between retrograde and antegrade TAVI ($p = 0.903$, see Figure). Periprocedural strokes occurred in 1.5% (transapical TAVI) vs 4.6% (transfemoral TAVI), n.s., and access related complications occurred in 8.2% (transapical TAVI) vs 9% (transfemoral TAVI), n.s. Logistic regression revealed periprocedural stroke as a significant risk factor for 30 day mortality ($p < 0.001$); gender, access site, or access-related complications remained not significant.

+AATS Member



CONCLUSIONS: Our data confirm the feasibility of a "transfemoral first" TAVI program with almost identical survival data with either access site, even when comparing patients with a similar risk profile. With stroke as a strong predictor of 30 day mortality, transapical TAVI should not only be considered in patients without femoral access, but also in patients with increased risk for stroke, as stroke rates tend to be lower.

T10. Safety and Feasibility of Sentinel Lymph Node Identification in Non-Small Cell Lung Cancer

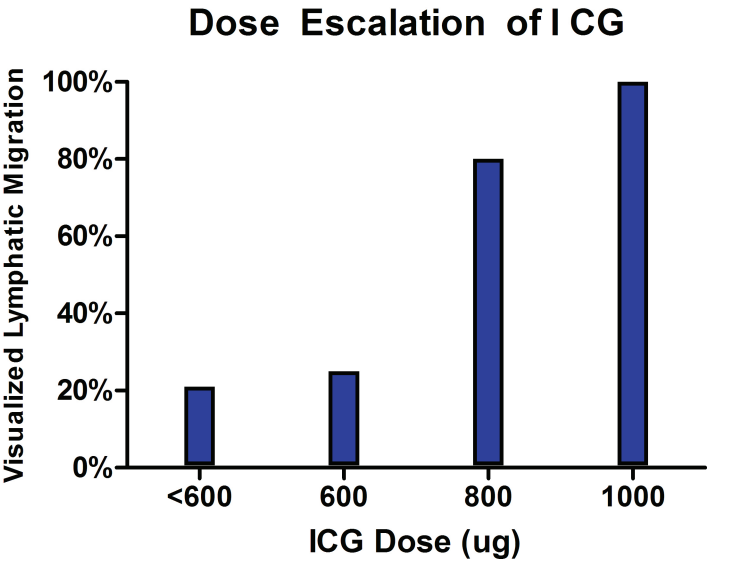
Denis M. Gilmore[1], Onkar V. Khullar[1], Michael T. Jaklitsch[+1], John V. Frangioni[2], Yolonda L. Colson[+1]

1. Thoracic Surgery, Brigham and Women's Hospital, Boston, MA, United States. 2. Beth Israel Deaconess Medical Center, Boston, MA, United States.

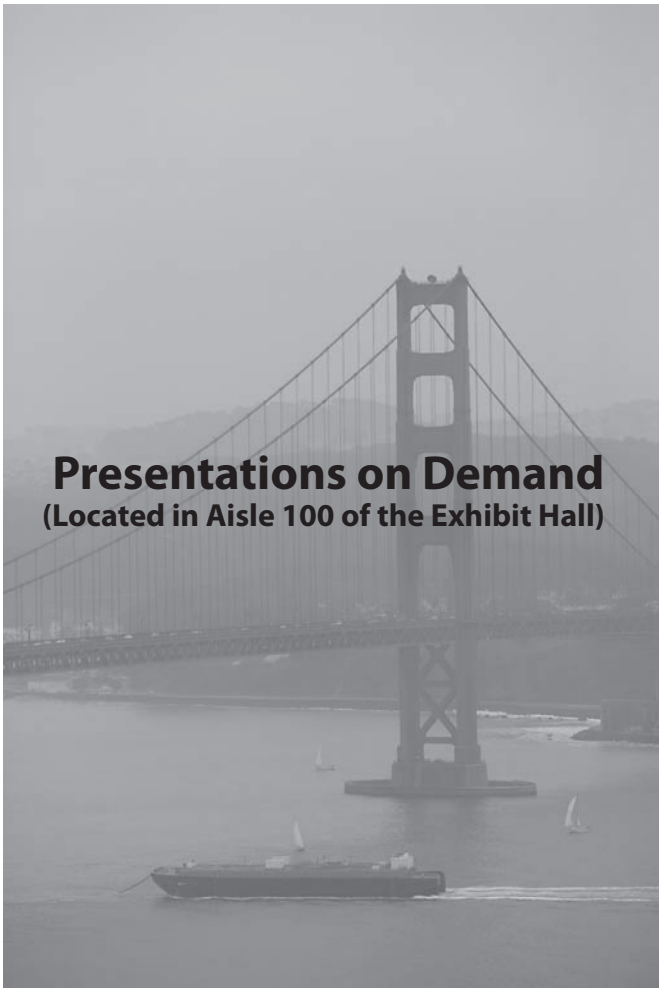
OBJECTIVE(S): Early stage non-small cell lung cancer has a high recurrence rate and low 5-year survival rate with lymph node involvement being the most important prognostic factor. Our objective is to use near-infrared (NIR) fluorescence imaging intraoperatively to identify tumor draining lymph nodes at greatest risk of metastasis.

METHODS: This is the first reported Phase I dose escalation clinical trial determining safety and feasibility of intraoperative NIR imaging using the fluorophore indocyanine green (ICG) in patients with stage I/II NSCLC. Intraparenchymal, peritumoral injection of ICG was performed over a dose range of 3.8 ug to 1 mg. Visualization of lymphatic migration, sentinel lymph node identification, and lymph node station were measured. Images were obtained either through open platform imaging via thoracotomy (n = 18) or thoracoscopic imaging (n = 11).

RESULTS: Twenty nine patients underwent peritumoral injection of ICG prior to lung resection. A dose escalation from 3.8 ug to 1 mg demonstrated dose dependant visualization of lymphatic migration. 5 out of 6 patients (83.3%) at doses of 800 ug or greater demonstrated visualization of lymphatic migration. No adverse reactions were noted. The optimal injection technique consisted of an intraparenchymal injection of ICG coupled with albumin, followed by a short period of lung ventilation.



CONCLUSIONS: Intrathoracic SLN visualization in patients with non-small cell lung cancer can be accomplished using minimally invasive NIR imaging and intraparenchymal peritumoral injection of ICG at a dose of 1 mg. NIR imaging with ICG is both safe and feasible without any adverse event reported in the first 29 patients. Further studies are needed to confirm the specificity and sensitivity of sentinel lymph node mapping in non small cell lung cancer.

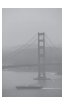


Presentations on Demand
(Located in Aisle 100 of the Exhibit Hall)

Adult Cardiac Surgery

Congenital Heart Disease

General Thoracic Surgery



Hours of Reviewing

Exhibit Hall Level 1 Aisle 1, Moscone West Convention Center

Sunday, April 29	5:00 p.m. – 7:00 p.m.
Monday, April 30	9:00 a.m. – 4:30 p.m.
Tuesday, May 1	9:00 a.m. – 4:00 p.m.

P1 **Surgeon Volume Influences Outcomes in Thoracic Aortic Endovascular Repair**

Authors/Institutions: W.F. Johnston, C.M. Bhamidipati, J.A. Kern, G. Ailawadi, Department of Surgery, Division of Thoracic and Cardiovascular Surgery, University of Virginia, Charlottesville, VA; G.R. Upchurch, J.A. Kern, Department of Surgery, Division of Vascular and Endovascular Surgery, University of Virginia, Charlottesville, VA; C.J. Lutz, Department of Surgery, Division of Cardiothoracic Surgery, State University of New York Upstate Medical University, Syracuse, NY

OBJECTIVE(S): The impact of surgeon volume on patient morbidity and mortality following thoracic endovascular aortic repair (TEVAR) remains unknown. Based on contemporary volume-outcome results from general and vascular surgery, we hypothesized that surgeon volume has a significant impact on patient outcomes following TEVAR.

METHODS: A total of 5739 patients underwent TEVAR placement between 2005 and 2009 for any indication gathered from the Nationwide Inpatient Sample (NIS). Using unique identifiers, annual surgeon case volume was calculated and stratified into terciles for comparison (Low = 1-10, n = 2078; Medium = 11-50, n = 1733; High ≥ 51, n = 1927). Multiple logistic regression analyses were performed to evaluate in-hospital mortality, the occurrence of any complication, and discharge disposition.

RESULTS: Cumulative unadjusted mortality for TEVAR was 7.8% (448/5734). High volume surgeons had the lowest mortality [6.0% (116/1927)], while low and medium volume surgeons had increased mortality rates [9.3% and 8.1% (192/2074 and 140/1733), respectively; P = 0.001]. Overall complication rate for TEVAR was 31.6% (1814/5739) with high volume surgeons having fewer complications than low volume surgeons [30.7% vs. 34.6% (591/1927 vs. 720/2078), P = 0.001]. High volume surgeons had the highest incidence of discharge to home [74.1% (1428/1927)] compared to low and medium volume surgeons [66.8%

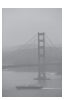
and 71.8% (1386/2074 and 1244/1733), respectively; P < 0.001]. Despite treating older patients with more comorbidities, high volume surgeons had a lower cost of care, less total charges, and shorter length of stay than low volume surgeons (P < 0.001 for all). By multivariate analysis, low and medium volume surgeons increased the adjusted odds of mortality, patient complications, and discharge to an alternative care facility compared to high volume surgeons (Table 1).

Table 1: Multiple logistic regression analyses for annual surgeon procedure volume in thoracic endovascular aneurysm repair as compared to high volume surgeons

	AOR (95% CI) to High Volume Surgeons	
	Low Volume Surgeons	**Mid Volume Surgeons**
Death	1.52 (1.22-2.05)	1.25 (0.92-1.70)*
Any complication	1.27 (1.07-1.51)	1.05 (0.88-1.25)*
Discharge to alternative care facility	1.77 (1.46-2.14)	1.28 (1.06-1.56)

Models adjusted for multiple patient demographics and hospital characteristics
AOR = Adjusted Odds Ratio; CI = Confidence Interval
p≤0.01 for all except * = Non Significant

CONCLUSIONS: High volume surgeons are associated with lower mortality, fewer complications, and a greater probability of discharge to home following TEVAR. These results suggest that annual surgeon volume is an important indicator of outcomes in TEVAR.



P2 **Center Volume Impacts Survival following Orthotopic Heart Transplantation in UNOS Status 1, But Not Status 2, Recipients**

Authors/Institutions: A. Kilic, J.V. Conte, A.S. Shah, Division of Cardiac Surgery, Johns Hopkins Hospital, Baltimore, MD; D.D. Yuh, Section of Cardiac Surgery, Yale University School of Medicine, New Haven, CT

OBJECTIVE(S): The aim of this study was to evaluate whether UNOS recipient status affects the impact of center volume on survival following orthotopic heart transplantation (OHT).

METHODS: The UNOS database was used to identify adult recipients undergoing first-time, single-organ OHT between 1999–2009. Patients were initially distributed into equal size tertiles based on center volume (low: <14.1 OHT/year, intermediate: 14.1–25.4 OHT/year, high: >25.4 OHT/year), and secondarily stratified according to recipient UNOS status (1A, 1B, or 2). Multivariable Cox regression analysis was conducted incorporating other significant recipient and donor univariate predictors of mortality post-OHT. Kaplan-Meier survival analysis was also conducted after stratification based on center volume and UNOS status.

RESULTS: A total of 19,188 eligible patients underwent OHT during the study period. There were 7,468 (38.9%) status 1A, 7,543 (39.3%) status 1B, and 4,177 (21.8%) status 2 recipients. There was a significant trend in decreasing post-transplant survival with more urgent status, such that 1A patients had the worst survival and status 2 patients had the best (5-year: 1A [69.7%], 1B [73.2%], 2 [75.1%]; $p < 0.001$). In risk-adjusted multivariable Cox regression analysis, status 1 patients were found to have a higher risk of postoperative mortality if they underwent OHT at a low volume center as compared to a high volume center (status 1A: HR 1.26 [1.10-1.43], $p = 0.001$; status 1B: HR 1.19 [1.04–1.36], $p = 0.01$). In contrast, status 2 patients had similar post-OHT mortality at low (HR 1.12 [0.95–1.33], $p = 0.17$), intermediate (HR 0.88 [0.74–1.03], $p = 0.12$), and high volume centers (reference). Similarly, Kaplan-Meier analysis indicated that there was a significant trend in decreasing 5-year survival with decreasing center volume for status 1 (log-rank p-value: <0.001), but not status 2 (log-rank p-value = 0.16), OHT recipients (Figure).

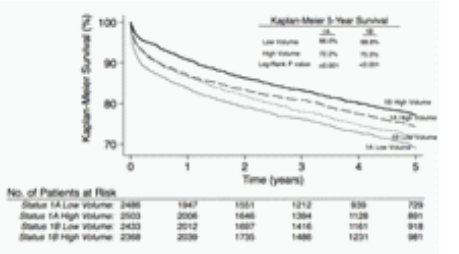


Figure: *Significant Impact of Center Volume on 5-year Survival in UNOS Status 1 OHT Recipients.*

CONCLUSIONS: This large-cohort analysis of over 19,000 OHT recipients demonstrates that center volume has a significant impact on post-transplant survival in UNOS status 1 patients. Conversely, the post-OHT survival of status 2 patients does not significantly differ with center volume. These findings strongly suggest that improved postoperative survival rates among status 1 patients would be achieved if these recipients were consolidated in higher volume transplant centers.

P3 Totally Endoscopic Robotic Ventricular Septal Defect Repair in the Adult

Authors/Institutions: C. Gao, M. Yang, G. Wang, C. Xiao, J. Wang, Y. Zhao, Cardiovascular Surgery, PLA General Hospital, Beijing, Beijing, China

OBJECTIVE(S): We have previously reported totally endoscopic ventricular septal defect (VSD) repair in the adult using da Vinci S Surgical System. The optimal results encouraged us to extend the use of this technology for more complicated cases with VSD.

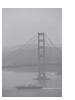
METHODS: From January 2009 to July 2010, twenty patients underwent totally endoscopic robotic VSD repair. The average age was 29.0 ± 9.5 (range 16 to 45) years old. Nine patients were female and 11, male. The echocardiography demonstrated that the average diameter of VSD was 6.1 ± 2.8 (range 2 to 15) mm, and 4 patients had concomitant patent foramen ovale. The VSD closure was directly secured with interrupted mattress sutures in 14 patients, and patched in 6 patients. All the procedures were completed using da Vinci robot via 3 port incisions and 2.0 to 2.5 cm working port in the right chest.

The Results of Robotic VSD Repair

Variable	
Procedure, n	20
Direct closure, n (%)	14(70%)
Patch closure, n (%)	6(30%)
Operation time (min)	225.0 ± 34.8
Cardiopulmonary bypass time (min)	94.3 ± 26.3
Cross clamp time (min)	39.1 ± 12.9
Mechanical ventilation time (h)	4.6 ± 3.3
Drainage volume (ml)	91.8 ± 60.8
Length of stay (d)	5.0 ± 2.1

RESULTS: All patients were operated on successfully. The mean CPB and mean cross-clamp times were 94.3 ± 26.3 (range 70 to 140) minutes and 39.1 ± 12.9 (range 22 to 75) minutes, respectively. The mean operation time was 225.0 ± 34.8 (range 180 to 300) minutes. The postoperative transesophageal echocardiography demonstrated intact ventricular septum. There were no residual left-to-right shunting and no permanently complete AV dissociation after operation. The mean hospital stay was 5 days. No residual shunt was found in the follow-up of mean 7 (range 1 to 22) months. The patients returned to normal function in one week without any complications.

CONCLUSIONS: The totally endoscopic robotic VSD repair in adult patients is feasible, safe and efficacious.



P4 **Safety and Efficacy of Cangrelor, An Intravenous, Short-Acting Platelet Inhibitor in Patients Requiring Cardiac Surgery**

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OBJECTIVE(S): Thienopyridines are a cornerstone of reducing ischemic and thrombotic complications in patients with acute coronary syndromes (ACS) or coronary stents. Guidelines advocate discontinuing thienopyridines prior to surgery to reduce the risk of bleeding complications; however this strategy may predispose patients to perioperative thrombotic complications. Cangrelor, a short-acting, reversible, intravenous P2Y12 platelet inhibitor has recently been shown to reduce transfusion and bleeding complications in patients requiring CABG. Whether cangrelor is an effective and safe perioperative antiplatelet bridge is unknown.

METHODS: Two hundred and ten patients treated with a thienopyridine for an ACS or coronary stent were randomized in a multi-center, double-blinded study to receive cangrelor or placebo while awaiting CABG after discontinuation of a thienopyridine. Platelet inhibition (PI), defined as

P2Y12 Platelet Reaction Units <240, was measured with serial point-of-care testing (VerifyNow™). Pre and postoperative outcomes, bleeding and transfusion rates were compared.

RESULTS: Complete PI was observed in 96% (93/97) of cangrelor and 20% (19/95) of placebo patients. Immediately prior to surgery and after discontinuation of study drug (<1–6 hrs prior to incision), PI remained in 26% (23/90) of cangrelor and 20% (17/85) of placebo patients. Adverse events were common both preoperatively (32/106, 30% vs. 29/101, 29%; p = 0.816) and postoperatively (48/102, 47% vs. 44/96, 46%, p = 0.863), but rates were not statistically different between cangrelor and placebo (respectively), tended to be minor, and unlikely drug-related. Serious adverse events were uncommon preoperatively (5/106, 4.7% vs. 4/101, 4.0; p = 0.790) and postoperatively (8/102, 7.8% vs. 5/96 5.2%; p = 0.454) for cangrelor vs. placebo, respectively (Table 1). Overall, cangrelor-treated patients (vs. placebo) tended toward fewer deaths with most occurring preoperatively in the "washout" period (Table 1). Bleeding and perioperative transfusion rates were not significantly different between groups.

Complications

	Cangrelor (n = 106)	Placebo (n = 101)	P-value
PRE-OP	n (%)	n (%)	
Death	1 (0.9)	3 (3.0)	0.29
MI	2 (1.9)	0	0.17
Stroke	0 (0.0)	1 (1.0)	0.31
POST-OP			
Atrial Fibrillation	13 (12.3)	13 (12.9)	0.90
Renal Failure	0 (0.0)	1 (1.0)	0.30
Death	1 (1.0)	2 (2.1)	0.53
MI	2 (2.0)	1 (1.0)	0.58
Stroke	1 (1.0)	1 (1.0)	0.97
24 hr CTube ≥2 liters	3 (2.9)	4 (4.2)	0.64
Transfuse ≥5 units PRBCs	7 (6.9)	8 (8.3)	0.70
Re-op for bleeding	2 (2.0)	2 (2.1)	0.95

CTube: Chest tube; MI: Myocardial infarction, PRBC: Packed red blood cells

CONCLUSIONS: Bridging patients with cangrelor prior to CABG effectively maintains PI during the thienopyridine washout period. Also, cangrelor did not significantly increase post-operative complications, bleeding, or perioperative transfusions. Cangrelor is an effective tool for surgeons and cardiologists to manage the risk of bleeding while providing effective platelet inhibition in patients awaiting surgery.

P5 Treatment of Functional Mitral Regurgitation—Intervention or Surgery?

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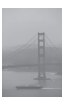
OBJECTIVE(S): Corrective surgery for functional mitral regurgitation (FMR) by restrictive annuloplasty has proven beneficial in that it improves NYHA functional class and induces reverse remodeling. However, proof of a survival benefit for such patients is still pending. Percutaneous techniques of mitral valve repair (MVR) may become a viable treatment alternative for high-risk patients with severe FMR.

METHODS: We retrospectively analyzed our prospective hospital database of patients with severe FMR undergoing either surgical MVR or percutaneous treatment using the MitraClipTM device. Patient characteristics and clinical and hemodynamic outcome at 30 days and 6 months are reported.

RESULTS: From March 2002 through June 2010 76 patients underwent isolated surgical MVR for FMR while 69 patients were treated using the MitraClip™ device. Patients undergoing MitraClipTM treatment were significantly older (73.0 vs 64.5 years, $p < 0.0001$) and due to comorbidity had a generally higher risk with significantly higher mean EuroSCOREs compared to surgical candidates (33.0% vs 10.3%, $p < 0.0001$). Mortality was 5.9% and 3.3% at 30 days, and 11.8 and 4.8% at 6 months (log rank test $p = 0.16$) for intervention and surgery respectively. Freedom from MR ≥II at 180 days was 94.7% after MVR and 76.8% after MitraClip™ therapy ($p = 0.007$).

CONCLUSIONS: In our experience, characteristics, comorbidity and risk factors of patients with severe FMR undergoing surgery differ significantly from those considered for interventional therapy. At 6 months, surgery is more effective compared to MitraClipTM in reducing MR. However, a large proportion of patients still benefits from intervention with sustained MR ≤ II. Despite differences in baseline characteristics, mortality rates were comparable between the two groups. Especially for elderly patients



with relevant comorbidities, MitraClipTM therapy seems an adequate alternative to surgery. At present, both treatment modalities appear to be complementary rather than competitive. Assessment, treatment and postprocedural care of patients by an interdisciplinary team is of paramount importance for clinical success.

P6 Durability of Aortic Valve Repair in Patients with Continuous Flow Left Ventricular Assist Devices

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OBJECTIVE(S): A competent aortic valve is essential in providing effective LVAD support. We have adopted a practice of aortic valve repair (AVRep) by placing a simple coaptation stitch at the time of LVAD implant in those with significant aortic regurgitation (AVr). However, its durability and the incidence of developing delayed aortic regurgitation in these repaired or previously competent aortic valves are unknown.

METHODS: The study included patients who underwent continuous flow LVAD implantation. Patients were divided into two groups, those with a competent aortic valve, and those who underwent AVRep. Clinical end points were mortality, progression/recurrence of AVr, and reoperation for aortic valve pathology. AR was measured qualitatively from mild-severe on a scale from 1–5.

RESULTS: One hundred twenty three patients received continuous flow LVADs between February 2007 and August 2011. Of those, 18 (15%) underwent AVRep and at LVAD implant, they had more severe AVr, 1.8 ± 1.4, compared to those who did not, 0.15 ± 0.43, ($P < 0.01$). At imaging follow-up (median of 312 days; range 0–1429 days), mean AVr score remained low for patients with AVRep (0.27 ± 0.46) in contrast to those without AVRep who had progression in AVr (0.78 ± 0.89) ($P = 0.02$). In addition, the proportion of patients with more than mild AVr favored patients who underwent AVRep (0% vs 18%) ($P = 0.05$). Despite higher 30-day mortality among patients with AVRep, late survival was similar. There were no reoperations for recurrent AVr.

CONCLUSIONS: Repair of AVr with a central coaptation stitch is effective in reducing regurgitation and is durable in patients receiving LVAD with follow-up extending into two years. Over time, AVr worsens in patients when no AVRep was performed. Further investigation is needed evaluating whether prophylactic AVRep should be performed at LVAD implant to avoid developing problematic central regurgitation over time, particularly in patients receiving LVAD for long-term (destination therapy) support.

P7 **In Bicuspid Aortic Valve Disease Requiring Aortic Valve and Supracoronary Proximal Aortic Replacement: Is Sinus Segment Stability A Function of STJ Effacement?**

Authors/Institutions: R.K. Milewski, T. Bavaria, T.J. Wallen, Z.E. Fox, W. Szeto, A. Pochettino, J.E. Bavaria, Surgery, University of Pennsylvania, Philadelphia, PA

OBJECTIVE(S): In Bicuspid Aortic Valve Syndrome (BAVS) requiring valvular and supracoronary aortic replacement, the decision to retain the sinus segment or perform a full root is controversial. Therefore, parameters for safe retention of the sinus of valsalva are needed. This study tests the hypothesis that AVR and supracoronary aortic replacement permits retention and stabilization of the sinus segment in BAVS patients stratified by aortic valve dysfunction and STJ effacement.

METHODS: From 2001–2011, a total of 1050 procedures were performed on BAV patients. AVR and supracoronary ascending aortic procedure was performed on 123 BAVS patients. Patients with emergent operation, dissection, or connective tissue disease were excluded. Pre-operative and most recent post-operative echocardiograms were analyzed on all patients. Patients were stratified by valve pathology, Aortic Stenosis (AS) (74.7%, n = 92) or Severe Aortic Insufficiency (AI) (25.3%, n = 26) and degree of STJ effacement defined as the STJ to annular ratio (Table). Mixed AS and AI were stratified as AS if aortic valve area was <1.45 cm^2.

RESULTS: Mean follow-up was 2.25 years. Average age was 61 ± 11.6 years (AS) and 47.6 ± 11.4 years (AI). There were zero 30 day mortalities. Zero patients required reoperation for aortic valve, ascending aorta, or aortic root replacement. There was one post-operative embolic stoke in an AS patient. Analysis of the AS patient cohort revealed a significant post-operative decrease in the sinus segment size in patients with Mild effacement compared to Normal STJ (p = 0.09) and Moderate effacement compared to Normal STJ (p = 0.013) (Table). Analysis of AI patients revealed a significant decrease in post-operative sinus segment size between Normal and Mild STJ effacement (p = 0.014) (Table). Patients with AI and moderate effacement showed a trend toward enlargement, however, statistical power was not reached. The 1, 5, and 10 year survival was 96%, 90%, and 87%.

Effacement (STJ/ Annular Ratio)	**As (N = 92)** Male = 73	**As Pre-Op Sinus Segment**	**As Post-Op Sinus Segment**	**As Δ Sinus Segment**	**Δ Sinus Segment Compared To Normal (P-Value)**	**Ai (N = 31) Male = 26**	**Ai Pre-Op Sinus Segment**	**Ai Post-Op Sinus Segment**	**Aiδ Sinus Segment**	**Δ Sinus Segment Compared To Normal (P-Value)**
Normal (1-1.3)	51 (55.4%)	3.67	3.77	+. 10	—	21 (67.7%)	4.18	3.85	.04	—
Mild (1.31-1.5)	33 (35.9%)	3.88	3.85	– .03	0.09	7 (22.6%)	4.14	3.85	– 0.33	0.014
Moderate (>1.51)	8 (15.7%)	4.03	3.85	– .18	0.013	3 (9.7%)	4.10	4.40	+ .4	NS

CONCLUSIONS: The sinus of valsalva was stable in the postoperative follow-up period with a significant decrease in segment size as effacement increased from normal to moderate (AS) and normal to mild (AI). However, there was a trend to increased segment size in severe AI with moderate effacement. In BAVS patients with aortic valve and proximal aortic replacement, surgical decisions utilizing degree of aortic valve dysfunction and STJ effacement can predict postoperative sinus of valsalva stability and whether aortic root replacement is necessary.

P8 Effect of Epidural Analgesia on Outcomes in Patients Undergoing Transapical Transcatheter Aortic Valve Implantation

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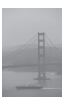
OBJECTIVE(S): Transcatheter aortic valve implantation (TAVI) is an option for the treatment of high-risk patients with severe aortic stenosis (AS). Transapical (TA) approach has been associated with worst outcomes due to worst baseline profile and risks associated with a thoracotomy. Special attention to pain-control for this incision has been demonstrated to be mandatory in other cardiothoracic interventions to avoid impairment of respiratory function. We examined the effects of epidural analgesia on postoperative outcomes in patients undergoing TA-TAVI via thoracotomy for the treatment of severe AS.

METHODS: 135 consecutive patients who underwent TA-TAVI with the Edwards Sapien valve were included in this study. Mean age was 79 ± 8 years and mean logistic EuroSCORE was 19.0%. All procedures were carried out under general anesthesia. An epidural catheter for pain relief was placed in the high thoracic location (HTEA) in 74 patients whereas 61 patients had pain relief via intercostal nerve blockade (INB) and supplemental intravenous/oral medication. Baseline characteristics were the same in both groups. All clinical, procedural and follow-up data were prospectively recorded.

RESULTS: Procedural success was 96.3%. The maximal pain related to the thoracic wound was higher in the INB group (median score 4) versus HTEA group (median score 2) ($p < 0.0001$). We found a higher rate of re-intubation in the INB group (22.2% vs. 2.7%, $p<0.001$). The rates of in-hospital pneumonia and sepsis in the INB and HTEA groups were 14.8% versus 2.7% ($p = 0.012$) and 16.4% versus 2.7% ($p = 0.006$), respectively. Also, 30-day mortality was higher in the INB group versus HTEA (19.7% vs 2.7%, $p = 0.001$). At a mean follow-up of 12 months, cumulative mortality was higher in the INB group versus HTEA group (36.1% versus 17.3%,



p = 0.018). On multivariate analysis, Logistic EuroSCORE (HR:1.027 [95% CI: 1.009–1.046], p = 0.036) and absence of HTEA (HR:2.059 [95% CI: 1.335-3.175], p = 0.0011) were independent predictors of cumulative mortality.

CONCLUSIONS: The use of HTEA is associated with significant decrease in respiratory complications and mortality following TA-TAVI. These results highlight the clinical relevance of an optimal pain control strategy following this procedure.

P9 The Effects of Surgeon and Hospital Volume on Inpatient Mortality following CABG in the United States

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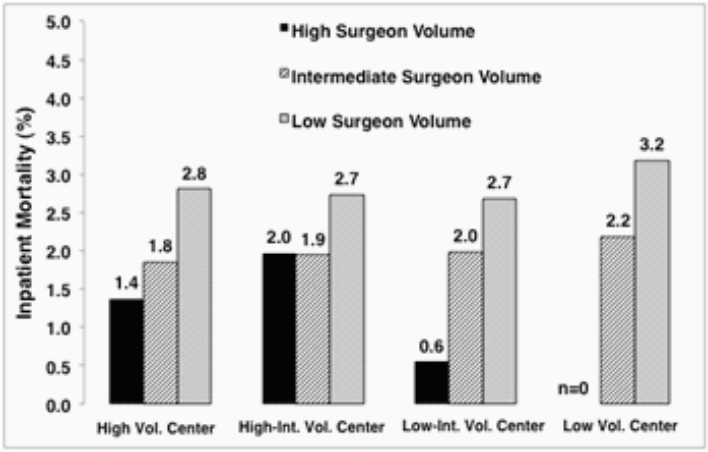
OBJECTIVE(S): Although surgeon and hospital case volumes have been implicated as predictors of mortality after CABG, it remains unclear if one factor drives the other, or if both exert independent effects on outcomes. We evaluated the combined effect of surgeon and hospital volumes on inpatient mortality following CABG.

METHODS: The weighted Nationwide Inpatient Sample was used to identify CABG procedures performed in the United States between 2003-2008. The primary outcome was in-hospital postoperative mortality. Surgeon annual volume thresholds were defined as low <50, intermediate 50–149, and high ≥150. Hospital annual CABG volume categories were defined as low <100, low-intermediate 100–299, high-intermediate 300–449, and high ≥450. Risk-adjusted multivariable logistic regression analyses were conducted to evaluate the independent and combined effects of surgeon and hospital volume on inpatient CABG mortality.

RESULTS: We evaluated 1,044,719 patients who underwent isolated CABG between 2003–2008. In risk-adjusted multivariable analysis excluding hospital volume, low and intermediate volume surgeons were found to have significantly higher inpatient mortality rates as compared to high volume surgeons (intermediate: OR 1.48 [1.27–1.74]; low: OR 2.03 [1.73–2.38]; each $p < 0.001$). Similarly, in multivariable analysis excluding surgeon volume, low and low-intermediate volume hospitals exhibited higher CABG mortality risk compared to high volume hospitals (low-intermediate: OR 1.18 [1.02–1.38], $p = 0.03$; low: OR 1.52 [1.19–1.95]; $p = 0.001$). In combined analysis, low or intermediate surgeon volume persisted as a risk factor for increased mortality ($p < 0.001$), however hospital volume no longer exhibited a significant independent effect. Indeed, surgeon volumes accounted for 72.1% and 48.6% of hospital volumes' effect on mortality in low-intermediate and low volume hospitals, respectively (Figure). Conversely, hospital volume only accounted for 3.4% and 5.4% of the increased mortality risk of intermediate and low volume surgeons, respectively.



Inpatient mortality following CABG, stratified by surgeon and hospital volume.

CONCLUSIONS: In this large-cohort analysis, we demonstrate that lower surgeon and hospital volumes independently portend a higher CABG mortality risk. Of more interest, however, is our finding that surgeon volume impacts inpatient mortality irrespective of hospital volume, whereas the impact of hospital volume on CABG mortality is significantly driven by surgeon volume.

P10 Pulmonary Hypertension Is Associated with Worse Early and Late Outcomes After Aortic Valve Replacement: Implications for TAVR

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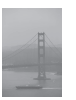
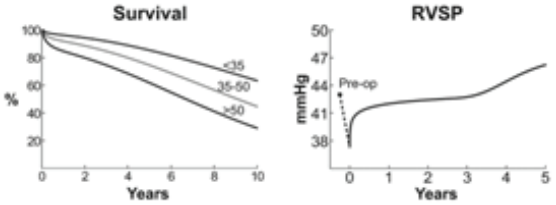
OBJECTIVE(S): To 1) assess prevalence of pulmonary hypertension (PHT) in patients undergoing aortic valve replacement (AVR) for severe aortic stenosis, and 2) analyze its effect on early and late outcomes.

METHODS: From 1/1996 to 7/2010, 4,372 patients underwent primary AVR with or without coronary artery bypass for severe aortic stenosis. Right ventricular systolic pressure (RVSP), a surrogate for PHT, was estimated echocardiographically in 2,385 and analyzed as a continuous variable; these patients constitute the study group. Data were analyzed using multivariable regression validated with bootstrap bagging and hazard function methodology from a prospectively collected database with active follow-up for a total of 10,218 patient-years (mean 4.3 ± 3.4) to assess survival and 3,716 echocardiograms to assess follow-up RVSP.

RESULTS: Median RVSP was 41 mmHg (range 10–104, 15th/85th percentiles 31/56) and remained steady in number of patients and PHT severity over time. Patients with higher RVSP were older, more symptomatic, more likely female, had more comorbidities, and were more likely to have tricuspid or mitral valve dysfunction. Hospital mortality was progressively higher with elevated RVSP (0.9% for 611 patients with RVSP <35 mmHg, 1.9% for 1,199 with RVSP 35–50 mmHg, and 3.1% for 575 with RVSP >50 mmHg). Higher RVSP was also associated with renal ($P < .0001$) and respiratory ($P < .0001$) failure, sepsis ($P = .01$), and prolonged length of stay ($P < .0001$). Early and long-term survival was progressively lower in patients with higher RVSP ($P < .0001$; Figure). RVSP on average did not recover to normal levels after AVR (Figure).





CONCLUSIONS: Most patients undergoing primary AVR have at least moderate PHT, the severity of which is associated with higher hospital mortality, serious complications, and worse long-term survival. PHT severity should be included in risk assessment for patients being evaluated for aortic valve intervention.

P11 Should 3-4+ Mitral Regurgitation be Treated in Patients Undergoing Aortic Valve Replacement? Implications for TAVR

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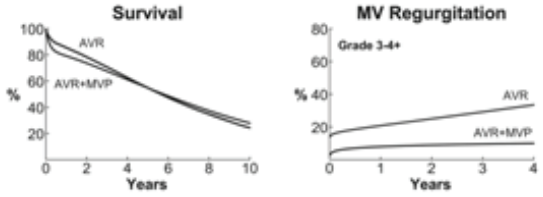
OBJECTIVE(S): To assist with patient selection for transcatheter aortic valve replacement (TAVR) in patients who present with severe aortic stenosis (AS) and 3–4+ mitral regurgitation (MR) by comparing patient characteristics, early and intermediate-term survival, and temporal trends of MR in those who undergo aortic valve replacement (AVR) alone versus those having AVR plus a mitral valve procedure (MVP).

METHODS: Between 1991 and 2010, 1,023 patients with 3–4+ MR underwent AVR alone (n = 314) or AVR + MVP (n = 445 repairs, 264 replacements) for severe AS. Patients undergoing AVR alone were older with more severe AS (0.61 ± 0.14 vs. 0.66 ± 0.15 cm^2, P < .0001), but had lower right ventricular systolic pressure (52 ± 13 vs. 57 ± 17 mmHg, P < .0001). To account for these differences, 240 patients were propensity matched on 81 variables (C = .80).

RESULTS: Thirty-day mortality was lower after AVR alone (4% vs. 7%, P = .008 unadjusted, P = .03 adjusted), but intermediate-term survival was similar unadjusted and adjusted (5-year survival, 57% vs. 54%, P = .6 unadjusted, and 55% for both adjusted, P = .15) (Figure). Although 3–4+ MR was reduced in most patients at 6 months (19% AVR vs. 7.1% AVR+MVP, P < .0001, adjusted), it was not as well maintained after AVR alone (33% vs. 10% at 4 years, P < .0001, adjusted; Figure).



CONCLUSIONS: Survival benefit of avoiding a mitral valve procedure for 3–4+ MR accompanying severe AS is not maintained in the intermediate term after AVR, despite sustained improvement of MR. Both short- and long-term safety and effectiveness of treating 3–4+ MR requires careful consideration in patients being evaluated for transcatheter versus surgical AVR.

P12 Outcomes of Surgical Aortic Valve Replacement in Low-, Intermediate, and High-Risk Patients

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OBJECTIVE(S): The introduction of transcatheter aortic valves mandates attention to outcomes following surgical aortic valve replacement (AVR) in low, intermediate, and very high-risk patients. This study analyzes the outcomes of AVR in three patient cohorts in the current surgical era.

METHODS: A retrospective review was performed from the Society of Thoracic Surgeons Adult Cardiac Database (STS ACD) which captured 141,905 patients who underwent isolated AVR with a STS Predicted Risk of Mortality (PROM) of <4% (Group 1: n = 113,377), 4–8% (Group 2: n = 19,769), and >8% (Group 3: 8,759) from 2002–2010. Fewer than 13.9% of patients undergoing surgical AVR have a predicted risk >8%. Furthermore, outcomes were analyzed based on two time periods: 2002-2006 (n = 63,754) and 2007-2010 (n = 78,151). Patients with previous aortic valve operations were excluded.

RESULTS: The mean age of patients was: Group 1 (65.3 ± 13.0 yrs), Group 2 (77.2 ± 9.9 yrs), and Group 3 (76.8 ± 11.8 yrs) ($p < 0.0001$). Women were more commonly represented in the high risk groups: Group 1 (38.6%), Group 2 (56.1%), and Group 3 (54.1%) ($p < 0.0001$). The median STS PROM for all patients was 1.84 [Interquartile range (IQR): 1.01–3.43] and was 1.46% (IQR 0.88–2.32) in Group 1, 5.24% (IQR 4.54–6.29) in Group 2, and 11.2% (IQR 9.24–15.09) in Group 3 ($p < 0.0001$). Resource utilization and morbidity increased among Groups (Table 1). Compared to PROM, overall observed operative mortality was lower than expected in all patients (2.5% vs 3.0%) and when analyzed within risk group: Group 1 (1.4% vs 1.7%), Group 2 (5.1% vs 5.5%) and Group 3 (11.8% vs 13.7%) ($p < 0.0001$

vs PROM). In patients operated on in the most recent surgical era (2007–2010) compared to 2002–2006, operative mortality was significantly reduced in Group 2 (5.4% vs 6.4%, p = 0.002) and Group 3 (11.9% vs 14.4%, p = 0.0004), but not in Group 1 (1.7% vs 1.7%, p = 0.54).

Operative Outcomes of Patients Undergoing Isolated AVR

Outcomes	Overall (N = 141,905)	PROM <4% (N = 113,377)	PROM 4–8% (N = 19,769)	PROM >8% (N = 8,759)	P-Value
MI (#,%)	1170 (0.82%)	873 (0.77%)	206 (1.04%)	91 (1.04%)	<0.0001
TIA (#,%)	853 (1.05%)	562 (0.85%)	201 (1.89%)	90 (1.92%)	<0.0001
Stroke (#,%)	2154 (1.52%)	1384 (1.22%)	462 (2.34%)	308 (3.52%)	<0.0001
DSWI (#,%)	386 (0.27%)	285 (0.25%)	58 (0.29%)	43 (0.49%)	0.001
Pneumonia (#,%)	4270 (3.01%)	2354 (2.08%)	1124 (5.69%)	792 (9.04%)	<0.0001
MSOF (#,%)	1431 (1.01%)	640 (0.56%)	393 (1.99%)	398 (4.54%)	<0.0001
Heart Block (#,%)	5664 (3.99%)	4150 (3.66%)	992 (5.02%)	522 (5.96%)	<0.0001
New Renal Failure (#,%)	5936 (4.18%)	3174 (2.8%)	1624 (8.21%)	1138 (12.99%)	<0.0001
New Dialysis (#,%)	2174 (1.53%)	891 (0.79%)	642 (3.25%)	641 (7.32%)	<0.0001
Postop Vent (Median hours)	8.0	7.0	12.3	18.0	<0.0001
Postop ICU (Median hours)	44.0	33.0	65.0	90.0	<0.0001
Postop LOS (Median days)	6.0	6.0	8.0	9.0	<0.0001
Operative Mortality (#,%)	3609 (2.54%)	1564 (1.38%)	1014 (5.13%)	1031 (11.77%)	<0.0001

CONCLUSIONS: Nearly 80% of patients undergoing isolated surgical AVR have low risk profiles and excellent outcomes. In the most recent era (2007–2010), outcomes have further improved in medium- and high-risk patients. These results may serve as a benchmark for evaluating outcomes in low-, medium- and high-risk patients undergoing transcatheter aortic valve replacement.

P13 Long-Term Outcomes of Early Surgery for Asymptomatic Severe Chronic Mitral Regurgitation

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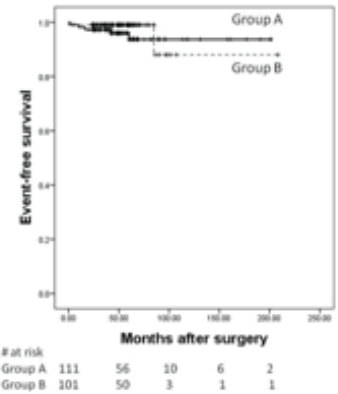
OBJECTIVE(S): We assessed long-term outcomes of early surgery in patients with asymptomatic severe chronic mitral regurgitation. We also evaluated the impact of preoperative left ventricular dysfunction, atrial fibrillation and/or pulmonary hypertension on outcomes in this patient group.

METHODS: From 1992 to 2007, 212 patients with asymptomatic severe chronic degenerative mitral regurgitation underwent early mitral valve surgery within 12 months after echocardiographic diagnosis. The mean age was 50 ± 15 years old. Mitral valve repair was attempted in all cases. We excluded patients who underwent surgery more than 12 months after diagnosis. The mean follow-up period was 56 ± 33 months. We divided patients into two groups; 111 patients with preoperative left ventricular dysfunction, atrial fibrillation or pulmonary hypertension (group A) and 101 patients without any of those findings (group B). Outcome measures included long-term survival, event (mitral valve reoperation or readmission with congestive heart failure)-free survival and recurrent mitral regurgitation. We also compared those outcomes between the two groups by univariate and multivariate analyses.

RESULTS: Mitral valve repair was successfully performed in 211 patients (99.5%) and mitral valve replacement was performed in 1 patient. The operative mortality was 0.5% (1/212). The 7-year actuarial survival, event-free survival and freedom rate from recurrent mitral regurgitation were 98.3%, 97.0% and 93.1%, respectively. There was no difference in the incidence of event or recurrent mitral regurgitation between the two groups. Multivariate analyses did not show that preoperative left ventricular dysfunction, atrial fibrillation and/or pulmonary hypertension was associated with the incidence of late event or recurrent mitral regurgitation.



CONCLUSIONS: Early surgery for asymptomatic chronic mitral regurgitation demonstrates excellent early and late outcomes. Presence of peoperative left ventricular dysfunction, atrial fibrillation and/or pulmonary hypertension does not affect outcomes of mitral valve surgery in this patient group when early surgery is performed and mitral valve repair is attempted.

P14 Does the STS Risk Score Accurately Predict Operative Mortality in Patients with Pulmonary Hypertension?

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OBJECTIVE(S): Conflicting reports argue the influence of pulmonary hypertension (PH) on morbidity and mortality following cardiac surgery. This study sought to assess the impact of PH on mortality following the most common cardiac operations and to evaluate the accuracy of the Society of Thoracic Surgeons' (STS) risk model in patients with PH.

METHODS: All adult cardiac procedures performed at a single center between 1994 and 2010 with a recorded preoperative mean pulmonary artery pressure (MPAP) and STS predicted mortality were reviewed. MPAP was defined as normal (<25 mmHg), mild PH (25–34 mmHg), moderate PH (35–44 mmHg), or severe PH (≥ 45 mmHg). For each group, observed mortality was compared to the median mortality predicted by the STS model. Multivariable logistic regression was performed to evaluate the influence of PH on mortality, including MPAP, STS predicted mortality, year of surgery, and surgeon as covariates in the model, with the normal MPAP group as the reference.

RESULTS: A total of 3343 patient records included STS predicted mortality and MPAP. The population was predominantly male (2326, 69.6%) with mean age 65.8. CABG was the most common procedure (2258, 67.5%), followed by AVR (833, 24.9%), MV procedures (209, 6.3%), and other procedures (41, 1.2%). The number of patients in each PH group is reported in the table, along with observed and STS predicted mortality. The observed mortality was significantly higher than predicted for patients with severe PH. The multivariable analysis found that both moderate PH (odds ratio 7.17, $p < 0.0001$) and severe PH (odds ratio 13.73, $p < 0.0001$) were significantly associated with increased mortality.

Observed versus STS Predicted Mortaltiy Stratified by Severity of Pulmonary Hypertension

	Normal MPAP <25	Mild MPAP 25–34	Moderate MPAP 35-44	Severe MPAP ≥45
N	1816	1068	334	125
Observed Mortality	1.2% (21)	2.1% (22)	7.2% (24)	12.8% (16)
Median STS Predicted Mortality	1.8%	2.3%	4.6%	5.2%
O/E Ratio	0.67	0.91	1.57	2.46
P value	0.13	0.89	0.19	0.04

CONCLUSIONS: The observed mortality was significantly higher than predicted for patients with moderate and severe PH. The STS risk model includes a host of risk factors such as patient age, key comorbidities, and type and urgency of operation to predict operative mortality. However, it does not appear to accurately predict mortality in patients with moderate or severe pulmonary hypertension.

P15 Radiofrequency Ablation Does Not Increase the Incidence of Atrial Tachycardia After the Maze Procedure: Findings from the Postoperative Electrophysiological Study

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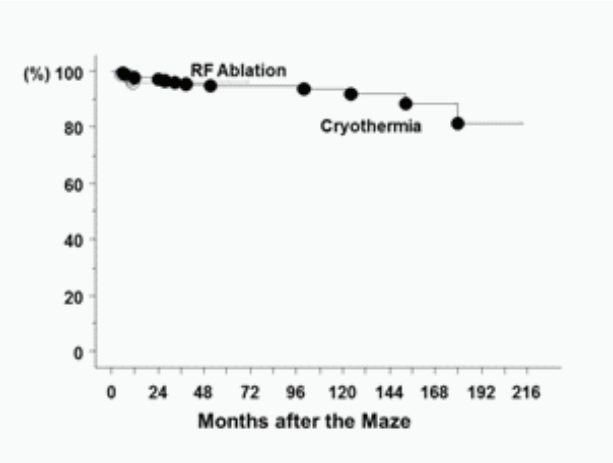
OBJECTIVE(S): Atrial tachycardia (AT) is a common complication with severe symptoms that occurs after the maze procedure. The use of radiofrequency (RF) ablation devices may fail to create a transmural lesion and increase the incidence of AT.

METHODS: The incidence of postoperative AT was examined in association with the surgical technique to create conduction block at each lesion in 318 patients who underwent the maze procedure from November 1993 to September 2011. The patients who underwent only pulmonary vein isolation (PVI) were excluded. There were 178 male and 140 female patients, with an average age of 63 ± 11 years old. The underlying heart disease was valvular in 273 patients (86%). The mode of AF was paroxysmal in 63 patients, persistent in 5, and long-standing persistent in 250. The technique used for the PVI was a cut-and-sew in 13 patients, cryothermia in 84, and RF in 221. The technique used for creating the coronary sinus (CS) lesion was cryothermia in 152 patients, RF ablation in 125, and a combination of these or others in 39. Conduction block across the PVI was confirmed in 158 patients (49.7%) and at the CS in 19 (6%) intraoperatively. All the patients who developed AT were examined by cardiologists and underwent an electrophysiological study and electro-anatomical mapping to determine the mechanism of the AT.

RESULTS: There were 9 (2.8%) early (<30 days) mortalities. Recurrence of AF was observed by an ECG or Holter monitoring in 34 patients (11%). Besides AF, AT occurred in 26 patients (8.4%) at 1–180 months (median, 24) postoperatively. The number of AT morphology ranged from 1 to 5. The mechanism of the AT was macro-reentry due to incomplete ablation at the CS in 18 patients (69%), recurrent conduction across the PVI

in 1, focal activation in 9 (including 3 with also macro-reentrant ATs), and undetermined in 1. The ATs were successfully ablated in 22 patients (85%). There was no significant difference in the incidence of AT due to incomplete CS ablation between the different ablative techniques (p = 0.99). The incidence was 5.4 % after cryothermia and 3.3% after RF ablation during a 6-year postoperative period.



Freedom from AT due to Incomplete CS Ablation. Closed circles with solid lines denote the freedom from AT due to incomplete CS ablation using cryothermia and open circles with broken lines denote that using RF Ablation. There was no significant difference in the incidence of AT due to incomplete CS ablation between the different ablative techniques (p = 0.99, Mantel-Cox Logrank test).

CONCLUSIONS: The majority of the postoperative ATs were associated with an incomplete CS ablation. RF ablation equally creates a conduction block to cryothermia and does not increase the incidence of postoperative AT.

P16 The Effect of ESC/EACTS Guidelines on Myocardial Revascularization on Referral Patterns to Cardiac Surgery

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OBJECTIVE(S): Joint guidelines on myocardial revascularization have been published by the European Society of Cardiology and European Association for Cardiothoracic Surgery (ESC/EACTS). Surgical disease is defined as left main stem, proximal LAD or three vessel disease (3VD). The guidelines suggest that patients with such pathology should be discussed with a surgeon prior to revascularization and ad hoc percutaneous coronary intervention (PCI) has no elective indication in these categories. No similar guidelines are in place in United States. We assess the impact of their introduction on referral patterns to a cardiac surgery service at a single, large volume cardiothoracic centre in the United Kingdom.

METHODS: ESC/EACTS Guidelines were published in August 2010 and presented in all units in UK involved in PCI and cardiac surgery. To assess their impact, referral patterns of all patients with stable surgical disease undergoing PCI at one institution were examined for six months before (Jan-June 2010) and six months after (Jan-June 2011) their introduction. Patients and demographics were identified from the British Cardiovascular Intervention Society Database. Treatment allocation and referral patterns were collected from minutes of Joint Cardiology/Cardiothoracic Multidisciplinary Meetings (MDM) and electronic patient records. Re-intervention rates were collected.

RESULTS: There were 197 patients who underwent elective PCI pre guidelines of which 62 had surgical disease. Only six (10%) were discussed at a MDM prior to intervention. Following introduction of the guidelines, 164 elective PCI were performed, of which 42 had surgical disease. Again only eight (19%) were discussed at MDM prior to intervention (p = NS). Follow up was completed for a median of 17 (15–20) months for pre and 4 (2–8) months for post guideline groups.

— 7 (12.5%) patients in the pre-guideline group underwent further PCI and mortality was 5% (n = 3) during follow up. Within the post guideline group, 2 (5%) underwent further PCI and there were no deaths.

— Ad hoc PCI in surgical disease occurred in 8 (13%) of patients pre guidelines and was unchanged at 9 (21%) patients post guidelines (p = NS).

— These patterns reflect practice across the whole of London.

CONCLUSIONS: Despite the development of ESC/EACTS Guidelines and widespread publicity, inappropriate elective and ad hoc PCI is performed in a significant number of patients who would clearly benefit from surgical revascularization.

P17 Outcomes After Transcatheter Aortic Valve Implantation in Patients with Impaired Left-Ventricular Function According to Standardized Endpoints

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OBJECTIVE(S): Transcatheter aortic valve implantation (TAVI) has demonstrated its benefits in patients with high risk for surgical aortic valve replacement. We sought to assess the outcomes of patients who underwent TAVI with regard to baseline left-ventricular function according to standardized endpoints recently defined by the Valve Academic Research Consortium (VARC).

METHODS: From 03/2008–07/2011, TAVI was performed in 300 consecutive patients at our institution using a balloon-expandable (BE) or self-expanding (SE) transcatheter heart valve. Baseline parameters, intraprodedural, and follow-up data were prospectively collected. In a retrospective analysis, patients were designated to group 1 (baseline left ventricular ejection fraction <45%) or group 2 (baseline left-ventricular ejection fraction ≥45%) and outcomes were analysed according to standardized endpoints defined by the VARC.

RESULTS: Fifty-nine patients were designated to group 1, 40 (67.8%) of whom had received a BE and 19 (32.2%) a SE device. In group 2 (n = 241), implantation of an BE had been performed in 215 (89.2%) and SE in 26 (10.8%) patients. Age was 77.6 ± 7.9 (group 1) and 80.6 ± 9.3 years (group 2, p = 0.02). Risk scores predicted a higher mortality for group 1 (log EuroSCORE 30.8 ± 13.9% vs. 21.8 ± 13.3%, p<0.001; STS-PROM 10.9 ± 8.1% vs. 9.0 ± 6.9%, p = ns). Device success was achieved in 53 (89.8%, group 1) and 204 (84.6%, group 2); the 30-day safety endpoint was reached in 15 (25.4%) and 50 (20.7%), respectively. Mortality at 30 days was 11.9% (group 1) and 10.4% (group 2). Major stroke occurred in 3 (5.1%) and 14 (5.8%), severe renal dysfunction in 5 (8.5%) and 4 (1.7%) (p = 0.02), and major access site complications in 2 (3.4%) and 24 (9.9%). One patient in

each group suffered from periprocedural myocardial infarction. Conduction disorders required permanent pacemaker implantation in 12 (20.3%) and 44 (18.2%) patients. Estimated cumulative 1-year survival was 47% (group 1) and 77% (group 2, $p < 0.01$).

CONCLUSIONS: TAVI can safely be performed in patients with severely compromised left-ventricular function with short-term results comparable to patients with normal or mildly reduced ejection fraction despite a higher predicted mortality. Nevertheless, the underlying disease and comorbidities translate into a significantly reduced mid-term survival in patients with markedly compromised left-ventricular function.

P18 Clinical Impact of Neurocognitive Deficits Following Cardiac Surgery

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OBJECTIVE(S): Neurocognitive deficits (NCDs) have been found to occur frequently following cardiac surgery. Although NCDs have received significant attention in the medical literature and public media, the true clinical impact of these deficits on patient outcomes and quality of life is not well defined.

METHODS: Neuropsychometric testing was performed on 696 patients undergoing coronary artery bypass surgery using a battery of 14 tests divided into 4 domains assessing memory, attention, speed, and psychomotor function. Neurocognitive assessments were performed preoperatively (100% complete), at hospital discharge (99% complete), and at 3 months postoperatively (94% complete). Neurocognitive deficits were defined as a drop in scores by 1 standard deviation in ≥1 domain. Quality of life was assessed using Short Form 36 and clinical outcomes were recorded. Mean age was 65 ± 8 years and 88% were male.

RESULTS: There was no in-hospital mortality and 99% survived at 3 months. NCDs were identified in 265 (38%) patients at discharge and in 132 (19%) at 3 months. Predictors of NCD at discharge were elevated preoperative creatinine ($p = 0.04$), increased cardiopulmonary bypass time ($p = 0.005$), and diabetes ($p = 0.003$). Intensive care unit stay (1.6 ± 2.2 vs. 1.3 ± 1.3 days, $p = 0.05$) and hospital stay (6.9 ± 4.3 vs. 6.2 ± 2.9 days, $p = 0.01$) were slightly longer in NCD patients. At 3 months, patients experienced improvements in both physical (34 ± 2% increase vs. baseline) and mental (10 ± 1% increase vs. baseline) components of quality of life, independent of the occurrence of NCDs ($p > 0.5$). Independent predictors of quality of life improvement included younger age, severe preoperative symptoms, normal left ventricular function, and absence of post-operative wound infection, but not NCDs (Table 1).

Table 1: Predictors of Improved Quality of Life Following Cardiac Surgery

Variable	Parameter Estimate	95% C.I.	p-Value
Younger Age	0.28	0.14–0.41	<0.001
CCS Angina Class	3.29	1.94.67	<0.001
Left Ventricular Function	1.31	0.01–2.6	0.04
Sternal Wound Infection	9.65	1.2–18.1	0.03
Neurocognitive Deficit	**-0.15**	**–3.0–2.7**	**0.92**

CONCLUSIONS: Neurocognitive deficits can be frequently detected on comprehensive neuropsychometric testing following cardiac surgery. However, they are not associated with any clinically important differences in patient outcome or in quality of life after surgery.

P19 Lateral Caval Flap Repair of Sinus Venosus Atrial Septal Defect: A Natural, Novel Approach

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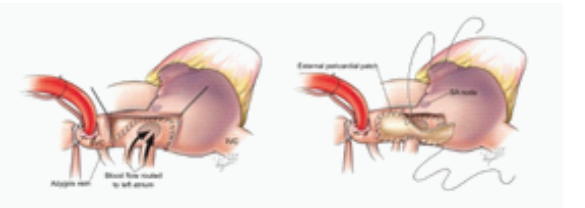
OBJECTIVE(S): Repair of sinus venosus atrial septal defect (SVASD) involves closing the atrial septal defect (ASD) and re-routing the anomalous pulmonary veins to the left atrium through the ASD without narrowing either the pulmonary veins or superior vena cava (SVC) or injuring the sinus node. Single patch and double patch repair techniques, and the Warden procedure, have been proposed and used. We found another approach to be more straightforward, natural, and attractive.

METHODS: From January 2000 to June 2010, 32 adult patients underwent repair of SVASD with anomalous right upper pulmonary veins using a lateral caval flap approach. Mean age was 48 years (range 26–74 years); 14 were men and 18 women. Intra- and postoperative echocardiograms and pre- and postoperative in-hospital electrocardiograms were reviewed. The Social Security Master Death File was interrogated for late mortality.



RESULTS: Of the 32 patients, 21 had a concomitant procedure: coronary artery bypass grafting, maze procedure, tricuspid valve repair, mitral valve repair, pericardiectomy, and patent foramen ovale (PFO) closure. Isolated procedures and those combined with PFO closure were performed via partial upper sternotomy. No patient required intraoperative revision or reoperation. There were no residual ASDs. No patient developed stenosis of either redirected anomalous pulmonary veins or SVC. There have been

no early or late deaths. Twenty-eight of 29 patients remained in sinus rhythm; 1 had junctional rhythm. One of 3 patients in atrial fibrillation preoperatively converted to sinus rhythm.

CONCLUSIONS: The lateral caval flap approach to SVASD repair is logical and simple. Initial results are excellent, with preservation of sinus node function and unobstructed venous return, both from SVC and anomalous pulmonary veins.

P20 Robotic Totally Endoscopic Double-Vessel Coronary Artery Bypass Grafting—State of Procedure Development

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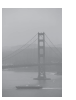
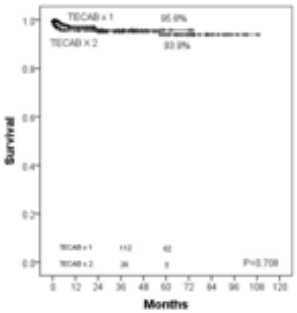
OBJECTIVE(S): Robotic totally endoscopic coronary artery bypass grafting (TECAB) has been under development for 10 years. With growing experience and technological improvement, double-vessel TECAB has become feasible. The aim of this study was to compare the current outcomes of single- and double-vessel TECAB.

METHODS: Between 2001 and 2011, 484 patients underwent TECAB by four surgeons at two institutions. Median age was 60 (31–90) years and the median EuroSCORE was 2 (0–13). Single- (n = 334) and double- (n = 150) vessel procedures were carried out using the daVinci®, daVinci®S™ and daVinci®Si™ robotic systems (Intuitive Surgical, Sunnyvale, CA, USA).

RESULTS: Compared to the single-vessel procedure, double-vessel TECAB required longer operative time (375 (168–795) min vs. 240 (112–605) min, $p < 0.001$) and had an increased conversion rate to larger thoracic incisions (31/150 (20.7%) and 31/334 (9.3%), $p < 0.001$). Ventilation time was 10 (0–288) hours vs. 8 (0–278) hours ($p = 0.006$). Hospital stay was comparable with 6 (2–27) days for double-vessel TECAB and 6 (2–33) days for single-vessel TECAB ($p = 0.794$). Perioperative mortality was 1/334 (0.3%) in single-vessel TECAB and 3/150 (2.0%) in double-vessel TECAB ($p = 0.09$). Freedom from major adverse cardiac and cerebral events (MACCE) at three years was similar following double-vessel and single-vessel TECAB (73.5% vs. 83.1% $p = 0.150$). Three year survival was 95.8% and 93.9% ($p = 0.708$) (Figure 1).





Single- and double-vessel TECAB survival curves.

CONCLUSIONS: Double-vessel TECAB appears feasible and reproducible. Operative times are longer and conversion rates to larger thoracic incisions are higher than in single-vessel TECAB. Postoperative ventilation time is longer. Other perioperative morbidities and mortality, recovery time, and long-term clinical outcomes, however, are comparable.

P21 Inhaled Epoprostenol in Adult Cardiac Surgery Patients: Is It Safe and Effective?

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OBJECTIVE(S): Inhaled Epoprostenol (iEPO) has been studied in several clinical trials as a substitute to inhaled Nitric Oxide (iNO). However, there are no large clinical trials examining the transition of iNO to iEPO in cardiac surgery patients. In November 2008, we initiated a trial of transitioning all adult cardiac surgery patients who were started on iNO in the Operating Room to iEPO within 6 hours of arrival to ICU. The purpose of this report is to examine 1) safety, 2) efficacy, and 3) cost differential of the transitioning from iNO to iEPO in a contemporary adult cardiac surgery patient population.

METHODS: The medical record of all adult (>18 yrs) cardiac surgery patients who were started on iNO in the Operating Room were reviewed and abstracted. The indication(s) for inhalation of iNO (RV dysfunction, pulmonary hypertension, or hypoxia) were abstracted. Hemodynamics (systemic blood pressure, central venous pressure, pulmonary artery pressure, and cardiac output and index) and oxygenation index (PaO2/FIO2) on iNO (prior to change-over to iEPO), immediately after change-over to iEPO, and 6 hrs after inhalation of iEPO were recorded.

RESULTS: During the study period, 197 adult cardiac surgery patients were treated with iNO in the OR. The indications for iNO use were: pulmonary hypertension (n = 24), RV dysfunction (n = 104) and hypoxemia (n = 94) (some patients had more than one indication). All of the patients were successfully transitioned to iEPO within 6 hrs of arrival in the ICU. None required restarting of iNO due to clinical deteriorations. The transition from iNO to iEPO did not affect PA pressure, hemodynamics, or oxygenation parameters ($p > 0.05$ in all categories). Furthermore after 6 hours of iEPO, the hemodynamics and oxygenation parameters remained stable ($p > 0.05$ in all categories). There were no complications associated with

the administration of iEPO during the 6 hrs of the study period. 90.4% (19 deaths) of patients in this cohort survived and were discharged from the hospital. Assuming that iNO would have been continued as long as iEPO, the mean cost-saving per patient was $5083.

CONCLUSIONS: Transition from iNO to iEPO in adult cardiac surgery patients within 6 hours of arrival in ICU is safe, equally effective in maintaining pulmonary hemodynamics and oxygenation index, and is associated with a cost saving.

P22 Twenty-Five Year Outcomes After Multiple Internal Mammary Artery Bypass

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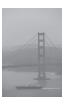
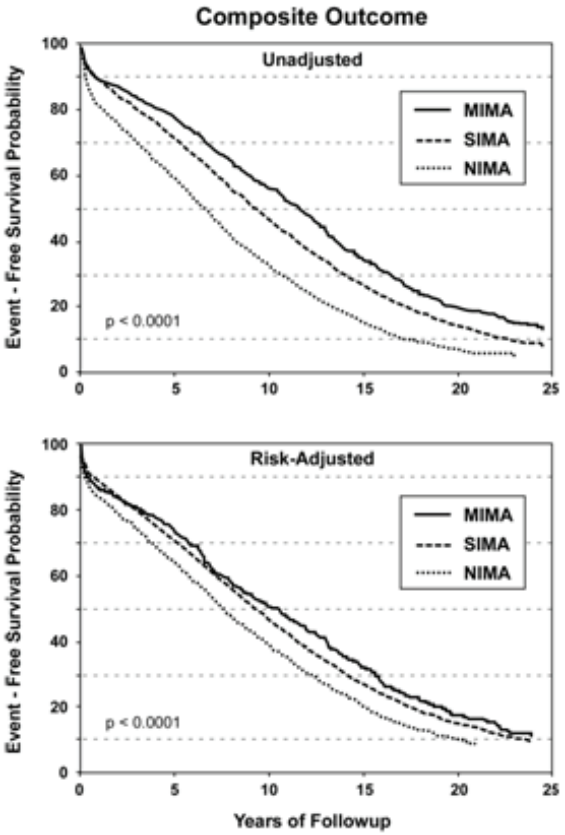
OBJECTIVE(S): Coronary artery bypass (CABG) with multiple internal mammary arteries (MIMA) is currently controversial. In the National database last year, only 4% of CABG cases involved MIMA's, despite many previous studies showing improved late results. The goal of this analysis was to assess outcomes of a single institutional experience with MIMA grafting for guidance with future clinical decisions.

METHODS: From a consecutive series of 19,483 isolated CABG patients over 23 years (1986-2009), all clinically important baseline patient characteristics were entered into a prospective databank, and follow-up data were obtained by yearly questionnaires, phone contact, and/or National Death Index. Outcomes examined were non-fatal myocardial infarction, late percutaneous coronary intervention, re-operative CABG, all-cause death, and a composite of all four. Three groups were defined: 1) No IMA graft (NIMA; 1,874/19,483 or 9%); 2) Single IMA grafting and adjunctive venous conduits (SIMA; 16,881/19483 or 87%); and 3) MIMA grafts (728/19,483 or 4%). Kaplan-Meier methods were used for unadjusted time to event comparisons, and Cox proportional hazards modeling was employed to adjust for differences in baseline patient characteristics. Comparisons between groups in the adjusted setting were performed using area-under-the-curve (AUC) analysis.

RESULTS: Significant differences in baseline characteristics (NIMA; SIMA; MIMA) included: Median age [years] (66; 64; 59), CHF [%] (22; 18; 13), EF (0.50; 0.52; 0.51), reoperation [%] (10; 3; 7), diabetes [%] (27; 30; 15), and female gender [%] (33; 28; 20). No differences existed in median number of diseased vessels (3; 3; 3), number of grafts per patient (3; 3; 3), or preoperative renal function. A positive gradient of improved composite outcome was observed as IMA grafts increased (Figure), whether assessing unadjusted or risk-adjusted data. Compared to NIMA, adjusted HR for SIMA was 0.79 [CI = 0.74–0.83], and for MIMA was 0.70 [CI = 0.62-0.80] (both $p < 0.001$). Average AUC improvement in adjusted composite outcome for SIMA-NIMA was 16%, and for MIMA-NIMA was 23%.





CONCLUSIONS: While this study should be interpreted within the context of observational analysis, the results confirm improved patient outcomes with MIMA grafting, achieving half again as much benefit as SIMA alone, a magnitude that is perhaps clinically significant. The data suggest that increased application of MIMA grafting during routine CABG should be encouraged to mitigate the inherent risks and costs of later cardiac events.

P23 Off-Pump Coronary Artery Bypass Is Associated with Fewer Adverse Events in Higher Risk Patients After Adjustment for Patient Factors, Center Volume and Surgeon Identity

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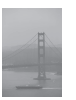
OBJECTIVE(S): It is unknown whether purported benefits of OPCAB are patient-specific within the STS national database or dependent upon center volume or operating surgeon.

METHODS: The STS National Cardiac Database was queried for all non-emergent, isolated CABG patients from 1/1/2005 through 12/21/2010 who had PROM scores and surgeon identifiers. Of these 876,081 cases ("All Sites"), 210,469 patients underwent surgery at sites that performed more than 300 OPCAB and 300 CPB cases during the 6-year study period ("High Volume Sites"). Endpoints included operative mortality, stroke, acute renal failure (ARF), mortality or major morbidity (M+M; including death, reop, deep sternal infection, stroke, ARF, prolonged ventilation), and prolonged postop length of stay (PLOS ≥14d). These were analyzed with conditional logistic models, stratified by site and by surgeon and adjusted for all 30 variables that comprise the STS isolated CABG 2007 predicted risk models, as well as surgery date. Four PROM groups were defined, such that the number of deaths in groups was similar (1st quartile: <1.5%; 2nd quartile: 1.5%–3.0%; 3rd quartile: 3.0%–6.0%; 4th quartile: >6.0%). The interaction of off-pump and PROM groups was tested to determine whether differences between OPCAB and CPB depended upon PROM. Outcomes after off-pump vs on-pump CABG were compared by intent-to-treat within the entire sample and within each PROM group, for All Sites and within High Volume Sites only.

RESULTS: OPCAB was associated with significant reduction in risk of death, stroke, ARF, M+M and PLOS compared to CABG on CPB after adjustment for 30 patient risk factors in the overall sample. This held true within high volume centers alone, and was somewhat more pronounced after adjustment for surgeon effect. See Table. In the overall sample, there was a significant ($p < 0.05$) interaction between OPCAB and PROM for death, ARF, M+M, indicating that OPCAB was associated with greater reduction in these adverse events in patients with higher PROM scores.



	All Sites CABG n = 876,081		High Volume Sites CABG n = 210,469		All Sites Adjusted for Surgeon		High Volume Sites Adjusted for Surgeon	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
Death	0.89 (0.84,0.94)	<.0001	0.84 (0.77,0.91)	<.0001	0.85 (0.80,0.90)	<.0001	0.75 (0.68,0.84)	<.0001
Stroke	0.66 (0.62,0.71)	<.0001	0.66 (0.60,0.73)	<.0001	0.63 (0.58,0.68)	<.0001	0.63 (0.56,0.72)	<.0001
ARF	0.80 (0.77,0.84)	<.0001	0.82 (0.78,0.87)	<.0001	0.77 (0.73,0.81)	<.0001	0.73 (0.67,0.79)	<.0001
M or M	0.78 (0.76,0.79)	<.0001	0.78 (0.75,0.80)	<.0001	0.77 (0.75,0.79)	<.0001	0.74 (0.71,0.77)	<.0001
ProLOS	0.77 (0.74,0.79)	<.0001	0.77 (0.73,0.80)	<.0001	0.77 (0.74,0.80)	<.0001	0.74 (0.70,0.79	<.0001

CONCLUSIONS: OPCAB is associated with reduced adverse events compared to CPB after adjustment for 30 patient risk factors among all sites in the STS National Cardiac Database. This difference was also found within high volume centers and after stratification by surgeon identity, indicating that the difference in outcomes is not explained by center volume or surgeon identity. The reduction in adverse events was greatest for patients with higher STS predicted risk.

P24 Monitoring the Performance of Cardiac Surgery Trainees Performing Minimally Invasive Mitral Valve Repair

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OBJECTIVE(S): We aimed to study the results of minimally invasive mitral valve repair procedures performed by a consultant who introduced the technique at our institution and five trainees surgeons who attend our institutional minimally invasive cardiac surgery training program.

METHODS: The first 50 video assisted mitral repair operations performed by each of five trainee surgeons who attended our institutional minimally invasive cardiac surgery training program between January 2004 and April 2011, were confronted with 250 operations performed by a consultant in the same period, using a propensity score analysis. In addition for each surgeons we used the cumulative sum (CUSUM) method to analyze the learning curve, with a 10% acceptable failure rate and calculated 80% alert and 95% alarm lines (Figure 1). Perioperative death or one or more of 10 adverse events constituted failure.

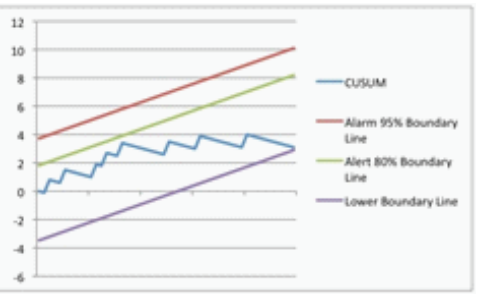

Figure 1

RESULTS: Postoperative outcomes were similar between trainees and consultant. There were 4 conversions (consultant 2, trainees 2). The overall failure rate was 9% (5% for consultant's operations and 4% for trainees' operations), including 2 deaths (0.8%). Cardiopulmonary bypass time (140 ± 72 min vs 161 ± 28 min p = 0.001) as well as aortic cross clamp time (98 ± 53 min vs 107 ± 43 min p = 0.001) were higher in the trainees group.

However, intensive care unit time was higher in the consultant group (1.9 ± 0.7 vs 1.3 ± 1.6 days; $p = 0.05$). No one trainee's Cusum curve crossed the alarm bounadary line. In all 5 trainees the Cusum curves crossed the lower boundary line between operation 15 to 25. Learning curve effect was more evident for those trainees who started to perform minimally invasive mitral repair early in our experience

CONCLUSIONS: Minimally invasive mitral valve surgery can be safely taught to young cardiac surgeons. Implementation of continuous performance monitoring for surgeons who want to gain experience with this technique is practicable. While the institution gains experience, learning curve of trainees is less steep.

P25 Effect of Age on Blood Product Transfusion Following Coronary Artery Bypass Grafting Surgery

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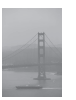
OBJECTIVE(S): Transfusion of blood products following cardiac surgery is a known risk factor for perioperative morbidity and mortality. Transfusion thresholds are often lowered in the elderly despite the lack of clinical evidence for this practice. The effects of transfusion in a specific subset of elderly patients following cardiac surgery have not been previously described. This study sought to examine the predictors for transfusion and its associated effects following coronary artery bypass grafting (CABG), particularly in elderly patients.

METHODS: Since 2005, 792 elective CABG patients with a short ICU stay (<24 hrs) and no reoperations were identified (age ≥75: n = 98). Dichotomous outcomes were evaluated with Fisher's Exact test or logistic regression. Effect of age and blood products on survival was assessed using multivariate Cox proportional hazard modeling.

RESULTS: Patients aged 75 and over were more likely to receive intraoperative (14% vs 4%, $p < 0.001$) and postoperative (15% vs 4%, $p < 0.001$) blood products. Every 10 year increase in age was associated with greater odds for receiving intraoperative (OR = 1.68, $p = 0.002$) and postoperative blood products (OR = 2.10, $p < 0.001$) after adjusting for clinical covariates and preoperative hematocrit. Older age was also significantly correlated with more units of blood. There was significantly increased risk of complications per unit of blood product transfused (Figure). Cox regression revealed that age was not predictive of survival (HR = 1.04, $p = 0.32$), but in the same model receipt of blood products during surgery or hospital stay was a significant predictor of survival (HR = 5.03, $p = 0.02$).



	Intraoperative		Postoperative	
	RBC	Non RBC	RBC	Non RBC
Any Complications	1.76 (0.002)	1.31 (0.02)	2.42 (<0.001)	0.98 (0.93)
Prolonged Ventilation >24hr	2.61 (<0.001)	1.61 (0.008)	6.60 (<0.001)	1.37 (0.048)
Renal Failure	1.45 (0.21)	1.28 (0.07)	2.33 (0.001)	1.20 (0.59)
Pneumonia	2.36 (<0.001)	1.73 (0.008)	4.19 (0.006)	1.49 (0.03)
Operative Mortality	3.31 (<0.001)	1.66 (0.007)	5.81 (<0.001)	1.34 (0.09)

Unadjusted odds ratios for oostoperative complications per unit of RBC or Non-RBC given intraoperatively or postoperatively (p-value).

CONCLUSIONS: In patients with an uneventful CABG surgery, age was a robust predictor for perioperative blood product transfusion. Transfusions were significantly associated with increases in post-operative morbidity and mortality. In fact, receipt of blood products was more predictive of survival than increasing age. Continued study into the effects of transfusion, particularly in the elderly, should direct hospital transfusion protocols to ensure optimization of perioperative care.

P26 Designer Drug AP214 Modulates Total Body Immune Response with Significant Improvement in Loss of Kidney Function and the Combined Endpoint: Death, Renal Replacement Therapy and Kidney Function in Open Heart Surgery—A Phase IIB Multicenter Randomized 2-Dose, Placebo Controlled Trial

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OBJECTIVE(S): More than 500,000 patients/year in the USA and EU undergo cardiac surgery, and a significant fraction (15–25%) of patients develop postoperative acute kidney injury (AKI) resulting in increased mortality, morbidity and prolonged hospital stay. Melanocortin receptor (MCr) agonists have shown marked immune modulating and organ protective effects in different animal disease models. AP 214 is a novel modified non-selective agonist with an increased binding affinity to the melanocortin receptor

The objective of this trial was to evaluate efficacy and safety of AP214 for prevention of development of AKI and long term outcome (GFR or composite endpoint) in patients undergoing cardiac surgery with cardiopulmonary bypass.

METHODS: Randomized, double-blind, placebo-controlled trial in cardiac surgery patients with an increased risk of postoperative AKI. AP214 was given at 2 dose-levels: 600 mcg/kg (low dose) and 800 mcg/kg (high dose), split into three i.v. bolus infusions. A total of 77 patients were randomized. Primary outcome measure: measured GFR baseline vs 4 days and 3 months after surgery and a combined endpoint of death, need of renal replacement therapy (RRT) and reduced kidney function. Secondary endpoint: safety profile and immune modulation.

RESULTS: Patients treated with AP214 showed a 60-70% significant relative risk reduction of the average GFR decline measured in the placebo group 3 months after surgery. Preliminary efficacy analyses revealed that AP214 (high dose compared to placebo) resulted in a lower incidence

of AKI within 48 hours (AKIN score; 9/26 vs 17/26) or 7 days (RIFLE score; 11/26 vs 17/26). AP214 at both dose-levels resulted in a better 90 day outcome on the composite endpoint (death, RRT or reduced kidney function) compared to placebo: placebo (15/26), AP214 low dose (6/25) and AP214 high dose (9/26). At both dose levels AP214 was safe with a safety profile comparable to placebo.

The general inflammatory response after cardiac surgery using cardiopulmonary bypass seemed to be reduced after the administration of AP214, however, these data need further analysis.

CONCLUSIONS: AP214 is safe and efficacy data indicate that AP214 may reduce the incidence of postoperative AKI and may improve long-term outcome in terms of better preserved GFR 3 months after surgery. In spite of the ambitious trial design, these preliminary promising data must be interpreted cautiously with respect to clinical significance and will need further confirmation.

P27 Surgical Pulmonary Embolectomy; A Primary Therapy for Life-Threatening Pulmonary Embolism

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OBJECTIVE(S): Acute pulmonary embolism remains a significant public health threat as the third most common cardiovascular cause of death. Current guidelines consider thrombolysis the primary therapy despite its high frequency of retroperitoneal and intracranial bleeding (15–24%) and 90 day mortality (46–55%). Surgical referrals are often delayed until clinical extremis occurs. Improved techniques for surgical embolectomy and improved long term survival have encouraged a more aggressive surgical approach in patients with hemodynamic instability, echo-documented right ventricular strain or presence of secondary cardiac clots.

METHODS: From January 1998—August 2011, twenty-seven consecutive patients underwent pulmonary embolectomy on cardiopulmonary bypass at a US academic center. Retrospective data review revealed the peri-operative demographic and clinical findings. The Social Security Death Index (SSDI) was queried for all-cause mortality dates of each patient in the database. Kaplan-Meier survival estimates were calculated based on the death dates to determine long-term post-hospital survival of the group.

RESULTS: In this retrospective review patients were more likely to be female (55.6%), Caucasian (63.0%), with history of hypertension (70.4%), and presented emergently for surgery (63.0%), with acute myocardial infarction (40.7%) or heart failure (37.0%). CPB was used in all patients (mean 65.5; SD 42.3 minutes). LOS post-op was 11 days (SD 8.2), and post-op ventilation 58.7 (SD 124.1) hours, including one outlier at 638 hrs. Thrombus extraction from the main pulmonary artery, secondary and tertiary branches was uniformly successful. Importantly, in this inclusive series, there was no 30-day mortality, nor post operative MI, stroke, sternal wound infection, or retroperitoneal/ intra-cerebral bleeding. Two late deaths at 2 and 10 months after discharge were unrelated to the pulmonary embolism or embolectomy procedure. Twenty-five of 27 patients remain alive, with up to 13 years follow-up.

Perioperative Variables	
Characteristic	N = 27
Patient Age, mean (SD)	55.6 (15.4)
Female Gender, n (%)	15 (55.6)
Caucasian Race, n (%)	17 (63.0)
Recent Heart Failure, n (%)	11 (40.7)
MI, n (%)	10 (37.0)
Emergent Status, n (%)	17 (63.0)
CPB Time, mean (SD)	65.5 (43.3)
Stroke, n (%)	0 (0.0)
MI, n (%)	0 (0.0)
Pneumonia, n (%)	4 (14.8)
30-Day Mortality, n (%)	0 (0.0)
1-Year Survival	87.7%
13-Year Survival	87.7%

CONCLUSIONS: Emergency surgical pulmonary embolectomy is safe, effective and provides excellent short- and long-term outcomes. These results support an aggressive surgical approach as primary treatment for life threatening pulmonary embolism.

P28 Concomitant Tricuspid Valve Procedure Reduces Right Ventricular Failure After Continuous Flow Left Ventricular Assist Device Implantation

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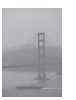
OBJECTIVE(S): Patients requiring left ventricular assist devices (LVADs) commonly have significant tricuspid regurgitation (TR) and right ventricular (RV) dysfunction. The use of continuous flow (cf) LVADs has been associated with reduced post-implantation RV failure. The added benefit of concomitant tricuspid valve procedures (TVP) post-cfLVAD is not well understood. Our hypothesis is that concomitant TVP will augment right heart circulation and afford better short-term clinical outcomes in patients requiring cfLVADs.

METHODS: We retrospectively examined 61 consecutive patients with significant (moderate or severe) TR pre-cfLVAD. Thirty-three of the 61 patients underwent concomitant TVP (LVAD + TVP), while 28 underwent LVAD alone. All patients demonstrated pre-implant features (mean ± SEM) predictive of post-cfLVAD RV failure, including elevated central venous pressure (CVP; 19 ± 1 mmHg), CVP/PAWP (pulmonary artery wedge pressure; 0.70 ± 0.03), and decreased RV stroke work index (RVSWI; 420.2 ± 28.2 mmHg×mL/m^2). Post-implant outcomes were examined, including length of stay and post-implant RV failure, defined as either need for mechanical RV assist device (RVAD) or prolonged inotropic agent infusion (≥14 days). End-organ function was examined and acute kidney injury (AKI) was defined as an increase in creatinine of more than 50% from baseline.

RESULTS: There were no differences between groups with respect to pre-cfLVAD creatinine, CVP, CVP/PAWP, or RVSWI. Patients in the LVAD alone group were more likely to exhibit post-implant RV failure (Table 1, $p < 0.05$) and require RVAD support ($p<0.05$). Post-implant inotropic agent use also tended to be longer in the LVAD alone group vs. LVAD+TVP (12.1 vs. 9.72 days, $p = 0.16$). The incidence of post-cfLVAD AKI appeared to be less in the LVAD+TVP group vs. LVAD. The LVAD+TVP patients also tended



to require a shorter hospital stay than LVAD alone patients and there were statistically fewer patients requiring prolonged hospitalization greater than 30 days ($p < 0.05$). Mortality rates were similar.

Table 1: Clinical Outcome Measures Post-Cflvad Implantation

	LVAD Alone	LVAD+TVP	p-Value
Post-cfLVAD RV Failure	13/28 (46.4%)	6/33 (18.2%)	**<0.05**
Need for RVAD	6/28 (21.43%)	1/33 (3.03%)	**<0.05**
Post-cfLVAD Inotropic Agent Infusion Support (days)	12 (11; 7, 16)	10 (9; 6, 12)	0.16
Post-cfLVAD Acute Kidney Injury	10/28 (32.14%)	7/33 (15.15%)	0.21
Post-implant Hospitalization (days)	32 (20; 15, 37)	24 (19; 13, 27)	0.21
Patients Requiring >30 Days Hospitalization	12/28 (42.9%)	6/33 (18.2%)	**<0.05**
Need for Rehospitalization in 1st Year Post-cfLVAD	17/19 (89.47%)	22/26 (84.6%)	1.0
30 Day Mortality	1/28 (3.5%)	1/32 (3.13%)	1.0
One Year Mortality	5/22 (22.73%)	3/24 (12.5%)	0.45

Duration data depicted as: Average (Median; 25th, 75th Percentile)

CONCLUSIONS: For patients who undergo implantation of cfLVAD with significant pre-implant TR and RV dysfunction, concomitant TVP is associated with reduced post-cfLVAD RV failure and reduction in prolonged hospitalization. Longer follow-up and further study may be required to determine if end-organ function and/or survival is influenced by concomitant TVP.

P29 Successful Linking of the STS Database to Social Security Data to Examine the Accuracy of STS Mortality Data

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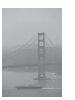
OBJECTIVE(S): Linking the Society of Thoracic Surgeons Adult Cardiac Surgery Database (STS–ACSDB) to the Social Security Death Master File (SSDMF) allows for verification of "life status" and long-term evaluation of surgical outcomes. The objective of this study is to confirm the feasibility of linking STS–ACSDB to SSDMF and to examine the accuracy of STS 30-day mortality data.

METHODS: STS–ACSDB began collecting social security numbers (SSN) on January 1, 2008, with its upgrade to version 2.61. In this analysis, all operations were evaluated using STS data collected under version 2.61 from January 1, 2008 to December 31, 2010. All such records were included in the analysis with no exclusions.



For each STS Database Participant, we counted the number of records that were 30-day deaths according to SSDMF but were not 30-day deaths according to STS data, using a combined probabilistic and deterministic matching rule with estimated 88.1% sensitivity, 99.95% specificity, and 98.3% positive predictive value. These records are labeled as "missed" mortalities in the table below.

RESULTS: Between January 1, 2008 and December 31, 2010, STS-ACSDB gathered records of 870,406 operations. SSN was available for 541,953 operations and was unavailable for 328,453 operations.

According to STS–ACSDB, the number of deaths prior to hospital discharge was 27,278 out of 870,406 (3.13%). In addition, according to STS–ACSDB, the number of 30-day deaths was 29,179 out of 870,406 (3.35%).

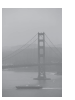
Table 1

Number of Missed Mortalities for a Given STS Database Participant	Number of Participants with this Many Missed Mortalities	Number of Missed Mortalities at all Participants in this Row	Number of STS Records at all Participants in this Row	Number of Missed Mortalities as a Percentage of All STS Operations
0	552	0	392,300	0%
1 to 5	401	869	337,630	0.26%
6 to 10	54	405	83,894	0.48%
11 to 15	17	221	28,400	0.78%
16 to 20	5	89	11,658	0.76%
More than 20	4	126	16,874	0.81%
TOTAL	**1,033**	**1,720**	**870,406**	**0.20%**

For each STS–ACSDB Participant, Table 1 documents the number of records that were 30-day deaths according to SSDMF but were not 30-day deaths according to STS data. These are labeled as "missed" mortalities. The table below provides some indication of the overall frequency of mortalities that are "missed" by STS and the amount of variation in the "missed" rate by hospital. Overall, 1,720 30-day mortalities were missed out of 870,406

operations; thus, only 0.20% of all operations in STS–ACSDB had missed 30-day mortalities. Overall, 1,720 30-day mortalities were missed out of 30,899 total 30-day mortalities; thus, 5.57% of all 30-day mortalities were missed.

CONCLUSIONS: Linkage to SSDMF confirms the current degree of accuracy of data describing "mortality within 30 days of surgery" in STS–ACSDB. Further adjudication is necessary for the 0.20% of operations found to have mortality within 30 days in SSDMF that was not reported to STS–ACSDB. This linkage will allow adjudication of variances and ongoing refinement of mortality reporting.



P30 Improved Left Ventricular Regional Contractility Pattern After Ischemic Postconditioning

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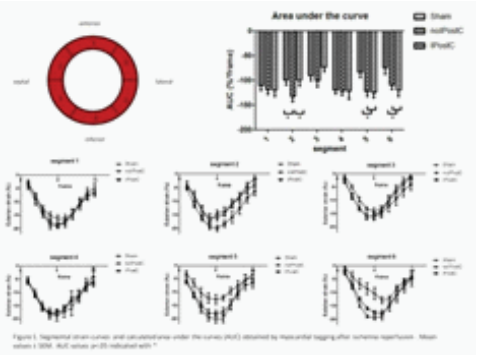
OBJECTIVE(S): Cardiac postconditioning (IPostC) limits reperfusion injury, but its effect on cardiac postischemic remodeling is insufficiently investigated. We studied cardiac morphology and regional contractility after IPostC in mice using cine magnetic resonance imaging (cMRI) with myocardial tagging and Left Ventricular (LV) pressure conductance analysis.

METHODS: Mice (C57BL6/J; age 12 weeks) were anesthetized with pentobarbital (50 mg/kg), xylazine (mg/kg), ketamine (30 mg/kg) and atropine (.03 mg/kg). After 30 min LAD occlusion in vivo, 12 mice underwent reperfusion with IPostC (3 cycles of 10 s reperfusion-reocclusion) and 12 without IPostC (noIPostC). cMRI and cardiac tagging was performed in a 9.4T Bruker Biospec after 1 and 10 weeks. Volumes and ejection fraction (EF) were calculated using home-written software and tagging grid deformation analysis with Diagnosoft 2.72 software. Load independent preload-recruitable stroke work (PRSW) was determined using pressure conductance analysis. Finally, hearts were excised, weighed and collagen content determined on 6µm Sirius red-stained sections using planimetry.

RESULTS: cMRI showed larger end-systolic and -diastolic volumes and reduced ejection fraction (EF) at both 1 and 10 weeks in noIPostC vs. others (all $p < .05$, EF at 10 weeks 45 ± 10% in noIPostC, 55 ± 6% in IPostC and 61 ± 8% in SHAM). Myocardial mass was higher in the noIPostC group vs. IPostC and sham at 10 weeks (72 ± 9 mg vs. 60 ± 13 mg and 59 ± 8 mg respectively, $p < .05$). The tagging grid deformation was less in the anterolateral wall (segment 5 and 6) while the interventricular septum (segment 2) showed significantly more compensatory deformation after IPostC Figure 1), evidenced by the individual strain curves and the calculated area under the curve. PRSW was lower in the noIPostC group (43 ± 13 mmHg vs. 74 ± 10 mmHg in IPostC and 87 ± 9 mmHg in sham, both $p < .01$). The collagen content in the LV wall was higher in noIPostC (.09 ± .02 vs. .04 ± .02 in IPostC and .02 ± .01 in sham, both $p < .001$).



CONCLUSIONS: The cardioprotective effect of IPostC is sustained after 10 weeks and protects against adverse LV remodeling. Myocardial tagging reveals an improved contractility pattern at both postischemic and remote areas, resulting in an increased global contractility.

P31 Prevascularization with Human Umbilical Vein Endothelial Cells Abrogates Contractile Function of Engineered Heart Tissue

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OBJECTIVE(S): Prevascularization has been touted as a method to improve the viability and vascular integration of engineered tissues, including engineered heart tissue (EHT). Addition of human umbilical vein endothelial cells (HUVECs) to rigid scaffold-based EHT has been demonstrated to result in the formation of capillary-like structures but the detailed study of its effect on EHT contractile function is lacking. Here, we defined the functional impact of prevascularization with HUVECs, human coronary artery endothelial cells (HCAECs) and human endothelial colony forming cells (HECFC) in an in vitro self-organizing EHT fiber model.

METHODS: EHT fibers were generated by allowing the self-assembly of neonatal rat cardiac cells on fibrin hydrogel. ECs (2×10^5) were allowed to self-organize with the cardiac cells. Contractile function was measured with an optical force transducer and force-length relationship was assessed. Histology and immunohistochemical studies were used to evaluate general morphology and distribution of HUVECs within the EHT fibers. RT-PCR was used to asses the transcript levels of hypoxia inducible factor-1a (Hif-1α) and myosin heavy chain beta (MyHβ).

RESULTS: HUVECs were heterogeneously located throughout the EHT fiber, although absent from the fiber surface. Human CD31+ tubule-like structures were also identified yielding a density of 250/mm^2. General morphology of EC containing fibers was comparable to control fibers as was the expression level of Hif-1α and MyHβ. However, HUVEC containing EHT fibers (square) had significantly decreased maximal force generation at all preload lengths (L) (where Lmax is the optimal preload yielding the greatest force production), rate of force generation and a flat force-length relationship as compared to control EHT fibers (diamond) (Data expressed as mean ± SD with $p < 0.01$ by t test, Figure 1). This abrogation in force production was not seen with HECFCs or HCAECs.

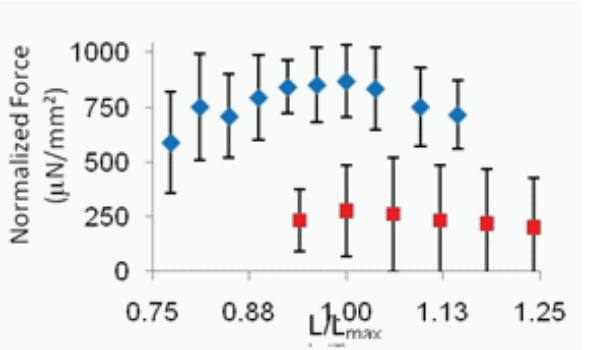

Figure 1. *EHT fibers prevascularized with HUVECs represented as diamond points. EHT without HUVECs represented by the square points*

CONCLUSIONS: The addition of HUVECs results in prevascularization of EHT. None of the ECs improved self-organizing EHT function. For HUVECs, the purported benefit of prevascularization was overshadowed by a significant decrease in EHT contractile function, although this abrogation of function was not due to hypoxia. Other EC types may be more appropriate for the prevascularization of self-organizing EHT. Future efforts will need to be directed at perfusing microvasculature in EHT to improve in vitro contractile function.

P32 Bicuspid Pulmonary Valve Implantation Using Polytetrafluoroethylene Membrane: Early Results and Assessment of the Valve Function by Magnetic Resonance Imaging

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OBJECTIVE(S): Durability of bioprosthetic valves in the pulmonary position is suboptimal. Promising early results of implanting bicuspid pulmonary valve (PV) made of polytetrafluoroethylene (PTFE) membrane were reported, but the valve function is not well defined. The objectives of this study were to evaluate early results of PTFE bicuspid PV implantation and to better define the function of this valve by cardiac magnetic resonance imaging (MRI).

METHODS: Fifty-six patients who underwent PTFE bicuspid PV implantation between June 2009 and August 2011 were retrospectively analyzed. The median age was 17.5 years and the median number of prior operations was 2. Fundamental diagnoses were TOF (n = 38), PA with VSD (n = 8), DORV (n = 7), and absent PV syndrome (n = 3). Indications for surgery were pulmonary regurgitation (PR, n = 34), pulmonary stenosis (PS, n = 10), combined PS and PR (n = 8), and as a part of corrective surgery (n = 4). To assess the function of this valve, preoperative and follow-up MRI data were analyzed. Thirty-two patients with PR underwent MRI preoperatively and 20 of these underwent follow-up MRI at median 6.7 months postoperatively.

RESULTS: There was 1 early death due to ventricular dysfunction. The median valve size was 26 mm and the median CPB time was 140 minutes. The median systolic pressure gradient across the PV (n = 30) was 10 mmHg by direct measurement. Intraoperative TEE (n = 51) showed no or trivial PR in 44 patients and mild PR in 7 patients. Pre-discharge echocardiography (n = 53) showed no or trivial PR in 49 patients and mild PR in 4 patient. Follow-up was complete except 4 foreign patients and the median follow-up duration was 13.5 months. There was no late death or reoperation. Follow-up echocardiography (n = 39) performed at median

6.9 months postoperatively showed no or trivial PR in 32 patients and mild PR in 7 patient. Follow-up MRI revealed good motion of the bicuspid PV and showed significant reduction in right ventricular volumes and significant improvement in biventricular function (Table). The median PR fraction (n = 22) of this valve was 9.5%. Two patients showed moderate PR due to anterior leaflet dehiscence.

Table: Changes in MRI Parameters

Variable	Pre-PVR	Post-PVR	P value
RV EDVI (mL/m2)	170 ± 29	106 ± 22	<0.001
RV ESVI (mL/m2)	85 ± 19	49 ± 15	<0.001
RV SVI (mL/m2)	85 ± 17	57 ± 13	<0.001
Effective RV SVI (mL/m2)	59 ± 13	72 ± 12	0.001
RV EF (%)	50 ± 6	55 ± 8	0.006
PR fraction (%)	50 ± 8	12 ± 8	<0.001
LV EDVI (mL/m2)	76 ± 8	82 ± 12	0.031
LV ESVI (mL/m2)	31 ± 6	30 ± 7	0.347
LV SVI (mL/m2)	45 ± 5	52 ± 9	0.003
LV EF (%)	60 ± 6	63 ± 6	0.014
RV/LV EDV	2.2 ± 0.4	1.3 ± 0.3	<0.001

EDV, End-diastolic volume; *EDVI*, end-diastolic volume index; *EF*, ejection fraction; *ESVI*, end-systolic volume index; *LV*, left ventricle; *PR*, pulmonary regurgitation; *PVR*, pulmonary valve replacement; *RV*, right ventricle; *SVI*, stroke volume index.

CONCLUSIONS: Early results of bicuspid PV implantation using PTFE membrane were satisfactory. PTFE bicuspid PV demonstrated excellent performance for the short term as evidenced by echocardiography and MRI. Leaflet dehiscence was a pitfall of this technique. Long-term follow-up is mandatory to determine the durability of this valve.

P33 Atrioventricular Valve Plasty Under the Guidance of Intraoperative Epicardial Real-Time Three-Dimensional Echocardiography

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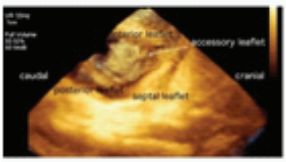
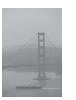
OBJECTIVE(S): The purpose of this study was to assess the feasibility and accuracy of intraoperative epicardial RT3DE (IERT3DE) for obtaining anatomical information of systemic atrioventricular valve as a surgical guide in congenital heart disease.

METHODS: Sixteen patients underwent atrioventricular valve plasty as well as the previous IERT3DE (IE33, Phillips). Median age was 3 years (6 days–13 years) and diagnoses were Asplenia in 3, HLHS in 3, DORV in 2, MR in 4, others in 4. After median sternotomy, the probe covered with a sterilized plastic case was put on the epicardium. Full volume data in 4 beats were acquired with high frame rate (more than 30Hz) by using X7-2 matrix array transducer. 3D images of atrioventricular valve were reconstructed by computer workstation; QLab at OR.

RESULTS: In 15 patients (94 %), we obtained images of good quality and could rapidly create 3D images as surgeon's views within 10 minutes. All the findings from 3D reconstructed images influenced and contributed to the actual valve plasty, when comparing to those of 2D images. Twelve patients (75 %) revealed less than mild regurgitation after the surgery, and artificial chordae reconstruction has been increasing with leaflet prolapse obtained by IERT3DE.



CONCLUSIONS: IERT3DE is a powerful modality to guide surgical planning for atrioventricular valve plasty in congenital heart disease, by providing good quality 3D images viewed from surgeon's position. IERT3DE movie will be presented.



P34 Progression of Neoaortic Annulus and Root Diameters and Aortic Regurgitation Following the Modified Ross-Konno Procedure

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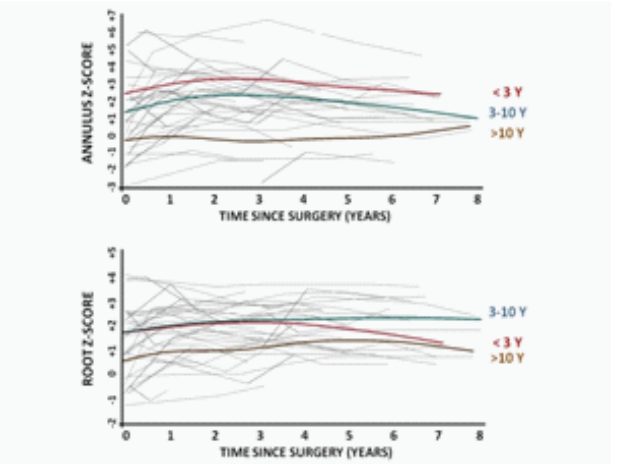
OBJECTIVE(S): In children with multi-level complex left ventricular outflow tract (LVOT) obstruction or significant annular hypoplasia, the Ross procedure, combined with modified Konno-type aorto-ventriculoplasty (Ross-Konno) is commonly performed. Nonetheless, progressive annular & neo-aortic root dilatation with subsequent regurgitation or aneurysm formation is of great concern. Patients following Ross-Konno may be especially at greatest risk due to the inherent disruption of supporting aortic annulus. This study examines progression of neoaortic annulus & root diameters and their effect on regurgitation following Ross-Konno.

METHODS: 43 patients, median age 6 years, underwent modified Ross-Konno by incising the annulus into the septum plus myectomy without VSD patch insertion. Serial Echocardiograms (n = 188, median 5/patient, range 2–11) were collected and regression models adjusted for repeated measures were used to model longitudinal growth of aortic annulus & root.

RESULTS: There were 2 operative deaths (5%) and 1 late mortality. At 8 years, survival was 93% and freedom from autograft, homograft and all-cause reoperation was 100%, 81% and 72%. Median post-procedure neoaortic annulus diameter & Z score were 14 mm (7 to 21), and 1.25 (–3 to +6.1), and median post-procedure root diameter & Z score were 21 mm (9 to 30) and 1.55 (–1.3 to +4.1). Serial Echo data showed progressive increase in neoaortic annulus (+0.56 mm/Y, $p < 0.001$) & root (+0.89 mm/Y, $p < 0.001$) diameters but little changes in annulus (–0.07/Y, $p = 0.08$) & root (–0.002/Y, $p = 0.96$) Z scores. 9 patients developed autograft regurgitation. Progression of regurgitation (jet width / aortic annulus ratio, AR) was +0.001/Y ($p = 0.22$). Older patients started with smaller annulus & root Z scores but had a weak trend for faster AR, annulus & root diameter increase than younger patients. Patients who required concomitant cardiac surgery had faster annulus diameter increase.



Changes in neo-aortic annulus Z score (upper vertical axis) and root Z score (lower vertical axis) over time (horizontal axis) in patients who underwent the modified Ross-Konno operation. While in general, overall Z scores remained steady over time, older patients had a weak trend for faster increase in those Z scores despite the fact that they started at lower Z scores right after surgery.

CONCLUSIONS: The Modified Ross-Konno procedure without patch allows LVOT reconstruction with good mid-term outcomes. In this subset of children with predominantly congenital LVOT obstruction, the autograft continues to grow however; stable annulus & root Z scores indicate that enlargement isn't out of proportion to somatic growth. Only few patients developed autograft regurgitation, usually trivial and nonprogressive, and none required autograft reoperation within our follow-up interval. Our results support modified Ross-Konno as the procedure of choice in children with complex LVOTO.

P35 Biodegradable Remodeling Annuloplasty Ring for Atrioventricular Valve Regurgitation In Common Atrioventricular Canal Defects: A Multi-Institutional Global Collaborative Experience

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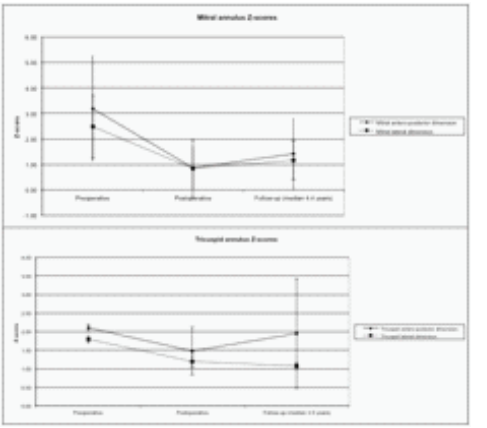
OBJECTIVE(S): Atrioventricular valve (AV) regurgitation is the most common reason for late reoperation after common atrioventricular canal repair. The purpose of this report is to review a collaborative multi-institutional initial experience in using a biodegradable annuloplasty ring in AV valve repair in patients with common AV canal defects.

METHODS: From June 2003 to February 2010, 22 patients (mean age 9.5 ± 9.1 years, range 1–40 years) underwent operation for AV valve repair. 12 patients had partial AV canal and 10 had complete AV canal. 12 were reoperations after prior AV canal repair or other operations. A mitral ring was used in 18 patients on the left AV valve (mean size 23.7 ± 3.4 mm), and a tricuspid ring was used in 6 patients on the right AV valve (mean size 20.9 ± 4.1 mm). Nineteen of the implanted rings were smaller than 26 mm.

RESULTS: There was one early death from biventricular failure. Early post-operative echocardiography showed a mean AV valve regurgitation grade of 0.4 ± 0.7 (3 patients with mild regurgitation, the remainder with trivial or none), a mean transvalvular gradient of 2.6 ± 2.6 mmHg and mitral annulus Z-scores of 0.8 ± 1.1 in the lateral dimension and 0.9 ± 0.8 in the anteroposterior dimension. For the right AV valve, the median early regurgitation grade was 0.3 ± 0.8, with a mean transvalvular gradient of 0.6 ± 1.1 mmHg and annulus Z-scores of 1.2 ± 0.2 in the lateral diameter and 1.5 ± 0.6 in the anteroposterior diameter. During a mean follow-up of 4 ± 2.5 years, there were no late deaths. 2 patients required left AV valve replacement, one for endocarditis and one for worsening regurgitation. In the remaining patients, the mean left AV regurgitation grade progressed to

1.1 ± 0.9 (1 patient with moderate regurgitation, 2 with mild), with transvalvular gradients of 2.6 ± 1.7 mmHg and annulus Z-scores of 1.2 ± 0.8 in the lateral dimension and 1.4 ± 1.4 in the anteroposterior dimension. The mean right AV regurgitation and gradients remained stable (0.5 ± 0.7 and 1.0 ± 1.4 mmHg, respectively), with annular Z-scores of 1.1 ± 0.1 in the lateral and 2.0 ± 1.5 in the anteroposterior diameter.



CONCLUSIONS: The biodegradable annuloplasty ring showed satisfactory results in stabilizing the dilated AV annulus at mid-term follow-up, while allowing for annular growth. It represents a novel tool in the surgical armamentarium for valve repair, potentially increasing the stability of the repair without increasing the complexity of the operation, while allowing for annular growth in children.

P36 Selective Cerebral Perfusion: Is Collateral Flow to the Lower Body Adequate? A Randomized Clinical Trial

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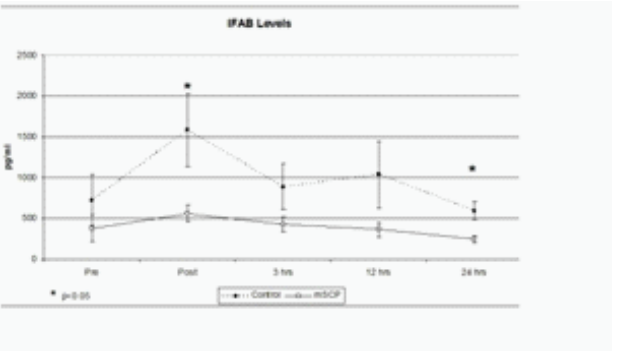
OBJECTIVE(S): Selective cerebral perfusion (SCP) during aortic arch reconstruction is commonly used, but the adequacy of lower body perfusion during SCP has been questioned. Studies have suggested that additional lower body flow during SCP improves outcomes. The goal of this randomized controlled study was to determine if additional lower body perfusion during SCP would decrease markers of tissue ischemia in neonates.

METHODS: 14 neonates undergoing arch reconstruction via sternotomy were randomized to Control (n = 7) or modified SCP (mSCP, n = 7) groups. All patients received SCP (25–30 ml/kg/min) via an innominate artery shunt during arch reconstruction. mSCP patients also received lower body perfusion (34.5 ± 5.5 ml/kg/min) through an in-dwelling lower body arterial line (umbilical or femoral). Cerebral, flank, and quadriceps near infrared spectroscopy (NIRS) were monitored during the procedure; intestinal fatty acid binding protein (IFAB), lactate, and c-reactive protein (CRP) were serially measured over 24 hours post-op; and urine output, serum and urine creatinine (Cr)and Cr clearance (CrCl) were measured daily for 3 days.

RESULTS: There were 4 single ventricle patients in each group with no significant difference in weights (mean 3.4 vs 2.8 kg, $p = 0.14$). There were no differences in cerebral NIRS ($p > 0.1$ at all timepoints). Quadriceps NIRS was significantly higher in mSCP during selective perfusion (27 vs 71 at 20 min, $p = 0.002$) with a similar non-significant trend at the flank (45 vs 64 at 20 min, $p = 0.1$). IFAB was significantly lower in mSCP immediately post-op and at 24 hrs ($p = 0.05$ and 0.02 respectively, Figure). There was no difference in lactate levels, urine output, serum or urine Cr, CrCl, ventilator time, ICU LOS, or total LOS.



CONCLUSIONS: These data suggest that there is some degree of lower body ischemia during SCP that can be decreased by providing direct flow to the lower body. However, augmenting lower body perfusion results in no demonstrable clinical improvement.

P37 Neurodevelopmental Outcomes Following Infant Cardiac Surgery Using Deep Hypothermic Circulatory Arrest with or without Intermittent Perfusion

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OBJECTIVE(S): To compare the neurodevelopmental outcomes (NDO) of infants who underwent cardiac surgery using deep hypothermic circulatory arrest (DHCA) with or without a period of intermittent perfusion (IP) and to identify patient and perioperative variables associated with NDO.

METHODS: Cross-sectional neurodevelopmental evaluation at 2 years of age was performed on 32 patients without chromosomal abnormality who underwent congenital heart surgery using DHCA in infancy. IP was performed by resuming CPB with flows of 80-100 cc/kg/min while remaining at deep hypothermia. The third edition of Bayley scales of Infant and Toddler Development was used to assess cognitive, language, and motor functioning. Clinical and perioperative data were extracted from the medical record.

RESULTS: Patients were stratified into two groups based on the use of IP: uninterrupted DHCA (N = 18, duration 32.2 ± 13.1 min), DHCA with IP (N = 14, 56.6 ± 15.0 min). Mean cognitive, language, and motor scores for each group fell within one standard deviation of the normative mean (10 ± 3). Despite a significantly longer duration of DHCA in the IP group, NDO were comparable (Table 1). In univariable analyses, longer duration of DHCA was significantly associated with worse gross motor outcomes within the IP group ($r = -.69$, $P = .03$), but not within the uninterrupted DHCA group. There was no association with other domains of neurodevelopment. In multivariable analyses, length of stay ($\beta = -.40$, $P = .02$) and presence of a significant preoperative comorbidity ($\beta = -.36$, $P = .03$) predicted worse outcomes in the cognitive domain (36% of variance), while presence of a significant comorbidity predicted worse outcomes in the receptive communication ($\beta = -.38$, $P = .04$, 11% of variance), fine motor ($\beta = -.44$, $P = .02$, 16% of variance), and gross motor ($\beta = -.67$, $P < .001$, 43% of variance) domains. Duration of DHCA was not predictive of any NDO in these models.

Group Differences in Clinical Characteristics and Neurodevelopmental Outcomes

	DHCA with IP (N = 14)		Uninterrupted DHCA (N = 18)		
Neuro-Developmental Scores	**Mean ± SD**	**1Q – 3Q**	**Mean ± SD**	**1Q – 3Q**	**P-Value**
Cognitive	8.2 ± 3.1	5.75 – 10	8.6 ± 3.7	7.75 – 10.25	ns
Receptive Communication	8.9 ± 4.0	6.25 – 12	8.8 ± 4.5	6 – 12.5	ns
Expressive Communication	9.6 ± 4.6	6 – 12	8.7 ± 4.3	6 – 10.5	ns
Fine Motor	10.5 ± 1.9	10 – 12	8.9 ± 3.5	8 – 10	ns
Gross Motor	7.8 ± 1.0	7.5 – 8.25	8.1 ± 2.0	7.25 – 9	ns
Clinical Variables (Continuous)	Mean ± SD	1Q – 3Q	Mean ± SD	1Q – 3Q	
Birth Weight (Kg)	3.1 ± 0.5	2.7 – 3.4	3.0 ± 0.5	2.6 – 3.3	ns
Age at Surgery (Months)	3.2 ± 3.8	0.2 – 5.3	1.5 ± 1.5	0.3 – 1.6	P = .08
Weight at Surgery (Kg)	4.7 ± 2.1	3.1 – 6.4	3.8 ± 1.1	3.3 – 4.5	ns
Aristotle Complexity Score	12.4 ± 3.1	10.6 – 14.6	10.6 ± 3.9	7.0 – 13.0	ns
Duration of CPB (Mins)	133.5 ± 44	103 – 166	86.1 ± 33.2	73.0 – 91.3	P = .002
Duration of DHCA (Mins)	56.6 ± 15.0	44.3 – 70.8	32.2 ± 13.1	28.3 – 40.3	P<.001
ICU Stay (Days)	12.4 ± 9.9	3.5 – 18.0	14.4 ± 36.7	1.0 – 9.0	ns
Length of Hospital Stay (Days)	33.3 ± 50.6	12.8 – 24.5	24.8 ± 42.2	9.0 – 23.0	ns
Cumulative DHCA Duration (Mins in Lifetime)	82.4 ± 46.6	45.8 – 107	41.7 ± 27.6	31.3 – 42.8	P = .004
Clinical Variables (Categorical)	Frequency	%	Frequency	%	
Premature Birth	2	14.3%	2	11.1%	ns

continued

	DHCA with IP (N = 14)		Uninterrupted DHCA (N = 18)		
Neuro-Developmental Scores	**Mean ± SD**	**1Q – 3Q**	**Mean ± SD**	**1Q – 3Q**	**P-Value**
Single Ventricle Physiology	4	28.6%	4	22.2%	ns
Significant Comorbidity	5	35.7%	5	27.8% ns	
Postoperative Cyanosis	4	28.6%	4	22.2%	ns
Morbidity	11	78.6%	6	33.3%	P = .02
Multiple Procedures (Lifetime)	8	57.1%	6	33.3%	ns
Multiple DHCA (Lifetime)	8	57.1%	3	16.7%	P = .03

CONCLUSIONS: NDO following cardiac surgery with DHCA were comparable to normative data. Use of IP allowed prolongation of total DHCA time without adversely impacting NDO. In this cohort, the association between prolonged DHCA and worse ND outcomes appeared to be a surrogate for factors such as severity of illness and length of stay. Studies comparing IP to other cerebral protection strategies (e.g., regional cerebral perfusion) should be considered.

P38 Fontan Circulatory Support: A Decision Algorithm for Systemic vs. Cavopulmonary Assist

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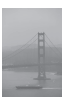
OBJECTIVE(S): Mechanical circulatory support (MCS) for the treatment of Fontan failure remains a significant and complex clinical challenge. Systemic support with a left ventricular assist device (LVAD) may not address all physiologic problems. Right-sided MCS in the form of right VAD therapy has serious limitations, including a need to take-down the Fontan connection. Cavopulmonary assist devices (CPAD) are emerging as a potential targeted therapy for Fontan failure. The objective of this study is to more clearly define MCS strategies for support of the failing Fontan circulation.

METHODS: Computer simulation and mock circulation models of Fontan failure were developed for 4 different clinical scenarios: 1) normal pulmonary resistance (NPR), 2) elevated pulmonary resistance (Right-sided failure, RSF), 3) diminished ventricular contractility and normal pulmonary resistance (Left-sided failure, LSF), and 4) diminished ventricular contractility and elevated pulmonary resistance (L+RSF). The hemodynamic effects of LVAD support, CPAD support, and combined LVAD and CPAD support for each of the 4 scenarios were then studied.

RESULTS: In patients with normal ventricular contractility (NPR, RSF), CPAD support reduces systemic venous pressure and increases preload, thereby augmenting cardiac output and ventricular work. VAD support augments cardiac output, but significantly diminished ventricular volume and end-diastolic pressure which may cause ventricular suction events. In patients with reduced ventricular contractility (LSF), LVAD support is ideal as it augments cardiac output and reduces ventricular volume and end diastolic pressure to normal levels, while CPAD support increases ventricular volume and end diastolic pressure excessively. In L+RSF patients, both CPAD and VAD support may be indicated. Based on these findings, a mechanical circulatory support algorithm is proposed (Figure).



CONCLUSIONS: The selection of left- versus right-sided MCS depends upon differentiation of clinical features of right vs left-sided failure in the failing Fontan circulation. The status of ventricular contractility is the pivotal determinant of this selection. With increasing numbers of survivors of Fontan palliation reaching adulthood, a decision algorithm which will guide MCS therapeutic decision-making in patients with failing Fontan physiology will be clinically useful.

P39 Sodium Bicarbonate Increases Cerebral Blood Flow in Children with Single Ventricle Physiology

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OBJECTIVE(S): Sodium bicarbonate (NaHCO3) is a common treatment for metabolic acidosis. This investigation employed diffuse optical spectroscopies to quantify cerebral blood flow (CBF) and blood volume (CBV) changes following rapid administration of NaHCO3 in children with hypoplastic left heart syndrome (HLHS). We hypothesized NaHCO3 would rapidly increase brain carbon dioxide (CO_2) levels, inducing physiological effects similar to hypercapnia, i.e., increased CBF and CBV.

METHODS: Patients with HLHS prior to each stage of palliative cardiac surgery were recruited for a pre-surgical brain MRI study. An arterial blood gas was obtained as part of the protocol; if necessary, NaHCO3 was given rapidly to correct acidosis.

A hybrid diffuse optical spectroscopy (DOS) and diffuse correlation spectroscopy (DCS) device acquired cerebral hemodynamic data continuously and non-invasively over the forehead. DOS measured changes in total hemoglobin concentrations (ΔTHC) relative to baseline period prior to NaHCO3 administration. DCS quantified changes in CBF (rCBF) relative to baseline.

To quantify the effects of NaHCO3, a 1-minute mean of each DOS and DCS parameter was obtained at 1, 5, 10, and 15 minutes following the injection of NaHCO3. A two-sided Wilcoxon signed rank test tested for changes in each parameter due to NaHCO3, and Pearson's correlation coefficient (R) tested for correlation between each parameter and the amount of NaHCO3 administered.

RESULTS: Of the 97 HLHS children recruited, 15 received NaHCO3 treatment for metabolic acidemia; N = 5 pre-Norwood, N = 5 pre-Glen, and N = 5 pre-Fontan. Patients had a median (interquartile range (IQR)) age of 0.5 (0,2.32) years and received a median (IQR) dose of 1.2 (0.9,1.6) mEq/kg NaHCO3 to treat a median (IQR) base excess of –4(–3,–6).

NaHCO3 significantly increased rCBF in 13/15 patients for up to 10 minutes. At 1 minute post-injection this increase in rCBF was highly correlated with the dose of NaHCO3 administered ($R2 = 0.76$, $p < 0.001$, slope = 39.9 %/(mEq/kg)). No significant changes in ΔTHC were observed at any time following injection. No difference in response of any hemodynamic parameter was observed between patients at different stages of palliative repair.

CONCLUSIONS: This work shows the substantial increases in CBF caused by NaHCO3 in HLHS patients. Because ΔTHC did not also increase, we suspect CBF increases are not solely due to the release of CO2 as initially hypothesized. Clinicians should be cognizant of this rise in CBF when treating with NaHCO3.

P40 Pediatric Robotic-Assisted Surgery: An Intermediate Single-Center Experience

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OBJECTIVE(S): This study reports our initial experience with robotically assisted surgery performed in children with congenital heart disease.

METHODS: Between March 2005 and July 2009, 17 children (mean age, 11.6 ± 4.8 years; range, 5 to 18 years) underwent totally endoscopic repair using remote access perfusion and robotic technology (da Vinci telemanipulation system). All procedures were performed with peripheral cardiopulmonary bypass, transthoracic aortic cross-clamp, and antegrade cardioplegia. Two ports and a 4-cm intercostals incision in the right chest were used for access. A total 21 procedures were performed and included: ASD closure (n = 10, including 1 patient with PAPVR), mitral valve valvuloplasty and annuloplasty (n = 5), tricuspid valve annuloplasty and valvuloplasty (n = 3), and VSD closure (n = 3). Two patients (12%) had a previous sternotomy.

RESULTS: Overall mean study times were as follows: cardiopulmonary bypass, 140.1 ± 56.4 minutes (range, 86 to 300); and cross-clamp, 76.5 ± 46.6 minutes (range, 38 to 207), length of hospital stay, 3.6 ± 2.1 days (range, 2 to 10). No operative or late mortality were observed. Two patients have had early surgical complications (bleeding and pneumothorax). No residual shunt or recurrent insufficiency was detected at intraoperative or early postoperative echocardiography. Mean follow-up was 73.6 ± 16.2 months (range, 35 to 89) and was 100% complete. Only one patient (first patient of the study) ultimately required tricuspid valve repair 2 months after robotic surgery for recurrent severe tricuspid insufficiency.

CONCLUSIONS: Pediatric robotic-assisted surgery can be successfully performed with the da Vinci robotic system. Robotic surgery is feasible and safe for a number of pediatric surgical procedures. Long-term follow-up is needed to determine the durability of the repair compared with a standard sternotomy approach.

P41 Selection Strategy to Correct Transposition of the Great Arteries with Ventricular Septal Defect and Left Ventricular Outflow Tract Obstruction: Aortic Translocation or En Bloc Rotation of the Truncus Arteriosus?

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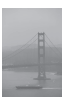
OBJECTIVE(S): We report the operative selection strategy and outcome of aortic translocation and en bloc rotation of the truncus arteriosus in correction of transpostion of the great arteries (TGA) with ventricular septal defect (VSD) and left ventricular outflow tract (LVOT) obstruction.

METHODS: Between 2006–2011, 15 patients (mean age 13.37 ± 3.3, months) with TGA,VSD and LVOT obstruction underwent correction using either aortic translocation and en bloc rotation of the truncus arteriosus. The decision not to proceed with a Rastelli procedure or with an an arterial switch was based on an echocardiographic review of the conal septal anatomy and the mechanism of LVOT obstruction Arterial translocation was the surgical technique used in 12 children in whom the LVOT obstruction is valvar—pulmonary valve is severely dysplastic, the pulmonary annulus is abnormally small and with associated small and malalignment of the right ventricle (RV) precluding the performance of a straight arterial switch. This technique consists of aortic root transection from the right ventricle including the infundibular muscle, transection of the main pulmonary artery above the level of the pulmonary valve,180° aortic root rotation and establishment of pulmonary artery continuity with an interposition heterograft. En bloc rotation of the truncus arteriosus where the aortic root is brought over the LVOT, and the pulmonary root over the RVOT was the preferred technique in 3 children whose LVOT obstruction is subvalvular with a competent albeit small pulmonary valve (mean 6 mm), with an adequate orifice. The native pulmonary valve was preserved and the RVOT was reconstructed with an autologous pericardial patch.

RESULTS: There was no operative mortality. One patient underwent pacemaker implantation for an AV Block III°. All patients were extubated within 48 hours. Hospital stay ranged from 6–19 days. Serial follow-up

echocardiography revealed absence of aortic valve incompetence. Biventricular outflow tracts remained unobstructed, and ventricular functions are normal, in all patients. Freedom from reoperation is 93.3% at 4 years, and survival rate is 100%.

CONCLUSIONS: The decision strategy to choose either aortic translocation or en bloc rotation of arterial trunks to correct TGA with VSD and LVOT obstruction was based on the conal septal anatomy, morphology of the pulmonary valve and level of LVOT obstruction. Both are safe procedures and functional results are highly satisfactory.



P42 Relationship of Normal Aortic Valve Cusp Dimensions as a Tool to Optimize Tricuspidization Aortic Valvuloplasty

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OBJECTIVE(S): Imprecise leaflet reconstruction in aortic valvuloplasty can lead to suboptimal post-operative valve function. Establishing an objective, standardized method for leaflet reconstruction based on readily measurable parameters would improve surgical outcomes. To this end, we evaluated the relationship between the intercommissural distances, free margin length, length of the base of cusp implantation and the cephalocaudal length of aortic valve leaflets in the normal pediatric heart.

METHODS: Morphologic analysis was conducted in 50 normal pediatric (7mo-18 yrs) formalin-fixed heart specimens. For each cusp, measurements were made by a single observer including the circumferential distance between commissures (NC, RC, LC), free margin length (L1), length of the base of cusp implantation (L2) and the cephalocaudal length (A) of each leaflet. Generalized linear modeling for both univariate and multivariate analysis was used to evaluate the correlation between these parameters. Modeling was done both before and after adjustment for covariates to assess the univariate correlation of each potential predictor and to identify the strongest predictors.

RESULTS: Significant correlations ($p < 0.001$) were found between the intercommissural distances (NC, RC & LC) and the L1, L2 and A values of individual leaflets, independent of age, gender and body surface area. Thus intercommissural distance, particularly RC, is a strong, reliable predictor of aortic valve leaflet length parameters. Figure 1 is an example showing the correlation between RC and L1.

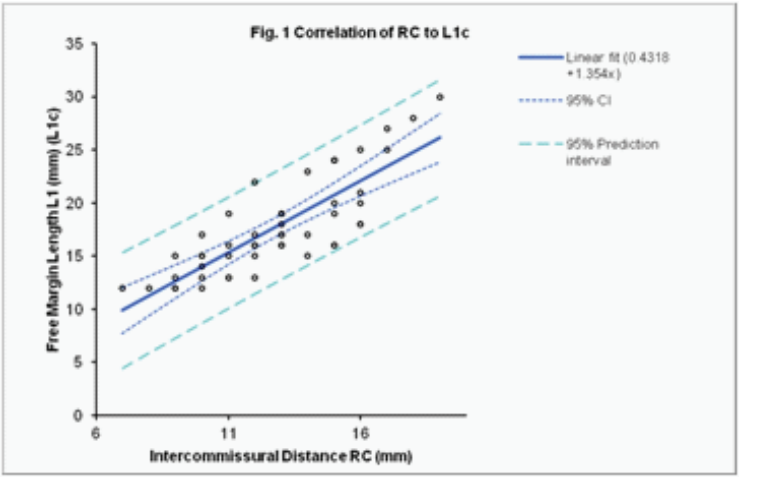

Figure 1: *is an example of correlation between intercommissural distance (RC) and free margin length (L1) of a leaflet.*

CONCLUSIONS: These results suggest that a single perioperatively measurable parameter—intercommisural distance—can be used to develop a simple algorithm to aid in the reconstruction of aortic valve leaflets that more closely parallel normal leaflets in shape and size, leading to potentially improved outcomes in tricuspidization aortic valvuloplasty.

P43 Impact of the Lung Allocation Score on Outcomes of Lung Transplantation in Patients Over the Age of 70 Years

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OBJECTIVE(S): The aim of this study was to evaluate the impact of the lung allocation scoring(LAS) system on outcomes of lung transplantation(LTx) in septuagenarians(age ≥70 years).

METHODS: The United Network for Organ Sharing(UNOS) database was used to identify first-time, single-organ LTx recipients between 1995–2009. The primary endpoint was all-cause mortality following LTx. Primary stratification was septuagenarians versus control patients aged 60–69.9 years. Data were secondarily stratified into pre- and post-LAS era. Univariate and multivariable Cox proportional hazards regression analyses were conducted. Survival was modeled using the Kaplan-Meier method.

RESULTS: During the study period, there were 15,726 eligible LTx patients, of whom 225 (1.4%) were septuagenarians and 4,634 (29.5%) were aged 60–69.9 years. There was a significant rise in the proportion of septuagenarian LTx recipients following institution of the LAS (pre-LAS: 0.3% vs post-LAS: 3.1%, $p < 0.001$). Septuagenarians in the post-LAS era were significantly older(72.0 vs 71.1 years, $p = 0.04$), had lower serum creatinine (0.91 vs 1.03, $p = 0.01$), shorter time on the waitlist (76.3 vs 165.1 days, $p = 0.002$), higher body mass index (26.3 vs 24.2, $p = 0.006$), and had a higher incidence of diabetes (13.4% vs 0%, $p < 0.001$) as compared to septuagenarians in the pre-LAS era. Pre- and post-LAS septuagenarians were well-matched in terms of donor and transplant characteristics except for a higher proportion of female donors in the post-LAS era (31.8% vs 10.0%, $p = 0.01$). Risk-adjusted Cox multivariable analysis demonstrated that in elderly recipients, age ≥70 years was an independent risk factor for mortality in the pre-LAS era (HR 2.03 [1.10–3.72], $p = 0.02$) but not in post-LAS era (HR 1.02 [0.71–1.46], $p = 0.91$). In addition, Kaplan-Meier 1-year survival was significantly worse in septuagenarians in the pre-LAS era (56.7% vs 76.3%, $p = 0.006$) but similar in the post-LAS era (79.0% vs 80.0%, $p = 0.72$) as compared to patients aged 60–69.9 (Figure).

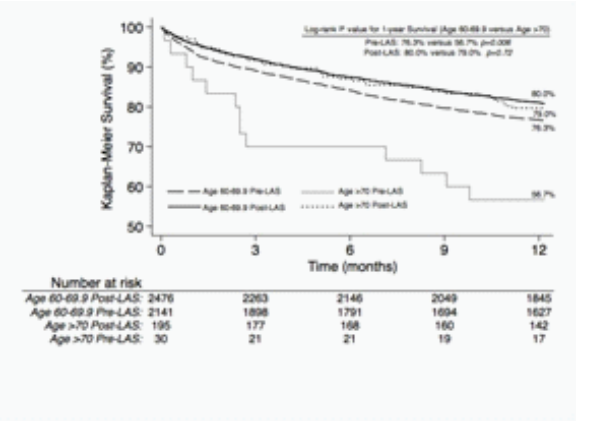

Figure: *Kaplan-Meier 1-Year Survival Stratified by Age Cohort and Pre- or Post-LAS Era.*

CONCLUSIONS: The introduction of the LAS system has been associated with a significant increase in the proportion of septuagenarian LTx recipients. Although age ≥70 years was associated with a higher risk of post-LTx mortality in the pre-LAS era, septuagenarians in the post-LAS era have short-term survival rates that are comparable to patients aged 60-69.9 years. Therefore, age ≥70 years should not serve as an absolute contraindication to LTx in the modern era.

P44 Robotic Thoracoscopic First Rib Resection for Paget-Schroetter Disease: A Retrospective Review of the Early Experience

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OBJECTIVE(S): First rib resection is the most effective treatment for Paget-Schroetter Disease. Previously described techniques have been associated with incomplete rib resection and neurovascular complications. We report a minimally invasive robotic transthoracic approach for resection of the first rib and scalenectomy.

METHODS: Over a 20 month period, 13 robotic first rib resections were performed in 9 patients. Pre-operative assessment included physical exam and bilateral venous angiography. On a thoracoscopic platform using 3, 2cm incisions, the robot was used to dissect the first rib and divide the scalene muscles. Success of the first rib resection was assessed by postoperative venous angiography.

RESULTS: There were 13 total procedures. 4 patients had staged bilateral resections. There were 6 men and 3 women. Mean age was 34 ± 8.5 years. Operative time was 187.6 ± 30.8 minutes. There were no complications and no mortality. Those patients with a patent subclavian vein on the postoperative venogram were anticoagulated with warfarin for 3 months. Patients with an occluded subclavian vein underwent angioplasty and stent placement. These patients underwent antiplatelet therapy for 3 months. At a median follow-up for 12 months, all patients had an open subclavian vein for a patency rate of 100%.

CONCLUSIONS: Robotic transthoracic first rib resection is feasible. This technique allows for a minimally-invasive en bloc resection of the offending portion of the first rib and scalenectomy, while minimizing neurovascular complications. While greater experience is necessary, this new approach to first rib resection may allow for a more aggressive treatment to patients with Paget-Schroetter Disease.

P45 Pre-Operative Consolidation to Tumor Ratio on Computed Tomography and FDG-PET SUVmax Predict Recurrence After Limited Resection of Early Lung Adenocarcinoma

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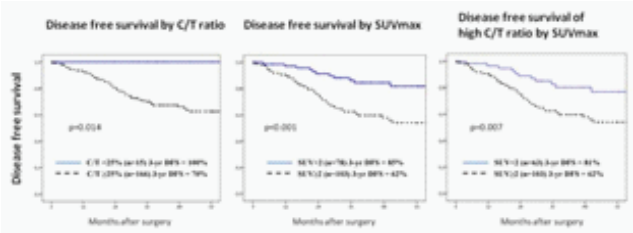
OBJECTIVE(S): Limited resections are proposed for clinical stage IA lung adenocarcinoma (LAC) 2cm or less (T1aN0M0), yet there are no validated predictive factors for post-operative recurrence. We investigated the prognostic value of pre-operative consolidation/tumor (C/T) ratio on computed tomography and maximum standardized uptake value (SUVmax) by FDG-PET.

METHODS: We retrospectively reviewed 962 consecutive patients who underwent limited resection for lung cancer at a single institution between 2000 and 2008. Exclusion criteria included clinical stage above T1aN0M0, histology other than adenocarcinoma, neoadjuvant treatment or history of prior lung cancer surgery within 2 years. Only patients with available SUVmax were included in analysis. C/T ratio of 25% (as per Japan Clinical Oncology Group 0201) and SUVmax of 2.0 (cohort median) were used as cutoffs. Disease free survival (DFS) was assessed via the Kaplan-Meier method.

RESULTS: 181 patients met the study inclusion criteria. Patients with low C/T ratio ($n = 15$) had a significantly lower 3-year recurrence rate than patients with high C/T ratio ($n = 166$) (3-year DFS = 100% and 70% respectively, $p = 0.014$). Patients with low SUVmax recurred significantly less than patients with high SUVmax (3-year DFS: 85% and 62% respectively, $p<0.001$). Furthermore, within the high C/T ratio group, SUVmax was prognostic (3-year DFS: 81% for low and 62% for high SUVmax, $p = 0.007$).



CONCLUSIONS: In clinical T1aN0M0 LAC undergoing limited resection, high C/T ratio and SUVmax are associated with higher rate of recurrence. Patients with C/T ratio below 25% did not recur. In addition, patients with high C/T ratio can be further stratified by SUVmax. C/T ratio and SUVmax provide widely available markers that can help identify patients with cT1aN0M0 disease at increased risk for recurrence after limited resection.

P46 Completion Pneumonectomy for Non-Small Cell Lung Cancer: Does Induction Treatment Influence Postoperative Outcome?

Authors/Institutions: D. Galetta, A. Borri, R.I. Gasparri, F. Petrella, P. Solli, L. Spaggiari, Division of Thoracic Surgery, European Institute of Oncology, Milan, Italy

OBJECTIVE(S): Completion pneumonectomy (CP) is associated with high morbidity and mortality. We reviewed our experience with this operation to evaluate if induction treatment (IT) may affect postoperative outcome and analyzing factors influencing long-term results.

METHODS: Between January 1998 and December 2010, 34 consecutive patients with non-small cell lung cancer (NSCLC) underwent CP. There were 26 males, mean age 64 years (range, 48–77 years). Right CP was carried out in 19 patients, and left in 15. Thirteen patients (38.2%) received IT (chemotherapy in 9, and chemo-radiotherapy in 4). Fifteen patients (44.1%) had an extended resection, and 3 (8.8%) had a tracheal sleeve CP.

RESULTS: Thirty-day mortality was 2.9% (1/34). Morbidity was 14.7%; there were 1 cardiac dislocation, 1 diaphragmatic hernia, 1 myocardial infarction, 1 TIA, and 1 immediate bronchopleural fistula which was re-operated on. Mean ICU stay was 1 day (range, 0-6 days). Mean hospital stay was 9 days (range, 5–30 days). IT did not influence postoperative morbidity and mortality. Ten patients (29.4%) had pathological stage I, 12 (35.3%) had stage II, and 12 (35.3%) had stage III. Overall 5-year survival was 51.7%. Factors influencing survival (Log-rank test) were PT ($p = 0.01$), extension of resection ($p = 0.04$), histology ($p = 0.01$), pathological stage ($p = 0.03$), T and N factors ($p = 0.2$, respectively). Twenty patients (58.8%) are currently alive and 12 (35.3%) without disease. At univariate analysis IT ($p = 0.0008$), histology (<0.001), stage ($p = 0.03$), and T ($p = 0.01$) had a statistical significance on survival. Factors affecting survival at multivariate analysis included IT ($p = 0.02$) and histology ($p = 0.03$).

CONCLUSIONS: In our experience, CP had a low mortality, acceptable morbidity, and good long-term survival which justifies this surgical procedure. Postoperative complications were not influenced by IT. Long-term survival was adversely influenced by the absence of IT, extended resection, squamous cell carcinoma, and advanced stages.

P47 Negative Pressure Wound Therapy for Management of Post-Pneumonectomy Empyema

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OBJECTIVE(S): Postpneumonectomy empyema (PPE) is a rare complication. Treatment strategies involve control of the underlying cause of infection, such as a debridement, closure and reinforcement of the bronchial stump, as well as residual pleural space obliteration by the Clagett procedure, including creation of an open window thoracostomy. We have recently shown that intrathoracic application of a negative pressure wound therapy (NPWT) is safe and effective for control of intrathoracic infections, and allows for preservation of chest wall integrity. Here we review our results applying the NPWT in patients presenting PPE

METHODS: We conducted a retrospective analysis of 16 consecutive postpneumonectomy empyema cases treated in our department from 2005 to 2011 by intrathoracic NPWT. All cases underwent surgical debridement of the pleural cavity, closure of the bronchial stump fistula (when present) with a muscle flap and repeated intrathoracic NPWT dressings. These were changed under general anesthesia and the chest wall was temporarily closed after each procedure. Once infection was controlled, the residual pleural cavity was obliterated with antibiotic solution and closed.

RESULTS: Sixteen patients (12 male, median age 65 years) underwent iterative NPWT dressings for the management of PPE. Eleven of 16 patients had right pneumonectomy. PPE was related to a bronchopleural fistula in 8 cases, requiring closure of the bronchial stump fistula by a muscle flap. The median length of NPWT was 25 days (range 5 to 61) and the median number of NPWT changes per patients was 6 (range 2 to 14). In-hospital mortality was 25% (n = 4) and was not related to NPWT. Control of infection was achieved in all surviving patients. One patient needed re-opening after chest closure for recurrent pleural infection requiring further debridement and additional NPWT treatment.

CONCLUSIONS: The intrathoracic application of NPWT combined to surgical correction of the underlying cause of PPE is safe and effective. NPWT device may be a good alternative to open window thoracostomy since it preserves chest wall integrity.

P48 The Use of Cryoablation for the Treatment of Local Pleural Recurrence Following Pleurectomy for Malignant Pleural Mesothelioma

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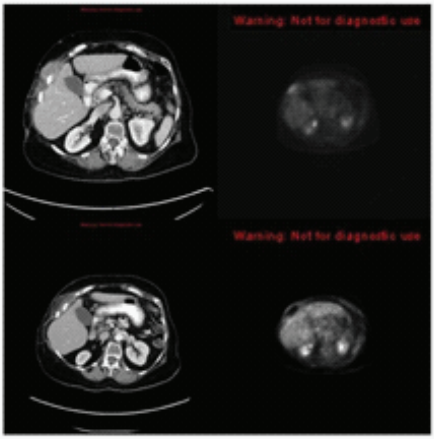
OBJECTIVE(S): To assess the efficacy and morbidity of performing percutaneous cryoablation of localized pleural recurrences following pleurectomy for mesothelioma

METHODS: Following IRB approval, we retrospectively reviewed our prospective thoracic surgery database for patients who were identified as having one or more percutaneous cryoablation treatments for localized recurrences following surgery for mesothelioma

RESULTS: We identified 21 patients who had previously undergone pleurectomy and radiation for malignant pleural mesothelioma. The mean patient age was 63.8 with 8/21 (38.1%) female and 13/21 (61.9%) male. The histologies were 18/21 epithelioid predominant (85.7%), 2/21 mixed (9.5%), and 1/21 (4.8%) sarcomatoid. The 21 patients underwent a total of 82 treatments (82 lesions) with a mean of 3.7 (range 1-16) treatments/lesions/patient. Lesions treated measured a mean of 31.7 (range 9-113) mm in diameter. Each lesion was treated with a mean of 1.7 (range 1–4) probes and to a mean of 2.65 (range 2–4) cryo cycles. 81/82 (98.7%) lesions were completely treated (as measured by PET) following one therapy. The single failure was early in our experience and resulted from incomplete treatment of a large 60 mm lesion. The morbidity was very low and consisted of pain, hematoma, small pneumothorax, and hemoptysis in one patient each and erythema in 2 chest wall lesions 6/83 (7.3%) All patients were treated as outpatients.



CT and PET scans prior to and following cryoablation.

CONCLUSIONS: Cryoablation of localized malignant pleural mesothelioma recurrences is the preferred adjunctive method of local control with an very low morbidity rate and a very high efficacy rate and should be used in preference to other therapies including surgery.

P49 Outcomes in Patients Requiring Mechanical Ventilation Following Pneumonectomy

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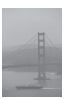
OBJECTIVE(S): The aim of this study was to clarify the short-term and long-term outcome of post-pneumonectomy mechanical ventilation (PPMV) and evaluate its chronological trend.

METHODS: The medical records of all patients who underwent pneumonectomy at our tertiary referral center between January 1994 and December 2009 were reviewed. PPMV was defined as mechanical ventilation via an endotracheal tube started within 30 days of the pneumonectomy and continued for greater than 24 hours. Comparative analyses were performed using chi-square test, Fisher's exact test or Mann-Whitney test, as appropriate. Survival and cancer free interval were analyzed using the Kaplan-Meier method and compared by a log-rank method.

RESULTS: Of 548 patients having pneumonectomy during the study period, 90 (16.4%) required PPMV. In multi-variate analyses, right-sided pneumonectomy, benign pathology and extended pneumonectomy were significant risk factors for requiring PPMV. Mean APACHE III scores for PPMV patients were 32.8 in 1994-2001 and 50.9 in 2002-2009 ($p = 0.0009$). Of patients who required PPMV, 53 (58.9%) were successfully weaned from ventilatory support. The odds of weaning from PPMV have not changed over the study period. All patients who could not be weaned had died within 12 months of pneumonectomy. Significant factors associated with inability to wean included: postpneumonectomy pulmonary edema, increasing age and increasingly positive fluid balance on the first day of PPMV. There were no significant differences in postoperative survival and cancer free interval between those successfully weaned from PPMV and those not requiring PPMV.

CONCLUSIONS: PPMV patients have been more critical than before, but the chances of weaning from PPMV have not worsened. If patients are successfully weaned from PPMV, long-term survival and oncologic outcome are similar to those who do not require PPMV.



P50 Individual Measures of Frailty Do Not Predict Surgical Outcomes in Elderly Patients Undergoing Thoracic Surgeries

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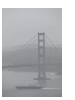
OBJECTIVE(S): To determine if a panel of geriatric frailty assessment tools administered pre-operatively is able to predict post-operative outcomes in patients ≥70 years old undergoing surgery for treatment of thoracic neoplasms.

METHODS: Patient frailty was assessed using a series of validated geriatric cognitive and physical measurement tools administered by members of the treatment team within 2 weeks of a patient's scheduled operation. A total of 7 different measures were used: Geriatric Depression Screen (GDS), Nutrition Screening Initiative Nutritional Health Checklist (NSI NHC), Mini Mental Status Exam (MMSE), Fatigue Inventory (FI), Eastern Cooperative Oncology Group Performance Scale (ECOG PS), and assessment of Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). Patient scores on screening instruments administered pre-operatively were compared to post-operative outcomes. Additional pre-operative data collected included baseline patient characteristics (age, gender, Body Mass Index, renal, cardiac, and pulmonary function) and co-morbid conditions (chronic medical conditions requiring treatment, significant past surgical history). Following surgery, patients were followed for a minimum of 30 days.

RESULTS: A total of 80 patients scheduled to undergo surgical resection of pulmonary or esophageal malignancies at a major academic center were enrolled in a prospective, IRB-approved study. One patient did not undergo surgery and was excluded from analysis. Final data analysis was conducted on 79 patients, 21.6% (21/79) underwent esophageal resection and 73.4% (58/79) underwent pulmonary resection. Univariate logistic regression demonstrated that no measured pre-operative factors including baseline patient characteristics, co-morbid conditions, and

scores on individual frailty measures were able to predict post-operative complications. Additionally, Cox proportional hazard analysis showed no association between any pre-operative variable, including scores on frailty measures, with post-operative hospital length of stay.

CONCLUSIONS: A single measure of frailty cannot reliably predict post-operative outcomes in a geriatric patient population undergoing surgery for thoracic malignancies. A combination of measures, instead of just one, may better predict post-operative outcomes.



P51 Surgical Results of Synchronous Multiple Primary Lung Cancers without Mediastinal Lymph Node Metastasis

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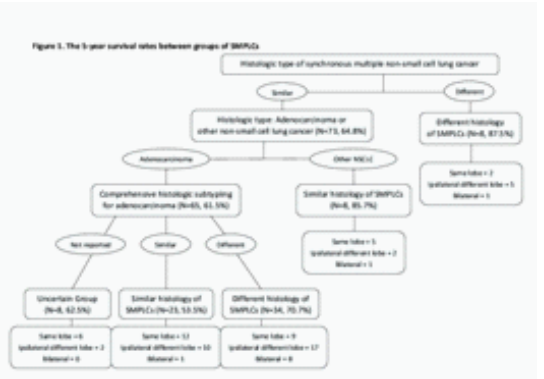
OBJECTIVE(S): Preoperatively distinguish independent synchronous multiple primary lung cancers (SMPLCs) from metastases are crucial but still challenging. The primary objective of present study was to evaluate the feasibility of surgical approach of these patients. In secondary objective, we also compared the survivals between SMPLCs and matched-stage of solitary primary lung cancers (SPLCs) after surgical treatments during the same period.

METHODS: Medical records were retrospectively reviewed. The patients met the modified Martini and Melamed criteria between 2001 and 2010 were enrolled. Patients at the same period received surgical intervention for SPLC without mediastinal lymph node involvement were also enrolled as a control group.

RESULTS: Between Jun 2001 and Dec 2010, 1778 patients received pulmonary resection for lung cancer in a tertiary referral center. Ninety four patients met the criteria of modified Martini and Melamed about the SMPLCs and 13 patients were excluded due to incomplete resection, neoadjuvant chemotherapy, lost follow-up, diagnosed with small cell carcinoma, N2 lesion and possible metastatic lesion. The location of the tumors was unilateral in 70 patients and bilateral in 11 patients. There was no surgical mortality. The median follow-up time was 39.0 months. The 3-year and 5-year overall survivals were 82.8% and 67.1%. Female gender and non-smoker had trends toward better overall survivals. In multivariable analysis, the largest tumor size (less than 3 cm, T1 group; 89.3% vs 56.3%, $p = .011$) and preoperative carcinoembryonic antigen (CEA) serum level associated with better survivals (70.0% vs 57.8%, $p = .037$). Subgroup analysis in multiple synchronous adenocarcinoma (N = 65) demonstrated that

different comprehensive histological subtyping had a trend toward better overall survival compared to similar (70.7% vs 53.5%, p = .275). There was no significant difference in overall survivals between the matched stage of SMPLCs and SPLC without lymph node involvement.



CONCLUSIONS: The surgical outcome of N2-negative SMPLCs is excellent and compatible with SPLCs, instead of T4 or M1 in current TNM classification system. Preoperative the largest tumor size and CEA serum level were the significant prognostic factors for SMPLCs with surgical intervention.

P52 Differential Inflammatory Response Could Contribute to the Disparity of Barrett's Esophagus and Esophageal Adenocarcinoma in European Versus African Americans

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OBJECTIVE(S): Barrett's esophagus (BE), the strongest risk factor for esophageal adenocarcinoma, is uncommon in African Americans (AAs). A decreased incidence of gastroesophageal reflux disease (GERD) is the most plausible explanation for this difference, but the literature is not supportive of this notion. We hypothesized that there is a differential genetic response to inflammation (GERD) in European Americans (EAs) versus AAs.

METHODS: Biopsies of the upper and lower esophageal epithelium were obtained from 19 males (10 EAs, 9 AAs) with a diagnosis of GERD undergoing esophagoscopy who had experienced acid reflux 2 or more times per week for greater than 6 months. Isolated RNA was analyzed using an 84 gene real-time RT-PCR array to quantify the expression of inflammatory cytokines and receptors.

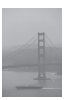
RESULTS: Multiple inflammatory genes were significantly upregulated in the lower compared to upper esophagus of EAs, while AAs showed no significant spatial difference in gene expression in response to reflux. The upregulated genes in the lower esophagus of EAs include IL-5 (eosinophil activation), CCL25 (cell-mediated immunity), CXCL14 (monocyte activator), CARD18 (COX regulation), and eotaxin-1 (eosinophil chemotaxis) (Table 1).

Unexpected was the finding that the inflammatory state or milieu whether "normal," represented by the upper esophagus, or in the distal esophagus exposed to reflux was increased in AAs vs. EAs. The majority of inflammatory genes tested were expressed at equal or greater levels in AAs than EAs, several >2-fold and significant.

Table 1: **Inflammatory genes upregulated in the lower esophagus of EAs relative to upper esophagus. P-values calculated by Wilcoxon Signed Rank test, * CXCL14 and CCL25 had p-values < 0.05 by paired t-test.**

Gene	Fold Change	p-value
Eotaxin-1	3.96	0.017
CARD18	3.18	0.028
IL-5	1.49	0.028
CXCL14*	1.96	0.059
CCL25*	1.55	0.114

CONCLUSIONS: We have observed that EAs have a different genetic response to inflammation (GERD) compared to AAs. Further investigation should be directed towards elucidation of the potential significance of differential inflammatory response to the pathogenesis of BE and esophageal adenocarcinoma.



P53 Host MHC Class II Expression Contributes to CD8+ T Cell Homeostatic Proliferation and Tumor Effector Function in a CD4+ T Cell-Independent Fashion Through Engagement of Lag-3

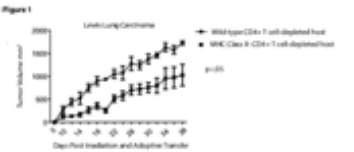
Authors/Institutions: S. Chang, A.E. Gelman, D. Kreisel, A.S. Krupnick, Department of Surgery, Division of Cardiothoracic Surgery, Washington University in St. Louis, St. Louis, MO

OBJECTIVE(S): Adoptive transfer of tumor-reactive CD8+ T cells into lymphopenic hosts results in their homeostatic proliferation, activation, and tumor-effector function. Elimination of CD4+ T cells may be advantageous to the field of tumor immunotherapy due to the presence of CD4+ regulatory T cells. It has been demonstrated, however, that homeostatic expansion of CD8+ T cells may depend on the presence of CD4+ T cells. Our objective was to evaluate host factors, namely MHC Class II expression (MHCII), that contribute to homeostatic CD8+ T cell proliferation independently of CD4+ T cells.

METHODS: CD45.1 wild-type or MHCII- mice were sublethally irradiated and antibody-depleted of CD4+ T cells. 5 $\times$ 106 CFSE-labeled CD45.2 congenic CD8+ T cells were adoptively transferred to such recipient mice and proliferation as well as IFN-gamma production was evaluated 5 days later. For immunotherapy studies mice were injected with 1 $\times$ 106 Lewis Lung Carcinoma in the flank.

RESULTS: Proliferation profiles in peripheral lymph nodes revealed that CD8+ T cells transferred into wild-type mice proliferated more vigorously then those transferred into MHCII- mice (77.8 $\pm$ 5.9 vs. 56 $\pm$ 7.5% respectively, p = .005). Lag-3 is a CD4-related receptor expressed on CD8+ T cells that can engage MHCII. In order to determine if Lag-3 expression was responsible for such differences we repeated these experiments using Lag3 knock out CD8+ T cells as donors and were unable to detect differences in proliferation in wild-type and MHCII- hosts (51.6 = $\pm$ 0.7 vs. 47.9 = $\pm$ 4.4%, p = .44). Surprisingly no differences in IFN-gamma production in transferred CD8+ T cells was evident between wild-type or MHCII- hosts (26.2 $\pm$ 7.2 vs. 22.9 $\pm$ 4.2, p = .7) suggesting that MHCII engagement of CD8 Lag3 contributes to proliferation independent of activation. We next adoptively transferred CD8+ T cells into irradiated, CD4+ T cell-depleted

wild-type and MHCII- hosts bearing Lewis Lung Carcinoma in the flank. Surprisingly tumor growth was attenuated in MHCII hosts (Figure 1) with a larger infiltration of both adoptively transferred and native CD8+ T cells in the tumor bed of MHCII- hosts (data not shown).



CONCLUSIONS: MHC Class II expression plays a role in CD8+ T cell proliferation, production of IFN-gamma, and tumor growth independent of CD4+ T cells. Engagement of CD8+ T cell Lag3 uncouples proliferation from activation under homeostatic conditions. Our data have implications for adoptive immunotherapy for solid tumors.