

1984 ANNUAL MEETING PROGRAM



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**American Association for Thoracic Surgery
64TH ANNUAL MEETING
Scientific Program**

MONDAY MORNING, May 7, 1984

8:30 a.m. Business Session (Limited to Members)
Grand Ballroom - Third Floor

8:45 a.m. Scientific Session
Grand Ballroom - Third Floor

1. Computed Tomography: An Effective Technique for Mediastinal Staging in Lung Cancer

BENEDICT D.T. DALY, L. JACK FAILING*,*

ROBERT D. PUGATCH, Y. JUNG-LEGG*,*

M. ELON GALE, GUNARS BITE**

*and GORDON L. SNIDER**

Boston, Massachusetts

Sponsored by: HAROLD F. RHEINLANDER

Boston, Massachusetts

Computed tomographic (CT) scans of the chest were utilized to stage the mediastinum in 148 instances of bronchogenic carcinoma considered for resection in 146 patients. Nodes > 1.5 cm in size were interpreted as abnormal. All nodes positive by CT were evaluated by mediastinoscopy (31), anterior mediastinotomy (7), or thoracotomy (7) depending on their anatomic location. All patients with negative findings underwent thoracotomy without prior surgical staging. Patients undergoing thoracotomy for staging or resection were divided into two Groups. In Group I (first 51 instances), routine mediastinal exploration was not carried out; in Group II (last 97 instances) the mediastinum was explored in every patient and nodes were submitted for histopathology. This report compares the CT and pathologic findings on the mediastinal lymph nodes.

# Patients	True Positive	True Negative	False Positive	False Negative	Sensitivity	Specificity	Accuracy
Group I	15	32	2	2	88%	94%	92%
Group II	18	65	8	6	75%	89%	86%
Central Tumor	26	38	9	4	87%	81%	83%
Peripheral Tumor	7	59	1	4	64%	98%	93%

Ten patients had false-positive scans, two with extensive granulomatous disease and seven with postobstructive pneumonitis; nine of the ten had central lesions and seven were located in the right upper lobe. Eight patients had false negative scans, six had either paraaortic or subaortic nodes (4) or posterior subcarinal nodes (2). These nodes would not have been accessible to mediastinoscopy. One patient had positive low paratracheal and subcarinal nodes but the metastases were focal and intranodal. One patient had small paratracheal nodes replaced by tumor and is the only patient with false negative nodes in whom routine mediastinoscopy would have prevented thoracotomy and resection. We believe CT staging of the mediastinum is indicated for all patients with lung cancer in whom surgery is contemplated. CT directs the most appropriate staging procedure for patients with positive findings and obviates mediastinoscopy for patients with negative findings.

*By Invitation

2. Adverse Prognostic Effect of N2 in Treated Small Cell Carcinoma of The Lung

JOHN A. MEYER, JOHN J. GULLO,*

PHILLIP M. IKINS, ROBERT L. COMIS*,*

WILLIAM A. BURKE and FREDERICK B. PARKER, JR.*

Syracuse, New York

Patients treated nonsurgically for "limited" small cell carcinoma of the lung relapse most frequently within the chest. We have sought to control this mode of treatment failure by adjunctive surgical resection, in addition to chemotherapy. Since 1975, we have treated patients with disease in clinical Stages I and II by initial resection and the full course of chemotherapy thereafter. Beginning in 1979, suitable patients with Stage III-MO disease (T3 and/or N2, MO) have been treated initially with two cycles of chemotherapy, followed by resection of the primary tumor, dissection of mediastinal nodes, prophylactic cranial irradiation, and continuing chemotherapy. Diagnosis of N2 in this study was made by positive biopsy at mediastinoscopy (nine cases), or in one case by CT demonstration of enlarged subcarinal nodes, plus later histologic finding of tumor in the excised nodes. Patients classified here as NO or N1 had negative mediastinoscopy, and no radiographic evidence of mediastinal node enlargement.

Many reviews find that continuing complete remission at 30 months after the start of treatment may be considered equivalent to disease eradication. Thirteen of our patients without the finding of N2 began treatment more than 30 months ago (three T3 N1; four T2 N1; four T2 NO; two T1 NO); one has died of a surgical complication and two (T3 N1, T2 N1) have suffered relapse at 14 and 17 months. The other ten patients (77%) have remained disease free.

Conversely, all of the first ten patients with an initial finding of N2 have developed known relapse within this period (nine patients), or in one instance, died at home with suspected recurrent disease. Known recurrences have appeared in the liver in four cases; in liver plus bone in two; in meninges, in opposite main bronchus, and in lung, one case apiece. Two relapses appeared very late, at 27 and 30 months after the start of treatment.

These findings suggest that disease control is possible in the majority of MO patients without demonstrable mediastinal node involvement. The initial finding of N2 may be indicative of dissemination sufficient in most cases to interfere with the patient's chances for long survival.

*By Invitation

3. Survival Following Sequential Resections for Second or Third Primary Lung Cancers

DOUGLAS J. MATHISEN, ROBERT J. JENSIK,*

L. PENFIELD FABER and C. FREDERICK KITTLE

Chicago, Illinois

The performance of sequential resections and the consideration of new lesions as second or third primary lung cancers remain controversial issues. Criteria to define these as new primary lesions depend upon a difference in histologic types, a prolonged interval between initial and second or third resections, and location in the contralateral lung or a different ipsilateral lobe. Ninety patients have undergone multiple resections for bronchogenic carcinoma from 1962 to November 1983. There were 10 examples of synchronous lesions and the remaining 78 were metachronous with the longest interval between resections being 17 years and four months.

The initial surgical procedures were pneumonectomy-11; lobectomy-42; sleeve lobectomy-9; segmentectomy-27; carinal resection-1. At the second operation, the procedures were: Segmentectomy-55; lobectomy-11; completion lobectomy-6; completion pneumonectomy-15. Two patients had sternotomy with bilateral resections and one patient had a tracheal resection. The third procedures were: Segmentectomy-6; completion segmentectomy-1; completion lobectomy-2; completion pneumonectomy-2.

In 18 patients undergoing the second procedure and 2 undergoing a third resection, a different cell type was identified. The peri-operative mortality following the second operation was 7 of 90 patients (8%), and there were no deaths in those patients undergoing three resections.

Cumulative survival following second resection in 78 patients with metachronous tumors was 33% at 5 years and 20% at 10 years.

*By Invitation

4. Experience With Primary Neoplasms of The Trachea and Carina

*F. GRIFFITH PEARSON, THOMAS T.R. TODD**

and JOEL D. COOPER

Toronto, Ontario

Between 1963 and 1983, forty-three patients were seen with primary malignant tracheal neoplasms and managed on our surgical service. The final pathology was adenoid cystic carcinoma - 28 cases, squamous cell carcinoma - 8 cases, leiomyosarcoma - 4 cases, and 3 miscellaneous tumours.

Thirty-two patients were managed by resection and primary anastomosis: trachea only -12, trachea and carina -12, trachea and cricoid - 4, trachea and larynx - 4. There were two operative deaths.

Six patients had defects replaced with a heavy duty Mrlex prosthesis, and all but one of these was operated on during the 1960's. Three of six died post-operatively due to innominate artery erosion.

Three patients with non-resectable tumours were treated with an indwelling silicone stent: one Montgomery T-tube, two silicone TY-tubes. All three had worthwhile palliation. Two patients with

extensive, but non-obstructive adenoid cystic carcinomas were managed by primary irradiation. Good clinical remission has been maintained in each at 30 and 36 months respectively.

The following observations are noted:

1) Adjunctive radiotherapy was used (either pre or post-operatively) in patients with adenoid cystic carcinoma. No patient having a complete resection has suffered a recognizable clinical recurrence. Furthermore, even patients with incomplete resections achieve good long-term palliation in most cases. This includes four patients with slowly progressive, asymptomatic pulmonary metastases.

2) Resection of cricoid with sparing of the larynx is possible in occasional patients with primary malignancies of the proximal airway.

3) With experience it is apparent that median sternotomy provides the best exposure for selected cases requiring carinal resection.

10:00 a.m. Intermission - Visit Exhibits - Second Floor

Complimentary Coffee

*By Invitation

10:45 a.m. Scientific Session - Grand Ballroom - Third Floor

5. Pulmonary Artery Banding

ROBERT A. ALDUS, GEORGE A. TRUSLER,*

TERUO IZUKAWA and WILLIAM G. WILLIAMS**

Toronto, Ontario

From January 1972 through December 1982, 209 patients underwent pulmonary artery banding at The Hospital for Sick Children, Toronto. A method for estimating the required band circumference was used in all children without significant pulmonary vascular disease. Children were divided into four categories according to diagnosis. Infants in Group I had ventricular septal defect (VSD), atrioventricular septal defect (AVD) or double outlet right ventricle with a subaortic VSD (DORVA). We attempted to band these infants tightly at a band circumference of 20mm + 1mm for each kilogram of infant body weight. Overall mortality was low (9%), response was moderate or good (89%) and pulmonary hypertension was well controlled (normal pulmonary artery pressure at subsequent repair in 88%). The highest mortality occurred in infants with VSD and coarctation of the aorta (16%). Group II infants had complete transposition of the great arteries (TGA) with VSD, double outlet right ventricle with a subpulmonic VSD, single ventricle or tricuspid atresia. These infants were banded more loosely at 24mm + 1mm for each kilogram of infant body weight. Overall mortality was good (13.5%), response to banding was moderate or good in 86% and subsequent pulmonary artery pressure was normal in 79%. Group III consisted of infants with mitral atresia, mitral stenosis and a variety of other complex lesions. Control of congestive cardiac failure was only slight or moderate, and early and late mortality was high.

Pulmonary artery banding by this method allows for safe and effective control of congestive cardiac failure and pulmonary hypertension in infants with congenital heart disease and excessive pulmonary blood flow.

*By Invitation

6. Valvotomy for Pulmonary Atresia with Intact Ventricular Septum: A Disciplined Approach to Achieve a Functioning Right Ventricle

*ADNAN COBANOGLU**, *MARK T. METZDORFF**,
*C. WRIGHT PINSON**, *GARY L. GRUNKEMEIER**
and *ALBERT STARR*

Portland, Oregon

During the past 20 years, a consistent policy in applying early valvotomy has resulted in a unique opportunity to appraise the long-term results of this approach in pulmonary atresia with intact ventricular septum (PA:IVS). Since 1964, 27 of 35 patients with PA:IVS had Type 1 or 2 right ventricle (RV); 25 of these had early valvotomy, 7 with and 18 without concomitant shunt. The remaining 2 patients with Type 2 RV and the 8 patients with Type 3 RV were treated with shunt alone. The overall operative mortality was 34%; those patients weighing more than 3 kilograms and those operated since 1977 had operative mortalities of 18% and 16% respectively. There were 17 survivors of early valvotomy: 12 had valvotomy alone and 5 valvotomy with shunt; 12 had Type 1 RV and 5 Type 2 RV. Survival (\pm standard error) for these 17 patients was 85(\pm 10)% and 68(\pm 17)% at 5 and 10 years respectively. The probability of reoperation was 100% by 6 years of age, with outflow patch reconstruction successfully employed in all cases where reoperation has been performed. Aggressive follow-up and early recatheterization were essential features of management. Delayed reconstruction after shunt alone was unsuccessful in 3 patients, 2 with Type 3 RV and 1 with Type 2 RV.

Primary direct valvotomy without shunt is the operation of choice for patients with PA:IVS and Type 1 RV. Concomitant shunt may be required for some Type 1 and most Type 2 RV patients, selected preoperatively by angiography or postoperatively by clinical necessity. Delayed right ventricle reconstruction after shunt alone is not an acceptable approach when an outflow tract is present.

11:30 a.m. Presidential Address - Grand Ballroom - Third Floor

A Laboratory For Progress

DWIGHT C. McGOON

12:15 p.m. Adjourn for Lunch - Visit Exhibits

*By Invitation

MONDAY AFTERNOON, May 7, 1984

2:00 p.m. Forum Session - Grand Ballroom - Third Floor

7. Thoracic Disease in Patients with Acquired Immune Deficiency Syndrome

*HARVEY I. PASS**, *DOROTHY A POTTER**,

*JACK A. ROTH**, *JAMES H. SHELHAMMER**,

*HENRY MASUR**, *CHERYL M. REICHERT**

and ABE M. MACHER*

Bethesda, Maryland

Sponsored by: RICHARD E. CLARK
Bethesda, Maryland

The acquired immune deficiency syndrome (AIDS) is characterized by the development of multiple recurrent opportunistic infections and unusual neoplasms in individuals with no prior history of immune suppression. This report summarizes the role of diagnostic modalities currently used in the evaluation of thoracic disease in AIDS patients. Efficacy of treatment was then determined by correlation with post mortem findings in all patients. The mean age of 15 AIDS patients with thoracic disease was 39 years, all were male, and risk factors included homosexuality (10 of 15), bisexuality (3 of 15), intravenous drug abuse (1 of 15) and Haitian nationality (1 of 15).

Pulmonary disease (hypoxia, pulmonary infiltrates) was present in all patients necessitating 23 transbronchial biopsies (TBB) in 11 patients. 65% were diagnostic, with Pneumocystic Carinii Pneumonia (PCP) and cytomegalovirus (CMV) pneumonia being the most common findings. Nine open lung biopsies (OLB) in 8 patients documented either PCP or Kaposi's sarcoma (KS). **Esophageal disease**, characterized by dysphagia, was found in 4 patients, and endoscopic evaluation demonstrated Candida esophagitis (2), esophageal KS (1), and CMV esophagitis (1).

Mean time to death from diagnosis of AIDS was 7.7 months, with post mortem examination performed in all patients. Although **Pneumocystic carinii** was the most common antemortem cause of pneumonia in our AIDS patients, it was rarely found at autopsy as PCP was successfully eradicated in 70% of the patients treated. At autopsy, four additional cases of unsuspected pulmonary KS were discovered as well as nine cases of CMV pneumonia (the most common cause of death, 10 of 15, 67%). Esophageal disease documented at autopsy included: CMV esophagitis (3), KS (2), and Candida (1).

Our data reveal that PCP and Candida esophagitis can be successfully treated in AIDS patients if appropriately diagnosed. The major cause of mortality is pulmonary insufficiency, often due to severe CMV infection. Thoracic surgeons must continue to play an aggressive and important role in the early diagnosis and management of potentially treatable pulmonary and esophageal disease in these patients.

*By Invitation

8. The Effect of Mid-Sternal Thoracotomy on Pulmonary Function in Patients Undergoing Coronary Revascularization

NA

SALVATORE M. ZABBATINO*,

DANIEL B. SULLIVAN*, NABIL KHALIL*

and GERALD M. LEMOLE

Browns Mills, New Jersey

It is generally assumed that non-complicated cardiac operation performed through a midsternal incision is associated with only minimal impairment of pulmonary function (PF). In order to verify this assumption, PF was studied in 30 consecutive male patients (age range 42 - 71 yr) undergoing surgery for coronary artery disease. Lung volumes, flow rates, diffusion capacity, and arterial blood

gases were determined prior to surgery, at discharge (avg 8.7 ± 1.9 d), and at 3 months. In addition, peak flow was obtained immediately after extubation. Seventeen patients had smoking history, but none had history of pulmonary dysfunction. All underwent non-complicated coronary revascularization (4.4 ± 1.8 grafts/patient) performed by one surgeon. The left internal mammary artery (LIMA) was utilized in 24 patients. The left pleura was inadvertently opened in 14 and a left chest tube was left in in 6. Aortic cross-clamp time was 68 ± 27 min and pump time was 119 ± 43 min. The changes in each parameter were analyzed by paired t test and expressed as mean \pm S.D. (*p.05).

	Vital Capacity	Residual Volume	Tot. Lung Capacity	Max. Mid. Exp. Flow Rate*	FEV ₁	Diffusion Capacity	Peak Flow Rate	PO ₂
Pre-op:	4.1 \pm 0.9L	2.6 \pm 0.9L	6.8 \pm 1.1L	3.4 \pm 0.8L/S	3.2 \pm 0.6L	23.0 \pm 5.3	8.6 \pm 2.0L/s	79 \pm 7mmHg
Periextub.:	*		*	*	*		3.1 \pm 2.0L/*s	*
Discharge:	2.8 \pm 0.9L	2.3 \pm 0.7L	5.1 \pm 1.3:	2.3 \pm 1.3L/S	2.2 \pm 0.6L	21.0 \pm 7.0	5.9 \pm 2.1/*s	71 \pm 7mmHg
3 months:	3.7 \pm 0.8L	2.2 \pm 0.9L	6.0 \pm 1.3L	2.8 \pm 1.1L/S	2.8 \pm 0.6L	25.3 \pm 5.4	7.6 \pm 1.6L/*s	86 \pm 9mmHg

Pleural invasion or LIMA dissection did not affect the results. None had abnormal PF preoperatively. These data indicate that a significant impairment in lung volumes, flow rates, and oxygenation - but not in diffusion capacity - do occur in association with a midsternal thoracotomy in patients undergoing coronary revascularization. Return to preoperative values was observed in 3 months.

*By Invitation

9. Use of T-lymphocyte Analysis in Early Diagnosis of Adult Respiratory Distress Syndrome

MARTIN L. DALTON and CARL S. RIGBY*

Jackson, Mississippi

Adult respiratory distress syndrome (ARDS) afflicts an estimated 150,000 Americans annually with a mortality rate in excess of 50%. Although frequently associated with trauma, sepsis and shock, the precise etiology remains obscure. Certainly the role of the immune system in the development of ARDS needs further definition. Cell-mediated immunity via T-lymphocytes has been shown to be severely depressed following trauma, major surgical procedures and shock. These conditions, plus sepsis, are the usual precursors of ARDS.

We have studied by monoclonal antibody staining and fluorescence-activated cell sorting (FACS) twelve massively traumatized patients of the type particularly prone to develop ARDS. In each instance, total T-lymphocytes and subsets of helper T-lymphocytes and suppressor T-lymphocytes were precisely measured at the time of admission, following surgery and on alternate days postoperatively.

All twelve patients have survived and a definite pattern of T-lymphocyte aberration has emerged. Nine patients progressed satisfactorily, with findings of increased helper T-lymphocyte and increased helper/suppressor ratio. Two patients developed delayed infection with no sustained increase in helper T-lymphocyte and little change in the helper/suppressor ratio. One patient developed ARDS preceded by a marked increase in suppressor T-lymphocytes and a decrease in the helper/suppressor ratio. No other patient in the series has developed ARDS and no other patient has developed this pattern of T-lymphocyte response. Recovery of the patients was accompanied by an increase in helper cells and an increase in helper/suppressor ratio.

We conclude that T-lymphocyte analysis offers a promising means of evaluation of patients considered highly susceptible to ARDS. Certainly, early detection of ARDS would facilitate management and increase survival. It is conceivable that pharmacologic modification of the immune response could become a vital part of the treatment of ARDS.

*By Invitation

10. Perioperative Blood Transfusion Adversely Affects Prognosis after Resection of Stage I (NO) Non-Oat Cell Lung Cancer

PAUL I. TARTTER*, LEWIS BURROWS*

and PAUL A. KIRSCHNER

New York, New York

Recent studies suggest that pretransplant blood transfusions prolong kidney graft survival by non-specific immune suppression. Because immune suppression in cancer patients may be associated with earlier tumor recurrence and shorter survival, we studied the relationship of perioperative blood transfusion to prognosis in 165 consecutive resections of Stage I (NO) non-oat cell lung cancer over the 15 year period 1966 - 1980.

Using life table and Cox proportional hazards analysis two statistically significant prognostic factors emerge: 1) extent of resection ($p = 0.0056$) and 2) perioperative transfusion ($p = 0.0282$).

Other factors such as age, sex, tumor size (T1 or T2), histopathology, admission and discharge hematocrit, estimated blood loss, duration of operation and anesthetic agents were not statistically significant.

All were operated by one surgeon to minimize surgeon-related technical variables which may be important determinants of the need for perioperative transfusion.

DISEASE-FREE SURVIVAL						
	Number	Year 1	Year 2	Year 3	Year 4	Year 5
Transfused	59	0.7669	0.7249	0.7015	0.6213	0.6213
Non-transfused	106	0.9525	0.8656	0.8015	0.7779	0.7625
P		0.0003	0.0058	0.0208	0.0132	0.0169

Inasmuch as only 15 of the 165 patients underwent pneumonectomy, they were eliminated from the final analysis leaving a more homogenous group of 150 lobectomies and lesser procedures. Survival advantage was noted in non-transfused patients (77% versus 68% disease-free at five years, $p = 0.0783$).

These results indicate that perioperative transfusion during pulmonary resection for lung cancer adversely affects prognosis and accelerates the appearance of recurrent or metastatic disease. This supports the finding of previous studies that perioperative transfusion adversely affects the prognosis for breast and colon cancer patients.

**3:00 p.m. Intermission - Visit Exhibits - Second Floor
Complimentary Coffee**

*By Invitation

3:45 p.m. Scientific Session - Grand Ballroom - Third Floor

11. The Fate of Arm Veins Used for Coronary Artery Bypass Grafts

WILLIAM S. STONEY, WILLIAM C. ALFORD,
GEORGE R. BURRUS*, DAVID M. GLASSFORD*,
MICHAEL R. PETRACEK* and CLARENCE S. THOMAS
Nashville, Tennessee

Arm veins have been a common second choice as a graft conduit for those patients who have insufficient saphenous veins for coronary bypass operations. To define the durability and late patency of arm vein grafts, we reviewed our patients with one or more arm vein grafts used for coronary revascularization between 1974 and early 1983. A total of 58 patients required at least one arm vein graft and 50 patients are presently alive. Arm veins were used because of prior bilateral saphenous vein stripping in 39 (67%) patients, sclerotic or thrombosed vein in 7 (12%), prior use of saphenous veins in 6 (10%), varicosities in 5 (9%), and unknown in 1 (2%). Postoperative arteriograms were obtained in 25 of the 50 patients at an average of 21 months after the operative procedure. These 25 patients had received a total of 51 arm vein grafts and restudy showed that 24 (47%) grafts were patent with no abnormality, 22 (43%) were completely occluded, and 5 (10%) were patent but with a significant area of stenosis in the graft. Seventeen internal mammary artery grafts were also used in this same group of patients. Fifteen of these were investigated and 14 (93%) were patent, one with poor flow. For comparison, 28 additional patients with saphenous vein grafts were reviewed who had had a recent restudy arteriogram for symptoms. The time interval between operation and restudy for this group was 46 months. A total of 57 saphenous vein grafts were used and 42 (74%) were patent with 15 (26%) occluded. From this study, we conclude that arm vein grafts have a high failure rate of 43% (22/51) and are not as dependable as saphenous vein grafts or internal mammary artery grafts.

*By Invitation

12. Late Surgical Results for Ischemic Mitral Regurgitation: Role of Wall Motion Scores and Severity of Regurgitation

C. WRIGHT PINSON*, ADNAN COBANOGU*,
MARK T. METZDORFF*, GARY L. GRUNKEMEIER*,
PHILIP KAY* and ALBERT STARR
Portland, Oregon

The indication for concomitant valve surgery for ischemic mitral regurgitation (IMR) is examined in 120 consecutive patients with IMR who had coronary bypass surgery (CBS) since 1970. IMR was mild in 67%, moderate in 21%, and severe in 32%. IMR patients compared with 3334 CBS patients without MR, had significantly more cardiomegaly (31% vs. 5%), left heart failure (LHF) (42% vs. 6%) and abnormal CASS wall motion scores (WMS) (71% vs. 42%).

Eighty-six IMR patients (72%) had CBS alone and 34 (28% had concomitant valve surgery. No patient with mild IMR as compared to 24% with moderate and 91% with severe IMR had valve surgery.

Operative mortality for mild, moderate, and severe IMR was 5%, 10%, and 38%; 5-year survival was 82%, 60%, and 47%, respectively. Other significant determinants of survival were

cardiomegaly, LHF, type of operation, and WMS. Patients with mild IMR and WMS of 5-10 (n = 40) had 5-year survival of 93%, comparing favorably with CBS patients without MR. For patients with either moderate/severe IMR (n = 27) or WMS of 11-20 (n = 25), 5-year survival was 70%, while in patients with both high wall motion scores and moderate/severe IMR (n = 20), it was 45%, demonstrating an additive detrimental effect.

In conclusion, IMR is a major additive risk factor to WMS in CBS. Mild IMR is best managed by CBS alone. CBS alone in patients with moderate IMR and with high WMS yielded poor results, suggesting this subset of patients should have their valves explored. Severe IMR requires concomitant mitral valve surgery.

*By Invitation

13. Primary Myocardial Revascularization: Trends in Surgical Mortality

DELOS M. COSGROVE, FLOYD D. LOOP,

BRUCE W. LYTLE*, CARL C. GILL*,

LEONARD R. GOLDING*, PAUL C. TAYLOR*

and MARLENE GOORMASTIC*

Cleveland, Ohio

From 1970-1982, 24,672 patients underwent primary isolated myocardial revascularization: Group I, 4,517 patients operated on from 1970-1973; Group II, 6,181 patients 1974-1976; Group III, 6,869 patients 1977-1979; Group IV, 7,105 patients 1980-1982. The operative mortality rate was 1.2% for the entire experience and 1.2%, 1.4%, 1.6% and 0.8% for Groups I-IV respectively. The mortality rate for Group IV was significantly lower, $p < 0.001$.

Clinical, angiographic and operative variables were analyzed for operative risk factors using univariate analysis. All univariately significant factors were then analyzed using a multivariate logistic regression analysis for the entire experience.

	X ²	P-VALUE
Emergency	121.6	<0.001
CHF	29.1	<0.001
Left Main Disease	32.9	<0.001
Women	27.4	< 0.001
History of CHF	18.3	<0.001
Abnormal EKG	16.9	<0.001
Age	42.5	<0.001
Cardioplegia	14.6	<0.001
Number Grafts	17.8	<0.001
Poor LV Function	5.3	0.02

Incomplete Revasc 3.9 0.05

Group I-IV were independently analyzed for variables which increase operative mortality.

Group I	Group II	Group III	Group IV
Emergency	Emergency	Emergency	CHF
Left Main Disease	Left Main Disease	Age	Women
# Grafts	Age	CHF	Emergency
Poor LV Function	CHF	Poor LV Function	Age
Women	# Grafts	Women	Abnormal EKG
Age	History CHF	History of CHF	Incomplete Revasc

Cardiac causes accounted for 203 (66.2%) patients. This has gradually decreased from 75.3% in Group II to 58.5% in deaths of Group IV. Neurologic deficit was the second most frequent cause of death, 29 (9.6%), reaching a high in Group IV (18.9%). The median interval from surgery to hospital death has increased from two days in Group I to eight days in Group IV.

We conclude 1) there has been a significant decrease in operative mortality in the 1980's. 2) Emergency surgery has been the principle risk factor. 3) Left main disease has been neutralized as a risk factor. 4) Death ascribed to cardiac causes is decreasing in incidence.

**By Invitation*

14. Sequential Internal Mammary Artery Grafts: Expanded Utilization of an Ideal Conduit

**M. LAXMAN KAMATH*, LINDA S. MATYSIK*
and DONALD H. SCHMIDT***

Milwaukee, Wisconsin

Sponsored by: EDWARD F. PARKER

Charleston, South Carolina

Several long-term patency studies have documented the superiority of internal mammary artery grafts (IMAG) over vein grafts (VG) as conduits for the revascularization of the ischemic myocardium. Thus far, each IMAG has been used for anastomosis at one site on the coronary artery limiting the area of revascularization. In an effort to expand the utility of IMAG we have performed sequential anastomoses in 82 patients (pts) over the past 3 years and our experience is presented in this report. Based on the nature of anastomoses the pts are divided into three groups. Pts in group I received single sequential IMAG, group II received one sequential IMAG and one end-to-side IMAG, while pts in group III received two sequential IMAG. In addition pts in each group received VG as needed. Graft patency was evaluated by coronary angiography in 30 pts (36.5%). The results are presented in the table.

	Group I	Group II	Group III	Total
Total No of pts	46	29	7	82
Total No of IMAG	192	87	28	207
Total No of VG	123	68	14	205
No of pts evaluated	13	15	2	30
No of IMAG evaluated	26*	45	8	79
No of IMAG patent	24	43	8	75
Graft patency %	92.3	95.5	100	95
No of VG evaluated	37	35	7**	79
No of VG patent	35	30	7	72
Graft patency %	94.5	85.7	100	91

*One IMAG could not be injected, patency of two grafts-unknown.

**One Gortex graft, patent.

Functional adequacy of myocardial revascularization was evaluated by exercise stress test in 77 pts (94%) including every pt who had angiography. Among pts who were evaluated for graft patency, stress test was negative in 26 (86.6%) pts, positive in 3 (10%) pts and equivocal in 1 (3%) pts. In the total study population, stress test was negative in 64 (83%) pts, positive in 5 (6.4%) pts and equivocal in 8 (10%) pts. At the time of this reporting 96% of the pts were alive and well.

The results show that patency of sequential IMAG is comparable to the patency rate reported for single end-to-side IMAG. It is also evident that expansion of the area of revascularization using sequential IMAG is technically feasible and the results of stress tests suggest that such anastomoses provide adequate nutrition to the revascularized myocardium.

*By Invitation

15. Coronary Artery Bypass for Unsuccessful Percutaneous Transluminal Coronary Angioplasty

GEORGE J. REUL, DENTON A. COOLEY,

DAVID A. OTT*, J. MICHAEL DUNCAN*,

JAMES J. LIVESAY* and O. H. FRAZIER*

Houston, Texas

Of the 518 consecutive patients undergoing percutaneous transluminal coronary angioplasty (PTCA) for 571 coronary lesions, 184 eventually underwent aortocoronary artery bypass (ACB) because of failure of the procedure. Immediate failure of PTCA resulted in ACB in 157 patients, all operated upon the day of PTCA attempt. Late failure manifested by recurrent symptoms 1 week to 2 years post-PTCA resulted in ACB in 27 patients. Age range was 34 to 79 years (mean, 56.5 years). There were 130 men and 54 women. Complicating factors were previous ACB (16 patients); previous PTCA (12 patients), and pre-PTCA acute myocardial infarction (3 patients). Delayed ACB (another hospital admission) was done in 27 patients (no deaths). Immediate ACB (0-24 hours) because of failure to dilate the vessel or because of complications of the dilatation attempt

was done in 87 patients (2 deaths). Emergency ACB (less than 3 hours) was required in 63 patients who were unstable because of unrelieved angina, persistently ischemic EKG, or hypotension (1 death). In the remaining 7 patients, cardiac arrest occurred during PTCA and required immediate cardiopulmonary bypass and emergency ACB (3 deaths). Overall mortality was 3.3% (6/184). More than one graft was required in 49% (90/184), indicating multiple vessel involvement. Despite emergency ACB, evolution to transmural infarction occurred in 26 of 70 (38%) who were either unstable with acute ischemia or had cardiac arrest during PTCA. Early mortality of ACB following unsuccessful PTCA (6/184) compared with early mortality following elective ACB during this same period (42/3500) was significantly different ($p < 0.05$). Perioperative infarction following failed PTCA (26/184) was significantly different ($p < 0.001$) when compared to infarction following elective ACB (88/3500). Thus, during PTCA immediately available surgical back-up is imperative, and proper patient selection is essential since there is a high incidence of perioperative infarction and operative mortality following unsuccessful PTCA.

*By Invitation

TUESDAY MORNING, May 8, 1984

6:45 - 8:15 a.m. Simultaneous Breakfast Sessions**

A. Surgical Management of Myocardial Infarction

MODERATOR: Floyd D. Loop, Cleveland, Ohio

B. Congenital left Ventricular Outflow Tract Obstruction

MODERATOR: John W. Kirklin, Birmingham, Alabama

C. Carcinoma of the Esophagus

MODERATOR: Earle W. Wilkins, Jr., Boston, Massachusetts

8:30 a.m. Scientific Session - Grand Ballroom - Third Floor

16. Late Results of Repair of Ruptured Chordae

THOMAS A. ORSZULAK, HARTZELL V. SCHAFF*,*

GORDON K. DANIELSON, JEFFREY M. PJEHLER,*

JAMES R. PLUTH, FRANCISCO J. PUGA,*

*D WIGHT C. McGOON and ROBERT L. FRYE**

Rochester, Minnesota

Between 1958 and 1980, 131 patients came to operation for repair of ruptured chordae of the mitral valve (82 males and 49 females: median age 57, ranging 5 to 70 years; 79% in New York Heart Association Class III and IV preoperatively). The leaflet involved was the anterior in 44 patients (33.5%), posterior in 85 (64.8%), and both leaflets in 2. Most frequently associated valve abnormalities were annular dilatation (60%), leaflet prolapse (21%), and leaflet cleft (15%). Mitral valve repair was effected by plication in 116 patients, wedge resection of the leaflet in 6, Ivalon sponge buttress of the posterior leaflet in 3 patients, chordal repair in 2 patients, and isolated annular procedures in the remaining 4 patients. Annuloplasty was included in repair in 115 patients. Early mortality was 6.1% (9% for anterior leaflet repair, 4.7% for posterior leaflet repair). Late follow-up (2 to 19 years, 10 years median) included 98% of patients and demonstrated an overall survival of 88% at 5 years and 75% at 10 years. Patient age, additional operative procedures, and presence

of atrial fibrillation did not influence late survival. Actuarial survival curves were similar in patients with repair of ruptured chordae to the posterior leaflet and anterior leaflet. Twenty-eight patients (22.7%) ultimately came to reoperation at a mean of 5 years, 25% of the anterior leaflet patients, and 22.2% of the posterior. One patient had re-repair, the others mitral valve replacement. Overall patient survival (88 vs. 72% at 5 years) was significantly better in these patients undergoing mitral valve repair for ruptured chordae compared to patients having mitral valve replacement for ruptured chordae during the same time period. Our data support valve repair for mitral regurgitation due to ruptured chordae including those patients with ruptured chordae to the anterior leaflet.

*By invitation

**No advance registration. Attendance by ticket only. Tickets must be purchased at registration desk by 2:00 p.m. on Monday, May 7, 1984. Price of ticket covers attendance at session and breakfast.

17. Early and Late Risk of Aortic Valve Replacement: An 11-Year Concomitant Comparison of the Porcine Bioprosthetic and Tilting Disc Prosthetic Aortic Valves

*LAWRENCE H. COHN, ELIZABETH N. ALLRED**,

*VERDI J. DiSESA *, RICHARD J. SHEMIN**

and JOHN J. COLLINS, JR.

Boston, Massachusetts

Results in 912 consecutive patients (614M/298F, 16-95, 61 yrs, 28 functional class (FC) 1-2, 533 FC 3, 351 FC 4) operated upon from 1/72 to 1/83 who received 663 porcine valves (PV) and 249 tilting disc valves (TDV) were analyzed. Age and sex were similar but there was a higher percent FC 4 for TDV. 657 patients had primarily aortic stenosis (AS) while 255 had primarily aortic regurgitation (AR). Associated procedures were done in 308 patients (33%). Overall operative mortality was 57/912 (6.3%), 29/640 (4.5%) for AVR alone, 20/228 (8.7%) for AVR + CABG and 8/44 (18%) for AVR + AAA. Overall operative mortality for AR was 19/255 (7.5%), 38/657 (6%) for AS; mortality for PV was 28/663 (4.2%), and 29/249 (11.5%) for TDV.

Long-term follow-up was analyzed for 511 PV and 191 TDV patients operated upon from 1/1/72 to 1/1/82, providing a minimum 12 mo. follow-up, 48 mos. Actuarial survival at 120 mos excluding no deaths was $61 \pm 3\%$; for AS it was $64 \pm 4\%$ and for AR, $55 \pm 8\%$ ($p < 0.01$); probability of survival was $65 \pm 5\%$ for PV and $57 \pm 5\%$ for TDV ($p < .02$). Survival at 108 mos for AVR alone was $72 \pm 4\%$, for AVR ± 11 ($p < .01$) and for AVR + AAA 45 ± 11 ($p < .01$). Survival probability for FC 1-3 was 70 ± 5 , and 50 ± 5 for FC 4 ($p < .001$). At 120 mos the probability of thromboembolism (TE) overall was 88 ± 2 , for PV 88 ± 2 and 89 ± 3 for TDV ($p = \text{NS}$). Emboli/pt year were 1.8 for PV, 1.3 for TDV ($p = \text{NS}$). For PV in atrial fibrillation TE was 77 ± 5 vs 91 ± 3 for sinus rhythm ($p < .002$). Only 10% of PV patients (in AF) were on anticoagulation (A/C) while all TDV patients were on A/C; there were 6 major hemorrhages in TDV patients (3%, 0.6/pt yr). 4 TDV patients had total thrombosis (off A/C) and one in the PV group.

Primary valve dysfunction did not occur with TDV but did in 13/511 patients with PV (2.5%) ($p < .006$); freedom from valve dysfunction at 120 mos with PV was $88 \pm 7\%$. There were no differences in age groups for PV dysfunction. Perivalvar leak necessitated reoperation in 7 patients (6 PV, 1 TDV) (7%); freedom from PVL was 98 ± 1 at 120 mos. Late endocarditis occurred in 10 patients; probability free from SEE was $97 \pm 1\%$ in PV at 120 mos and 99% in TDV ($p < .05$).

The overall operative risk for AYR is now about 5%. Late survival reflects preoperative FC and associated cardiovascular disease. TE, valve thrombosis and A/C hemorrhage are major risks of TDV. Valve failure, primary or infectious, is the major risk factor of PV.

* By Invitation

18. Five-Year Experience with the St. Jude Valve Prosthesis

AURELIO CHAUX, RICHARD J. GRAY*,*

LAWRENCE S.C. CZER, MICHELE A. DeROBERTIS**

and JACK M. MATLOFF

Los Angeles, California

Our 5-year experience with the bileaflet, St. Jude cardiac valve prosthesis has been analyzed. To ensure a minimum follow-up of one year, 198 patients (pts) receiving only St. Jude prostheses, between March 1978 and June 1982, were reviewed. All pts (mean age 63 yrs, range 6 to 84) were followed, for a total of 4896 pt months (mean 25 months). Mitral valve replacement (MVR) was performed in 90, aortic valve replacement (AYR) in 73, and MVR + AYR (DVR) in 35. Concomitant coronary bypass was performed in 101 (51%), with additional cardiac procedures in 22 (11%). There were 13 (6.5%) early and 30 (16.0%) late mortalities. One pt died one day after surgery due to prosthetic erosion into the atrioventricular groove. Two pts subsequently developed perivalvular leaks, both due to SBE. One-hundred seventy-six were anticoagulated with warfarin sodium and 9 were not. Nine thromboembolic episodes (TE) occurred (2.5/100 pt years): 4 after MVR (2.3/100 pt years), 2 after AYR (1.3/100 pt years) and 3 after DVR (3.7/100 pt years). No episode of TE was fatal, but one pt experienced a residual right hemiparesis, and one had successful reoperation for a thrombosed aortic valve. There were no structural failures at any time. Thus, the total valve-related complication rate from all causes (TE, SBE-perivalvular leak, valve erosion, valve-related death) was 2.9/100 pt years (12 events). Of the surviving pts, 139 (90%) were improved by at least one NYHA class. No evidence of clinically-significant hemolysis or anemia was found in 50 pts studied a minimum of 2.5 years after surgery.

In summary, 5 years of pt follow-up after St. Jude cardiac valve replacement reveals: 1) structural valve failure has not occurred; 2) the TE rate is low (2.5/100 pt years) in properly-anticoagulated pts; 3) no clinical evidence of hemolysis has occurred; 4) the all-inclusive valve-related complication rate has been low (2.9/100 pt years).

These intermediate results, taken in concert with prior demonstration of excellent hemodynamic function, support the continued use of this cardiac valve prosthesis.

*By Invitation

19. Mitral Valve Replacement for Mitral Regurgitation With and Without Preservation of Chordae Tendinae

*TIRONE E. DAVID**, *MAURICE M. DRUCK**

*and ROBERT J. BURNS**

Toronto, Ontario

Sponsored by: RICHARD D. WEISEL

Toronto, Ontario

This study compares left ventricular function (LVF) following correction of chronic mitral regurgitation (MR) by conventional valve replacement (Group 1) and replacement with preservation of chordae tendinae and papillary muscles (Group 2).

Between July 1979 and June 1983 every patient with isolated MR who required valve replacement was alternately placed into Group 1 (17 patients) or Group 2 (18 patients). Preoperative LVF was assessed by nuclear angiography in the day before surgery and, postoperatively 3 to 6 months later in all patients. Preoperative NYHA classification and LVF were similar in both Groups. All patients received porcine bioprostheses of 31 or 33 mm. The intraoperative management was similar as far as conduction of anesthesia, cardiopulmonary bypass (CPB), myocardial preservation and anoxic time. All patients were weaned off CPB with no difficulty although the mean left atrial pressure of Group 1 was higher than Group 2 ($p < 0.01$). Five patients from Group 1 and one patient from Group 2 required inotrope support in the intensive care unit. There was no operative death.

Postoperative ejection fraction decreased from 0.56 ± 0.11 to 0.50 ± 0.08 in Group 1 ($p < 0.05$) and, the change was not significant in Group 2 (from 0.55 ± 0.08 to 0.57 ± 0.06). Postoperative ejection fraction during exercise fell from 0.50 ± 0.08 to 0.46 ± 0.05 in Group 1 ($p < 0.02$) and increased from 0.57 ± 0.06 to 0.64 ± 0.11 in Group 2 ($p < 0.01$).

These findings suggest that preservation of chordae tendinae and papillary muscles during valve replacement for chronic mitral regurgitation has a beneficial effect in postoperative LVF.

10:00 a.m. Intermission - Visit Exhibits - Second Floor

Complimentary Coffee

*By Invitation

10:45 a.m. Scientific Session - Grand Ballroom - Third Floor

20. Staged Partitioning of Single Ventricle

PAUL A. EBERT

San Francisco, California

The operation of septation of the single ventricle has always appeared to be a more physiologic and desirable approach to patients with such conditions providing the AV valves functioned independently. The present experience related to four patients who had a staged partitioning of their single ventricle anomalies. The patients were identified to have a single ventricle of a common chamber type with increased pulmonary blood flow and a posterior position pulmonary artery that was in approximation to the tricuspid annulus. Their ages at the time of the first stage operation were three, six, nine and ten months. At this time, one patch was placed at the apex of the ventricle and a second patch at the superior portion of the ventricle between the AV valves. This was accomplished through the tricuspid orifice and a band was placed on the pulmonary artery. The time of second stage repair ranged from six to eighteen months. At this time the pulmonary artery band was removed and the pulmonary artery enlarged. A third patch was placed in the central

portion of the ventricle to close the "large VSD". All four patients have survived. One child developed infundibular pulmonary stenosis two years after his second stage procedure. This subsequently required a right ventricle to pulmonary artery conduit. All four are in sinus rhythm and remain in general good health. Staging allows the apical and base patches to stiffen and avoids paradoxical motion of the artificial septum at the time of closure of the remaining "VSD".

*By Invitation

21. Reoperation for Obstructed Right Ventricle-Pulmonary Artery Conduits: Early and Late Results

HARTZELL V. SCHAFF, ROBERTO M. DiDONATO*,*

GORDON K. DANIELSON, FRANCISCO J. PUGA,*

DONALD G. RITTER and DWIGHT C. McGOON*

Rochester, Minnesota and Rome, Italy

Obstruction of right ventricle-pulmonary artery (RV-PA) conduits can result from neointimal peel formation and/or valvular degeneration and calcification. To determine the risks and outcome of reoperation, we have reviewed 100 consecutive patients (pts) who had replacement of severely stenotic RV-PA conduits between 10/16/72 and 5/25/83. Original reparative surgery was performed for transposition of the great arteries with ventricular septal defect (VSD) (37%), pulmonary atresia with VSD (26%), truncus arteriosus (24%), and other complex malformations (13%). At reoperation the 70 boys and 30 girls had a mean age of 13.3 ± 4.8 years (\pm SD). Seventy-three pts had fatigability or symptoms of right ventricular failure; in the remaining pts, conduit obstruction was diagnosed at routine examination. Associated cardiac defects were identified in 47 pts including: residual VSD (28); truncal, aortic, or tricuspid valve insufficiency (17); and hypoplasia or stenosis of the proximal right or left pulmonary arteries (22). During surgery 37 homografts, 61 Dacron grafts with integral porcine valves, and 3 other conduits were replaced with valved (83) or non-valved (17) pro-stheses. The mean RV-PA pressure gradient fell from 81 ± 6 preoperatively to 7 ± 8 mm Hg postoperatively ($p < 0.01$). Concomitant cardiac valve replacement was performed in 7 pts, and residual VSD closure was accomplished in 26 pts. Operative (< 30 days) mortality was 7%, and all deaths occurred in pts who had additional operative procedures. There was no mortality among the 47 pts who only had replacement of the stenotic extracardiac conduit. At 3 and 5 years postoperatively, probability of survival among pts dismissed from the hospital was $94 \pm 3\%$ and $86 \pm 6\%$, respectively. Conduit obstruction may produce serious late morbidity in children who have had otherwise successful repair of complex congenital heart disease, but in our experience risk of reoperation for conduit obstruction alone is low, thus minimizing the effect of graft failure on overall survival.

11:30 a.m. Address by Honored Speaker -

Left Ventricular Aneurysmectomy: Resection or Reconstruction?

ADIB D. JATENE, Sao Paulo Brazil

12:15 p.m. Adjourn for Lunch - Visit Exhibits

12:15 p.m. Cardiothoracic Residents' Luncheon - Trianon Ballroom

*By Invitation

TUESDAY AFTERNOON, May 8, 1984

2:00 p.m. Scientific Session - Grand Ballroom - Third Floor

22. Timing of Coronary Revascularization Following Acute Myocardial Infarction: Early and Late Results in Patients Revascularized Within Seven Weeks

MARK S. HOCHBERG*, VICTOR PARSONNET,
ISAAC GIELCHINSKY, S. MANSOOR HUSSAIN*
DANIEL A. FISCH* and JOHN C. NORMAN
Newark, New Jersey

Complications of acute myocardial infarction (post-infarction angina and cardiogenic shock) usually require early angiography. If significant coronary artery disease is demonstrated, the precise timing of myocardial revascularization may be of critical importance.

From 1978 through 1982, 179 patients with documented myocardial infarction underwent early angiography and operation within seven weeks. The male:female ratio was 140:39; average age was 58 ± 1.8 (SEM); and ejection fraction (EF) averaged $41 \pm 3\%$. Forty-eight (27%) patients required pre-operative intra-aortic balloon (IABP) support, and an additional eight (5%) required it to be separated from cardiopulmonary bypass. An average of 2.9 ± 0.2 vessels were bypassed. Hospital mortality for these 179 patients was 17%. However, when mortality rates were categorized according to the post-infarction week in which operation was performed, hospital mortality ranged from 56% for those patients operated upon within one week of infarction to 5% for those patients operated upon seven weeks following infarction. Of those patients operated upon within the first week following infarction, 25% were in cardiogenic shock and 63% required pre-operative IABP. Clearly the most critically ill patients were operated upon during the early post-infarction period.

However, there was a marked difference in survival when patients in each of the seven weekly groups were classified according to EF. All patients with EF $\geq 50\%$ (53 patients) operated upon at any time following infarction survived their hospital course with only one late death. Conversely, of the 126 patients with EF $< 50\%$ operated upon during this seven-week interval, there were 32 (25%) hospital deaths and five (4%) late deaths. The difference in early and late survival of patients operated upon with EF $\geq 50\%$ compared to patients with EF $< 50\%$ is highly significant ($p < .001$).

We conclude that myocardial revascularization is safe at any time following myocardial infarction for those individuals with EF $\geq 50\%$.

*By Invitation

23. Observations on 100 Patients with Continuous Intraoperative Monitoring of Myocardial pH: The Adverse Effects of Reperfusion and Ventricular Fibrillation

SHUKRIF. KHURI*, WILLIAM A. MARSTON*,
MIGUEL JOSA*, NINA S. BRAUNWALD,
ANN C. CAVANAUGH* and ERNEST M. BARSAMIAN
West Roxbury, Massachusetts

The first continuous MpH measurements in man were performed in 100 patients undergoing cardiac surgery with cold K + cardioplegia. Both MpH and the adjacent myocardial temperature (MT) were recorded from the mid and inner layers of the anterior left ventricular wall. MpH and MT data following a single period of aortic clamping (AC) were analyzed to characterize the metabolic correlate of reperfusion and its determinants. MpH at the end of AC (MpH_{ac}) averaged 6.94 ± 0.04 (Mean \pm SEM). Following reflow it fell and reached a nadir (MpH_r) of 6.64 ± 0.03 ($P < 0.001$) in 11.0 ± 0.69 minutes; after that it rose gradually to reach normal levels at discontinuation of cardiopulmonary bypass. MpH_r reached significantly lower levels (6.5 ± 0.07) in the patients (32%) whose MpH_{ac} was below 6.8 (Group I) than in the patients (68%) whose MpH_{ac} was above 6.8 (6.78 ± 0.03) (Group II). As shown in the Table, in Group I rapid rewarming (MT above 32 °C at 15 minutes of reflow) caused a significant drop in MpH whereas slow rewarming (MT $< 30^\circ$ at 15 minutes) seemed to reduce reperfusion acidosis. In Group II, MpH_r was

significantly higher than Group I ($P < 0.001$) and rapid rewarming did not affect MpH more adversely than slow rewarming.

Defibrillation effected a significant rise in MpH in both groups. This rise was significantly more in Group I (0.22 ± 0.03 pH units) than in Group II (0.13 ± 0.02 pH units, $P < 0.001$). Within a narrow range, perfusion pressure did not seem to relate to reperfusion acidosis. It is concluded that the metabolic correlate of reperfusion is a fall in myocardial pH which is determined primarily by the extent of the ischemic damage incurred during the period of AC. When this degree of ischemia is significant (MpH below 6.8), reperfusion acidosis can be significantly reduced by slow rewarming and prompt defibrillation. This study also underscores the value of continuous metabolic monitoring as a new adjunct in the continuing quest for optimal myocardial preservation.

*By Invitation

24. Indications for Ultrafiltration in the Cardiac Surgical Patient

DONALD J. MAGILLIGAN, JR.

Detroit, Michigan

Ultrafiltration is the removal of water and plasma concentration of electrolytes from blood by convective transport across a semi-permeable membrane. We have used Ultrafiltration in 48 cardiac surgical patients and from this experience have evolved indications for its use. **Thirty-three** of the 48 patients had the ultrafilter inserted in the cardiopulmonary bypass (CPB) circuit at the start of surgery since they had evidence of excess body water preoperatively. The amount of ultrafiltrate removed ranged from 1000 to 6600 ml. and averaged 2728 ml. resulting in an average intraoperative fluid balance of - 638 ml. and an average intraoperative weight gain of 1.9 kg. Eleven of these 33 patients had pre and postop measurement of extravascular lung water (EVLW) by the thermal-dye technique. The postop EVLW (823 ml.) was significantly lower than the preop EVLW (1119 ml.) ($p < .05$). Thirteen of the 48 patients had the institution of Ultrafiltration after bypass had begun because of a long perfusion and/or excessive pump reservoir volume and/or low hematocrit (Hct). The ultrafilter was easily interposed in the recirculation line during bypass in these patients and resulted in a mean Ultrafiltration volume of 1619 ml. and an average fluid balance of +595 ml. **One** of the 48 patients with severe CHF, sepsis, respiratory failure and nutritional depletion had Ultrafiltration preoperatively. After Ultrafiltration for 4 days which allowed an intake of 3000 k/cal/ day with a nitrogen balance of +3.2 g/day and without weight gain the patient underwent successful MVR and CABG. One patient returned to the hospital after AYR with no improvement in CHF and resistant to maximal diuretic therapy. Ultrafiltration was instituted through an AV dialysis shunt with a 7.4 kg. weight loss in 7 days and improvement in radionuclide ejection fraction from 37 to 60 percent.

Ultrafiltration is indicated: 1. **Intraoperatively** during CPB: A) in the patient who shows clinical, radiographic or EVLW evidence of excess body water preoperatively. B) when pump reservoir volumes are excessive. C) when pump volumes are high and the Hct is < 18 . Ultrafiltration can be considered: 2. **Preoperatively** or 3. **Postoperatively** when a patient needs large fluid volumes for nutritional support or in the fluid overloaded diuretic resistant patient. Our studies showing no increase in EVLW during CPB in the normovolemic patient suggest that the routine use of Ultrafiltration during CPB is not indicated.

*By Invitation

25. A Clinical Trial of Blood and Crystalloid Cardioplegia

STEPHEN S. FREMES, RICHARD D. WEISEL,
DONALD A.G. MICKLE*, GEORGE T. CHRISTAKIS*,
JOAN IVANOV* and RONALD J. BAIRD
Toronto, Ontario*

Although experimental studies suggest that blood cardioplegia (BCP) provides better myocardial protection than crystalloid cardioplegia (CCP), clinical studies remain inconclusive. Eighty-two patients undergoing elective coronary bypass surgery were randomized to receive either blood or crystalloid cardioplegia. Ischemic injury, as defined by the highest postoperative CK-MB was significantly less with BCP (BCP: 27.4 ± 12.7 ; CCP: 36.7 ± 17.6 U/L, $X \pm SD$, $p < 0.05$). Forty-four patients (BCP: 22; CCP: 22) had more sensitive measurements to assess the metabolic response to aortic occlusion and to compare the metabolic and functional recovery from surgery. Coronary sinus blood flow (CSBF) was calculated by the continuous thermodilution technique and was significantly lower after cross-clamp removal with BCP (BCP: 132 ± 71 ; CCP: 228 ± 125 mL/min, $p < 0.01$), indicating less reactive hyperemia. Cardiac extraction of lactate was significantly greater with BCP during cardioplegia (BCP: -0.4 ± 0.9 ; CCP: -1.0 ± 0.7 mmol/L, $p < 0.01$) and immediately after aortic declamping (BCP: -0.1 ± 0.4 ; CCP: -0.7 ± 0.8 mmol/L, $p < 0.01$). The left ventricle was biopsied prior to aortic occlusion (PRE), immediately after cross-clamp release (POST) and 30 minutes after reperfusion (LATE). Adenosine triphosphate did not change with BCP (PRE: 16.0 ± 5.7 ; POST: 15.0 ± 4.9 ; LATE: 14.4 ± 9.7 mmol/kg dried weight), but decreased significantly with CCP (PRE: 19.9 ± 8.6 ; POST: 14.1 ± 7.7 ; LATE: 11.6 ± 3.6 mmol/kg, $p < 0.01$ by analysis of variance, ANOVA). Thermodilution cardiac output measurements permitted calculation of stroke work index (SWI), and nuclear ventriculograms permitted calculation of left ventricular and diastolic volume index (EDVI) and end systolic volume index (ESVI). Myocardial performance (the SWI-EDVI relation) and systolic elastance (the systolic blood pressure -ESVI relation) were significantly better with BCP ($p < 0.01$ by ANOVA), although compliance (the left atrial pressure - EDVI) was similar.

Blood cardioplegia reduced ischemic injury, decreased anaerobic metabolism and permitted better functional recovery. Blood cardioplegia provides superior protection for elective coronary bypass surgery, and may improve the results of surgery in unstable or other high-risk patients.

3:15 p.m. Intermission - Visit Exhibits - Second Floor

Complimentary Coffee

*By Invitation

4:00 p.m. Scientific Session - Grand Ballroom - Third Floor

26. Dysphagia Complicating Hiatal Hernia Repair

*ROBERT D. HENDERSON
Toronto, Ontario*

Following surgical management of reflux dysphagia may be a continuing or added problem. Radiology alone may not diagnose the problem and only by careful evaluation can a cause be found. In a series of 208 patients treated surgically for a recurrent hiatal hernia, 34 (16.3%) presented with dominant dysphagia. Prior to their original operation 29 had been correctly diagnosed as reflux, however 5 were incorrectly diagnosed (4 D.E.S. and 1 achalasia) and treated by myotomy and hernia repair. The original operation was Nissen (14): Total fundoplication gastroplasty (T.F.G.) (3): Belsey (7): partial fundoplication gastroplasty (P.F.G.) (4): myotomy (5) and unnamed hernia repair (1).

Evaluation by history indicated that dysphagia resulted from the operation (17) and preceded but was worsened by surgery (17). Radiology showed reflux, recurrent hernias, diverticulae or stasis in 14 (41.2%), however more importantly 20 patients were called normal. When solids were added to barium, obstruction was demonstrated in all patients. Positive manometric and pH findings of reflux, hernia recurrence, intact HPZ with myotomy, increased wrap length and scleroderma

were present in 23 (68%). Endoscopic stasis, reflux, ulceration or stricture were present in 17 (51.5%).

The etiology of dysphagia was diagnosed in all patients - reflux stricture (9); tight or long Nissen (15); muscle injury (3) inappropriate myotomy with reflux (3); myotomy with over competent repair (2) and early Nissen intussusception (2).

Surgical correction was by T.F.G. (32); Nissen (1) and colon interposition (1). In 4 the myotomy was closed. Complete follow-up averages 3.9 years. There is 1 anatomic recurrence, 28 are asymptomatic and 5 are much improved but have minor persistent dysphagia. Only by complete investigation can the cause of the dysphagia be recognized and treated.

*By Invitation

27. Surgery for Esophageal Achalasia: Results of Esophagomyotomy Without an Antireflux Operation

F. HENRY ELLIS, JR., ROBERT E. CROZIER
and ELTON WATKINS, JR.
Burlington, Massachusetts*

Current widespread enthusiasm for combining an antireflux procedure with esophagomyotomy for esophageal achalasia is, we believe, not only predicated on the incorrect assumption that reflux is common after esophagomyotomy but is a potentially hazardous undertaking when performed in the setting of an aperistaltic esophagus. These concerns prompted us to review our results after esophagomyotomy alone.

Between January 1970 and July 1983, 109 patients with esophageal achalasia underwent esophagomyotomy at the Lahey Clinic. Twenty-nine patients had been treated on one or more occasions by forceful dilation and seventeen had been operated on before. Esophagomyotomy was performed through the left chest by a technique to be described in which the myotomy is limited for the most part to the distal esophagus. No patients died during hospitalization. Eleven (10%) experienced postoperative complications only one of which was significant. Results are based on follow-up studies of 88 patients operated on 1 - 13.5 years ago (average follow-up 6.75 yrs.). Six patients were lost to follow-up and 15 were operated on less than a year ago. Eighty patients (91%) were improved by surgery. The improvement rate was 94% for those undergoing a primary operation and 86% for those undergoing reoperation. Only 3 of the 8 poor results were due to reflux esophagitis and they are satisfactorily managed medically.

Multiple regression and discriminant analysis of such risk factors as age, sex, duration of symptoms, stage of disease, prior operation, or dilations revealed that only prior operation correlated significantly with poor results ($p = 0.0002$). Because of the high success rate of a limited esophagomyotomy and the low incidence of significant reflux symptoms after its use, we recommend that it be performed without an associated antireflux procedure.

*By Invitation

28. Tracheoplasty with Pericardial Patch for Extensive Tracheal Stenosis in Infants and Children

FAROUK S. IDRIS, SERAFIN Y. DeLEON,
MICHEL N. ILBAWI*, CAROL GERSON*,
GABRIEL F. TUCKER * and LAUREN HOLINGER*
Chicago, Illinois*

Long tracheal stenosis due to complete trachea! rings or other causes presents a difficult problem in management and a serious threat to life in infants and children. Primary resection and anastomosis cannot be accomplished because of the extent of the lesion, which may involve more than two-thirds of the length of the trachea. Few and occasional successes are reported with various surgical techniques. Three patients, ages 4, 7, and 21 months, were operated upon during the past 2 years. A long pericardial patch was used for the tracheoplasty performed through a median sternotomy incision with partial cardiopulmonary bypass. The first patient operated upon was a 7-month old with complete tracheal ring and a right upper lobe tracheal bronchus. His lesion required patching from 1 cm proximal to the larynx down to the carina. A second operation 5 months later

was performed to patch 2-3 rings proximal to the carina which were not enlarged during the first surgery. He is asymptomatic one year following surgery. The second child, operated upon at 21 months of age, had agenesis of the left lung. Acute respiratory difficulty may have been precipitated by superimposed infection. She is doing well 9 months postoperatively. The third patient operated upon was a 4-month old who was transferred to our institution in extremis and who could not be bronchoscoped until partial bypass was instituted (1-2 mm tracheal lumen). In this infant, posterior tracheal indentation was caused by a right aortic arch. However, the anterior pericardial patch is fixed and does not collapse. We conclude from this encouraging limited experience that pericardium is a good substitute for extensive tracheal patching, and the median sternotomy incision provides excellent exposure of the entire tracheobronchial tree and permits easy institution of extracorporeal circulation. Bronchoscopic guidance is important during surgery and can be accomplished safely while on bypass. Prolonged tracheal stenting is not required. Early and aggressive management with this technique is recommended for this high-risk group of infants.

5:00 p.m. Executive Session (Members Only) - Grand Ballroom - Third Floor

7:00 p.m. Presidents Reception - Trianon Ballroom, New York Hilton

*By Invitation

WEDNESDAY MORNING, May 9, 1984

8:30 a.m. Scientific Session - Grand Ballroom - Third Floor

29. Surgical Assessment of Percutaneous Balloon Pulmonary and Aortic Valvuloplasty

JOSEPH T. WALLS, ZUHDI LABABIDI*,*

JACK CURTIS, and DONALD SILVER*

Columbia, Missouri

Results of percutaneous balloon pulmonary valvuloplasty (PBPV) and percutaneous balloon aortic valvuloplasty (PBAV) for relief of valvular pulmonic stenosis (PS) and valvular aortic stenosis (AS) were assessed in 56 patients. Thirty had PS and 26 had AS. Patients with PS had reduction in peak systolic valve gradient (G) from 85 ± 36 mmHg to 27 ± 17 mmHg ($p < 0.01$). Seven patients were later treated with open valvulotomy. Four of 5 patients with complex cardiac anomalies and PS had reduction in G following PBPV; one did not. Examination of the pulmonary valve at operation revealed 3 mechanisms of PBPV relief of PS (1) commissural splitting (2) cusp tearing (3) cusp avulsion from the anulus. All patients with cusp avulsion had infundibular stenosis. PBAV in 26 patients with AS reduced G from 113 ± 45 mmHg to 32 ± 17 mmHg ($p < 0.01$). Mild aortic valve regurgitation occurred in 10 patients. Two patients were later treated by open aortic valvulotomy. One had evidence of valve stretching and one had a commissure partially opened by PBAV.

Conclusion: PBPV and PBAV can relieve G of PS and AS. Over-distention of the valve anulus must be avoided to reduce the possibility of extensive cusp avulsion and severe regurgitation. At present we do not recommend PBPV in patients who have PS and infundibular stenosis due to increased incidence of cusp avulsion. Anatomic results are less predictable than open valvulotomy using cardiopulmonary bypass, however, the effects may be similar to closed operative techniques. No deaths occurred.

*By Invitation

30. Should Elective Repair of Coarctation of the Aorta Be Done In Infancy?

DAVID B. CAMPBELL, JOHN A. WALDHAUSEN*

and WILLIAM S. PIERCE

Hershey, Pennsylvania

Our experience with CoA in infants and the subclavian flap repair over the past ten years includes 51 patients under one year of age. In the group of 34 patients under one month of age at the time of operation, all but two had an associated PDA, and 22 (65%) had associated intracardiac anomalies. All neonates presented with severe congestive heart failure and operation was carried out promptly after stabilization with inotropic agents and diuretics. Prostaglandin infusions have been essential in the care of many of these infants. Operative mortality was two of 51 patients (4%). No patient more than four days old has died. Concomitant pulmonary artery banding was performed in five infants with no deaths. Twenty-one infants were repaired with running nonabsorbable suture, 22 with interrupted nonabsorbable suture, and the last eight have had continuous monofilament absorbable suture used. Mean follow-ups has been 42 months. Nine patients have been restudied invasively, revealing residual gradients (5, 15, 20 mm Hg) in three continuous repairs. The other six all had interrupted repairs and no gradient was present. Initial follow-up information for the group with absorbable suture repair suggests no residual gradients. No patient had significant upper extremity or hand morbidity. Ten patients have shown normal exercise responses (blood pressure and arm to leg gradients).

In the absence of absorbable vascular suture, an interrupted suture technique is superior to continuous running repair. In view of the low operative mortality, the excellent growth of the repaired area, and concern regarding the late development of cardiovascular disease (especially hypertension) if repair is effected in childhood or adolescence, we favor subclavian flap repair of CoA, in all infants <2 years of age **with** or **without** symptoms. Concomitant pulmonary artery banding is seldom indicated.

*By Invitation

31. The Mustard Operation for Simple and Complex Forms of d-Transposition: Early and Late Results

*WILLIAM A. GAY, JR., JOHN E. O'LAUGHLIN**

*and MARY ALLEN ENGLE**

New York, New York

Between Jan. 1972 and Nov. 1983, 112 children had operative repair of d-Transposition of the Great Arteries (d-TGA) using the interatrial baffle technique (Mustard) or a modification thereof. 73 operations (Group I) were done prior to 1977 and the 66 survivors formed the base for reporting late results. The remaining 39 (Group II) were done within the past five years and form the base for reporting early results. Complex d-TGA (associated VSD and/or PS) was present in 20 to 25% of both groups.

Operative mortality was 9.6% (7/73) in Grp I and 7.7% (3/39) in Grp II. There were four late deaths in Grp I (5.5%) at 1, 4, 5, and 10 years postop. 85% of the original group survived and enjoys virtually full activity. The majority of children with simple forms of d-TGA have required operative repair between 3 and 6 months of age. Those with more complex forms, because mixing is usually

adequate and pulmonary blood flow may not be excessive, may be able to have their operation later.

Although atrial or junctional rhythm is present in 9 of the Group I patients the majority have a sinus-like rhythm. There has been no complete heart block. The most troublesome sequel of the operation has been superior caval obstruction with edema of the face and upper extremities in the early postoperative period. In most patients elevation of the head of the bed has resulted in complete resolution. Obstruction to pulmonary venous inflow has been seen in only two patients, the only two to have Dacron used as the baffle material instead of pericardium. Malfunction of the tricuspid valve and/or right ventricular failure has been seen in only two patients. In both of these a VSD had been repaired through the tricuspid valve inferring intra-operative injury. The feared development of right ventricular failure and tricuspid regurgitation as a long-term consequence of making the right ventricle the systemic pump has not materialized. Recent technical modifications may result in lessening the incidence of caval stenosis/obstruction.

Although the arterial switch operation described by Jatene and the utilization of right atrial wall to shift caval inflow as described by Senning both present attractive features, the acceptable short and long-term results of the Mustard operation have made us hesitant to abandon it as our primary means of surgical repair of d-TGA.

*By Invitation

32. Experience With The Fontan Procedure

*HILLEL LAKS, JEFFREY C. MILLIKEN**,

JOSEPH K. PERLOFF, WILLIAM HELLENBRAND**,

BARBARA GEORGE, ALVIN CHIN**,

*THOMAS DISESSA * and ROBERTA WILLIAM**

Los Angeles, California and New Haven Connecticut

From 1975 to 1983, 32 patients (17 male and 15 female) have undergone the Fontan procedure, aged 2-38 years (mean 13 years). Sixteen had tricuspid atresia, 14 univentricular heart, and 2 pulmonary atresia with hypoplastic right ventricle (RV). Thirteen underwent right atrial (RA) to RV connections; in 8 with valved (V) and 5 without. Nineteen underwent RA to pulmonary artery (PA) connections, in 7 with V and 12 without V. There were 2 early (<30 days) deaths (6%) from venous hypertension in one, and delayed tamponade in one. Eight were treated with compressive venous assistance immediately postoperatively. The lower extremities and abdomen were placed in a mass suit and compressed at 30-45 mmHg for 30-45 seconds of the minute. This resulted in an elevation in right and left atrial and systemic blood pressure in all. In four with low output and large volume requirements, the assist device improved cardiac output and mobilized extravascular fluid. There were two late deaths, both with venous hypertension and one with conduit thrombosis. Doppler flow patterns in 8 patients showed biphasic flow in the PA regardless of the type of connection or anatomic diagnosis. Repeat catheterization in 10 patients showed no gradients. Reduced response to exercise was noted in 6 patients with marked elevation in RA pressure and little increase in cardiac output. There was no significant hemodynamic difference in the pressure relative to the type of connection used, the presence of a valve in the connection, or the anatomic diagnosis. As a group however, the RA to RV connections had a lower RA pressure and the

univentricular hearts, a higher RA pressure. All survivors remain clinically improved a mean of 4 years postoperatively.

Conclusion: This experience confirms that the Fontan procedure is an effective therapy for carefully selected patients with tricuspid atresia and other complex lesions. The choice of connection, the use of a valve, and the anatomic diagnosis has little effect on postoperative hemodynamics or function, whereas the pulmonary vascular resistance and left ventricular function is critical to a good result. Although the response to exercise is abnormal, the majority of patients have an excellent functional result.

10:00 a.m. Intermission - Visit Exhibits - Second Floor
Complimentary Coffee

*By Invitation

10:45 a.m. Forum Session - Grand Ballroom - Third Floor

33. Targeted Cyclosporine Dose for Cardiac Transplantation: Effect on Rejection and Toxicity

BARTLEY P. GRIFFITH, ROBERT L. HARDESTY*,*

ALFREDO TRENTO, ANN LEE**

and HENRY T. BAHNSON

Pittsburgh, Pennsylvania

A cumulative 16 month >80% survival has been achieved in 34 heart transplant recipients treated with cyclosporine, low maintenance dose pred-nisone and rescue antithymocyte globulin. The administered dose of cyclosporine has been targeted to a whole blood trough level of 1000 ng/ml as measured by radioimmunoassay (Sandoz). If the serum creatinine was elevated (>1.5 mg%), a lower level was sought. When a higher level (1000-1500 ng/ml) was tolerated, as judged by the absence of renal toxicity, it was not reduced if there was evidence of rejection, but a higher level was not sought solely to treat rejection. A lower level (<500 ng/ml) was sought in the management of lymphoproliferative disease (2 patients).

The gradation of histologic rejection (0-4) has been assessed relative to blood levels (<500, 500-1000, and >1000 ng/ml). The average grade of rejection determined by weekly biopsies obtained during the initial hospitalization (4-8 weeks) was similar at whole blood levels of 500-1000 ng/ml (2.2) and at levels greater than 1000 ng/ml (2.3). Interestingly, those patients with levels less than 500 ng/ml had an average grade of rejection of only 1.2. The administered oral dose averaged 5.8 mg/kg, 7.8 mg/kg, and 8.2 mg/kg to achieve the incremental levels. A whole blood level of less than 500 ng/ml was associated with a lower serum creatinine (0.48 mg%) compared to a level of 500-1000 ng/ml (1.6 mg%) and greater than 1000 ng/ml (1.1 mg%). Hepatic toxicity (bilirubin 3.2 mg%) was noted at the level > 1000 ng/ml. In 2 patients, a lymphoproliferative syndrome resolved when the levels were reduced below 500 ng/ml.

In conclusion, whereas high levels of cyclosporine are associated with more toxicity, rejection has been independent of the levels achieved by our protocol.

*By Invitation

34. A New Myofascial Flap: Vascular Conduit Designed for Growth

EDWARDS. YEE, SCOTT REPLOGLE*.*

YEE-PHONG CHANG and PAUL A. EBERT
San Francisco, California*

The current usage of pulmonary artery conduits have greatly altered the fatal outcome of many congenital heart lesions. However, their severe limitations have been tissue ingrowth of the synthetic lumen, lack of enlargement with time, and the distortion of the native tissue. Autogenous tissue with pericardium have shown aneurysmal changes. To test the feasibility of the autogenous fascial tissue for (1) patency, (2) potential growth, (3) prevention of distortion of normal vessels, two types of myofascial flaps were designed based on current microvascular and flap rotation techniques. Twenty beagle puppies (4 weeks old) underwent replacement of the left pulmonary artery by either Group I-patch angioplasty or Group II-circumferential tube graft. The flap designed was based on the rectus muscle and its adjacent fascial tissue with preservation of the pedicle base and its blood supply from the internal mammary artery (IMA). This constructed conduit was rotated into the thoracic cavity for replacement of small puppy pulmonary artery (6-8mm).

Results: Angiographically at 18 months no pulmonary artery occlusions, distortions or aneurysms were encountered. Both groups I & II exhibited similar growth patterns at the 6 months time intervals. While the internal mammary artery patency rate was only 25%, long term growth was best seen in these conduits (left to right pulmonary artery diameter ratio = 0.88 ± 0.11).

Groups I & II	6 Mos	$.89 \pm .05$	18 Mos	$0.60 \pm 0.14^*$
Patent IMA	6 Mos	$.85 \pm .04$	18 Mos	0.88 ± 0.11

*p = 0.05

Conclusions: (1) The rectus fascial flap design is nonthrombogenic which exhibits no tissue overgrowth, distortion, or aneurysm and can serve as a patent conduit even in a diminutive small low pressure system. (2) The growth of this tissue flap is dependent on the patency of its blood supply.

*By Invitation

35. Amelioration of the Deleterious Effects of Platelets Activated During Cardiopulmonary Bypass: Comparison of a Thromboxane Synthetase Inhibitor and a Prostacyclin Analogue

CHARLES B. HUDDLESTON,*

*JOHN W. MAMMON, JR. *, THOMAS H. WAREING*,*

FLAVIAN M. LUPINETTI, JEFFREY A. CLANTON*,*

JERRY C. COLLINS and HARVEY W. BENDER, JR.*

Nashville, Tennessee

Thrombocytopenia and platelet dysfunction are commonly seen following cardiopulmonary bypass in part as a result of the contact of platelets on the surfaces of the oxygenator. Further, the microvascular bed of the ischemic myocardium is a potent stimulus for platelet deposition and microvascular plugging. Thus, it would appear theoretically advantageous to provide pharmacologic protection of platelets by inhibiting their response to activating agents thereby

preventing their loss into the extra-corporeal circuit and also the deleterious effects of myocardial platelet deposition. To study this further, 21 mongrel dogs were placed on cardiopulmonary bypass with 30 minutes of normothermic global ischemia. They were randomly assigned to receive pretreatment with an infusion of either saline (control, n = 8), a thromboxane synthetase inhibitor (RO-22-4679, n = 5), or a prostacyclin analogue which does not lower blood pressure (ZK 36,374, n = 8). Following global ischemia, the animals were supported with cardiopulmonary bypass for 30 minutes, weaned and separated, then sacrificed 60 minutes later. Comparisons among the groups were made on the basis of blood platelet counts, myocardial blood flow (using radioactive microspheres), and myocardial platelet deposition (using ¹¹¹Indium-labelled platelets). Results (mean ± SEM, *p < .01 vs. control):

GROUP	Platelet Count (X10 ³)		LV Platelet Deposition		(Ratio of Tissue ¹¹¹ In: Blood ¹¹¹ In)
	Baseline	Post-CPB	Endocardium	Epicardium	
Control	250.4 ± 20.7	69.7 ± 10.6	0.124 ± 0.027	0.122 ± 0.021	
RO-22-4679	265.3 ± 51.9	92.8 ± 14.8	0.087 ± 0.011	0.096 ± 0.010	LV = Left Ventricle
ZK 36,374	250.4 ± 35.8	102.8 ± 10.7*	0.045 ± 0.002*	0.043 ± 0.002*	CPB = Cardiopulmonary Bypass

	Hematocrit		Myocardial Blood Flow (ml/min/gram)			
	Baseline	Post-CPB	Endocardium		Epicardium	
			Baseline	Post-CPB	Baseline	Post-CPB
Control	47.3 ± 3.5	24.5 ± 2.9	0.68 ± 0.07	0.49 ± 0.14	0.64 ± 0.06	0.60 ± 0.18
RO-22-4679	44.8 ± 1.7	25.5 ± 2.4	0.89 ± 0.10	1.04 ± 0.12*	0.75 ± 0.11	1.14 ± 0.11*
ZK 36,374	37.4 ± 2.2	24.6 ± 1.5	0.72 ± 0.08	1.28 ± 0.15*	0.74 ± 0.10	1.70 ± 0.21*

We conclude that ZK 36,374 prevents platelet consumption during cardiopulmonary bypass over and above that seen with inhibition of thromboxane synthesis alone. It also prevents deposition of platelets into the myocardium following global ischemia and we presume by that mechanism increases myocardial blood flow.

*By Invitation

36. Pulmonary Circulatory Support: A Quantitative Comparison of Four Methods

WAYNE E. GAINES*, WILLIAM S. PIERCE,

G. ALLEN PROPHET* and KAY L. HOLTZMAN*

Hershey, Pennsylvania

Various innovative methods of pulmonary circulatory support have been recently introduced; however, no quantitative comparison of these methods has been reported. Profound right ventricular failure (RVF) was produced in 16 healthy goats by inducing ventricular fibrillation after the systemic circulation was supported with a pneumatic pulsatile left atrial (LA) to aorta bypass pump. Right atrial (RA) pressure was adjusted to 18 ± 3 mm Hg; blood pH, pCO₂, pO₂ and

temperature were controlled. Four methods of providing pulmonary blood flow were evaluated in each animal.

Method of Providing Pulmonary Blood Flow	C.I. (ml/min/kg)	LA Pressure (mm Hg)	RA Pressure (mm Hg)
Passive Flow Through The Pulmonary Artery (PA) due to RA to LA pressure gradient	31.1 ± 12.9	0 ± 6	18 ± 3
Pulmonary Artery Pulsation (PAP) via a 40 ml intra-aortic balloon (IAB) within a 20 mm Dacron graft anastomosed to the main PA	44.4 ± 13.6	3 ± 5	18 ± 3
PAP via a 65 ml single port valveless sac pulsatile assist device	64.3 ± 16.9	5 ± 3	17 ± 4
RA to PA Bypass via a valved pneumatic pulsatile sac type pump	102.0 ± 20.7	14 ± 5	12 ± 3

Passive PA flow alone provided inadequate pulmonary circulatory support. Addition of PAP via the IAB-conduit system increased C.I. 45% above passive PA flow ($p < 0.0005$). However, the C.I. remained inadequate. Increasing PAP volume with a 65 ml sac device provided an additional 65% increase in C.I. ($p < 0.0005$) to a level that is marginally adequate. The valved RA to PA bypass pump increased C.I. 228% of PA passive flow ($p < 0.0005$) to a satisfactory level and is the recommended method of pulmonary circulatory support in profound RVF.

*By Invitation

37. Cardiac Prostacyclin Kinetics During Surgical Cardioplegia

*GEORG S. KOBINIA***, *PAUL L. LaRAIA**,

*MYRON B. PETERSON**, *MICHAEL N. D'AMBRA**,

*WALTER D. WATKINS**, *MORTIMER J. BUCKLEY*

and *W. GERALD AUSTEN*

Boston, Massachusetts

Prostacyclin (PgI₂) is a very potent vasodilator and platelet antiag-gregating hormone. Despite the marked systemic changes in PgI₂ noted during cardiopulmonary bypass (CPBP) and its putative key role in myocardial injury responses, there is little information regarding the cardiac kinetics of PgI₂ during surgical cardioplegia (CP). Accordingly, we have evaluated the effect of 30 minutes of hyperkalemic (25 meq potassium), hypothermic (22 degree C.) CP on cardiac PgI₂ metabolism in a canine model of standard CPBP. Nine adult mongrel dogs were anesthetized and subjected to standard CPBP utilizing a BOS 5 oxygenator. No donor blood was used during the sterile operative procedures. Samples, drawn from the thoracic aorta (TA), the aortic root (AR) below cross-clamping and the coronary sinus (CS) were taken prior to onset of bypass with all lines in place (A), 25 minutes after partial bypass and cooling down (B), during infusion of initial CP (C), and during infusion of a final CP (D). The stable metabolite of PgI₂, 6 keto prostaglandin Fla, was measured by double-antibody radioimmunoassay.

Experimental Period	A	B	C	D
TA	312 (\pm 46)	845 (\pm 154)	700 (\pm 135)	561 (\pm 101)
AR	-----	-----	112 (\pm 79)	115 (\pm 59)
CS	*602 (\pm 170)	1088 (\pm 125)	**275(\pm 57)	**602(\pm 170)

Results are expressed as mean (\pm S.D.) pg/ml of 6 keto prostaglandin Fla

*p<0.03 compared with TA, **p<0.22 compared with AR

These findings support our previous data regarding the increase in systemic PgI2 levels during CPBP. Moreover, they demonstrate that cardiac prostacyclin production occurs during cardiac surgery prior to cardiopulmonary bypass. In addition, our results indicate that substantial cardiac production of PgI2 occurs during hypothermic CP. These findings suggest that the use of pharmacological agents that may nonspecifically inhibit prostaglandin synthesis should be avoided during cardiac surgery.

12:00 noon Adjourn for Lunch - Visit Exhibits

*By Invitation

**Current Everts A. Graham Memorial Traveling Fellow

WEDNESDAY AFTERNOON, May 9, 1984

1:30 p.m. Scientific Session - Grand Ballroom - Third Floor

38. Bronchoscopy After Cardiopulmonary Transplantation

*JOHN C. BALDWIN**, *STUART W. JAMIESON**,

*PHILIP E. OVER**, *EDWARD B. STINSON**,

NORMAN E. SHUMWAY and JAMES B.D. MARK

Stanford, California

Fifteen combined heart and lung transplants were performed between March, 1981 and August, 1983. The technical aspects of this operation, including the use of continuous polypropylene anastomoses, has been described. Six of these patients have undergone bronchoscopy at varying intervals after transplantation; five of these procedures were done for specific clinical indications; one was done incidentally during another surgical procedure requiring general anesthesia. We report the endoscopic and pathologic findings in these patients.

All patients had intact, healing tracheal anastomotic suture lines; there were no instances of tracheal stenosis. One patient had minimal granulation tissue along the suture line. The distal tracheobronchial tree appeared endoscopically normal in the transplanted lungs, except in areas of known infiltrates. Four of the patients had endobronchial biopsies, and all showed evidence of chronic inflammation in the submucosa. Eosinophilic proteinaceous exudate was noted in the alveolar air spaces in three of the four patients biopsied. No patient was bronchoscoped during a period of cardiac rejection documented by endomyocardial biopsy.

Controversy exists as to the optimal technique for tracheal anastomosis, but in the case of the steroid-treated, immunosuppressed transplant patient, the technique of continuous anastomosis with polypropylene yielded satisfactory results, free of recognized potential complications of early leakage, failure of healing, stenosis, and development of suture-related granulation tissue. Trans-

bronchoscopic endobronchial biopsy may not be helpful in diagnosing pulmonary rejection. All patients in this group who were biopsied showed submucosal chronic mononuclear cellular infiltrates, and most had intra-alveolar eosinophilic exudates. These findings were not associated with evidence of cardiac rejection in these patients.

*By Invitation

39. Bronchial Carcinoids: A Review of 111 Cases

BRIAN C. McCAUGHAN, NAEL MARTINI*

*and MANJIT S. BAINS**

New York, New York

The medical records of 111 patients with bronchial carcinoids seen between 1949 and 1983 were reviewed. There were 59 females and 52 males. The age range was 12 to 82 years (median 55 years).

Ten of the tumors were incidental pathologic findings at autopsy or surgery. These were excluded from survival data determinations. At the time of diagnosis 87 patients had disease localized to one hemithorax, 14 had distant metastases. The latter were more commonly male and smokers and their tumors had a more malignant histologic appearance compared to the patients with localized disease. Those with distant disease were treated with external radiation and/or chemotherapy and their median survival was 6 months.

Of the 87 with localized disease endobronchial resection was performed in 5 and pulmonary resection in 82 (pneumonectomy 11, bilobectomy 8, lobectomy 45, sleeve resection 3, segmentectomy 15). Disease free actuarial survival (Kaplan-Meier) following pulmonary resection was 91% at 5 years and 81% at 10 years. Factors predisposing to recurrence were central location of the tumor, a more malignant histologic appearance and regional lymph node metastases. Disease free survival at 5 and 10 years in 12 patients who had regional lymphatic metastases was 63% and 48% compared with 96% and 88% in those without lymphatic metastases ($p = .003$).

Complete resection of tumor and involved lymph nodes was associated with long term disease free survival in 4 of these 12 patients. Recurrence following endobronchial resection was observed in 3 of 5 patients.

We conclude that a) carcinoid tumors are malignant and 10% present with metastases and b) for those with clinically localized tumors, the prognosis is determined by the status of the regional lymph nodes which must be assessed at thoracotomy.

*By Invitation

40. Management of Recalcitrant Median Sternotomy Wounds

PETER C. PAIROLERO and PHILLIP G. ARNOLD**

Rochester, Minnesota

Sponsored by: GORDON K. DANIELSON

Rochester, Minnesota

During the past 7 years, 35 patients (30 males and 5 females) had repair of a chronically infected median sternotomy wound. Ages ranged from 13 to 73 years (mean 54.4 years). Sternotomy was performed for cardiac disease in 32 patients and for tumor in 3. Four patients had prior mediastinal radiation. Infection had been present a mean of 7.3 months (range 1 to 78 months). Skin pathogens were the most frequently cultured organisms; 3 patients had fungal infections; 9 patients had associated costochondritis.

All patients required sternal debridement; 7 had full thickness resection. Sternal rewiring was performed in 12 patients. Prosthetic material was not utilized. Reconstruction was with muscle transposition in 31 patients, omental transposition in 2, and both in 2. The pectoralis major muscle was transposed in 30 patients; 25 had simultaneous bilateral transpositions. The number of operations (including debridement) to reconstruct the sternum ranged from 1 to 6 (mean 2.7). The wound was closed at the time of muscle transposition in 26 patients. There were no operative deaths or immediate postoperative wound infections. Mean hospitalization was 18.4 days (range 5 to 44 days).

Follow-up ranged from 2 to 65 months (mean 22.9 months). There were 4 late deaths, none related to wound reconstruction. Two patients developed recurrent sternal infections; both responded to further debridement and reutilization of the previously transposed muscle. One patient developed a subphrenic abscess. All 35 patients eventually had a healed, stable wound. We conclude that muscle transposition is an excellent method of management for recalcitrant median sternotomy wounds.

*By Invitation

41. Encircling Endocardial Resection With Complete Removal of Endocardial Scar Without Intraoperative Mapping for the Ablation of Drug Resistant Ventricular Tachycardia

RODERICK W. LANDYMORE, CECIL E. KINLEY*,*

MARTIN J. GARDNER and DAVID A. MURPHY*

Halifax, Nova Scotia

Although localized endocardial resection (LER) guided by intraoperative mapping has proven superior to simple aneurysmectomy for drug resistant ventricular tachycardia (VT) LER fails to ablate reentrant ventricular arrhythmias in 15 to 20% of patients. Recently, we have employed encircling endocardial resection (EER) with complete removal of endocardial scar in 10 patients without intraoperative mapping. Reproducible sustained VT was induced in all patients preoperatively with programmed electrical stimulation (PES). PES was performed at twice the diastolic threshold with single and double premature extra stimuli. All 10 patients had failed a trial of conventional antiarrhythmics; 7 patients required frequent cardioversion and 3 patients required overdrive suppression with transvenous pacing. Ejection fraction, estimated by bi-plane angiography, ranged between 20 - 56% (X 31), cardiac index ranged between 1.5 - 2.7 l/m² (X 2.4)

and left ventricular end diastolic pressure at rest ranged between 15-32 mmHg (X 22). EER was performed in all patients with complete removal of endocardial scar. EER required reimplantation of the mitral apparatus in 9 patients. 8 patients underwent aneurysmectomy and 9 patients required concomitant aortocoronary bypass receiving a total of 13 grafts (X 1.3 grafts per patient). There were no spontaneous postoperative arrhythmias. PES was carried out following EER with single, double and triple premature extra stimuli; only 1 patient without postoperative clinical arrhythmias who had required daily preoperative cardioversion had inducible VT with postoperative PES but not after loading with Procainamide. Mean follow-up is 8.9 months. 8 patients are alive and well. There were 2 late deaths. 1 patient died with recurrent ventricular septal defects 2.5 months following extensive septal EER and 1 patient with massive pulmonary embolus and right heart failure at 4 months. This early experience suggests that EER with complete removal of endocardial scar successfully ablates reentrant VT. We feel that EER will prove to be more effective than LER because EER removes all ventricular sites that have the potential to generate reentrant VT. This data also indicates that ventricular septal defects are a potential hazard of extensive septal endocardial resection and has resulted in the use of a prophylactic septal patch in the last 2 patients.

*By Invitation

42. Cardiac Surgery in Patients with Functioning Renal Allografts

R. MORTON BOLMAN, III, ROBERT W. ANDERSON,*

J. ERNESTO MOLINA, JEFFREY S. SCHWARTZ,*

BARRY LEVINE, RICHARD L. SIMMONS**

*and JOHN S. NAJARIAN**

Minneapolis, Minnesota

The Transplant Service at the University of Minnesota Hospitals has performed nearly 2000 kidney transplants. Fourteen of these patients have developed cardiac conditions necessitating surgical intervention at intervals of 9 to 120 months (average 54 months) following their transplant. These patients had a mean age of 42 years and 5 (36%) were diabetic. All patients had functioning renal allografts with preoperative serum creatinines ranging from 1.0 to 3.2 mg/100 ml (average 1.4 mg/100 ml). All patients were receiving azathioprine and prednisone as their immunosuppressive therapy except two, whose immunosuppression had been discontinued due to life-threatening infection.

Ten patients underwent aorto-coronary saphenous vein bypass grafting (ACBP). One patient underwent two vessel ACBP and concomitant left ventricular aneurysmectomy. Two patients underwent surgery for native valvular endocarditis. One had tricuspid valve debridement for fungal endocarditis, and the other aortic valve replacement (AYR) for bacterial endocarditis. The final patient had calcific aortic stenosis and coronary artery disease (CAD), necessitating AYR and ACBP x 2.

Intraoperative management consisted of routine narcotic anesthesia combined with infusion of a mixture of furosemide in mannitol sufficient to maintain urine output of at least 50-100 ml/hour. Mean arterial pressure was maintained at 70 mmHg or greater during cardiopulmonary bypass to assure adequate perfusion of the renal graft. Myocardial protection consisted of moderate systemic hypothermia (28°C) combined with cold potassium car-dioplegia for periods of ischemia.

Two patients (14%) expired perioperatively. One was a young juvenile onset diabetic with markedly unstable angina who expired suddenly several days after surgery and at autopsy was found to have an occluded right ACBP and extensive infarction. The other was a 51-year-old lady with calcific aortic stenosis and CAD with unstable angina who expired in surgery from uncontrollable arrhythmias. There was one late death (7%) from non-cardiac related causes. The remaining 11 patients are alive and well at intervals of 3 to 82 (mean 25 months) after surgery. Postoperative serum creatinines averaged 1.4 mg/100 ml, unchanged from preoperative levels. Cardiac surgery can be performed safely in patients with functioning renal allografts. Patient survival was acceptable and preservation of renal function was uniformly successful in this group of patients.

*By Invitation

43. Myocardial Surgical Revascularization Following Streptokinase Treatment for Acute Myocardial Infarction

*JACQUES GEORGES LOSMAN**,

*GUILLERMO C. DACUMOS**,

CHRISTOPHER R. JONES, DOUGLAS NAGLE**,

ALLAN S. WILENSKY, R. NEWELL FINCHUM**,

ROBERT G. MARTIN, MARTIN T. BAILEY**

and DONALD R. KAHN

Birmingham, Alabama

Sixty-one patients (pts) admitted with acute myocardial infarction (MI) were treated with intra-coronary (ICOR, 39 pts) or intravenous (IV, 22 pts) Streptokinase (STR). There were no STR related complications. **Group I**, 25 ICOR-STR pts and **Group II** 14, IV-STR pts underwent coronary artery bypass grafting (CABG). **Group I** included 19 males (ages 40 to 69 years, mean = 54 ± 9) and 6 females (ages 38 to 70 years, mean = 58 ± 11). Admission ECG evidenced antero-lateral MI in 17 pts and inferior MI in 8. Peak CPK ranged from 190 U to 9000 U (mean = 2466 ± 2237 , median = 2150). MB fraction ranged from 2% to 46% (mean = 26 ± 11 , median = 26). Time from onset of symptoms to ICOR-STR was 290 ± 55 min. Fibrinogen blood levels decreased to 27% of control values 0.61 ± 0.2 mg/L versus 2.23 ± 0.2 mg/L). In 6 pts ICOR-STR failed to re-open the obstructed coronary artery (COR). All 6 developed severe hypokinesia (hypok) in that COR supplied area. Re-canalization occurred in 19 pts, the residual stenosis ranged from 80% to 99%. Severe hypok developed in the supplied area in 4 pts (one apical aneurysm). Five pts developed mild to moderate hypok and 11 (58%) had no myocardial damage. **Group II** included 12 males (ages 37 to 71, mean = 56 ± 10) and 2 females ages 62 and 72. Admission ECG evidenced antero-lateral Mi's in 4 pts and inferior Mi's in 10 pts. Peak CPK ranged from 230 U to 8100 U (mean = 2187 ± 2008 , median = 1700), MB fraction ranged from 1% to 29% (mean = $16\% \pm 7$, median = 15%). Time from onset of symptoms to IV-STR was 163 ± 89 min., with symptoms relieved in 13/14 pts after 43 ± 29 min. In 4 pts IV-STR failed to re-open the COR. Severe hypok of the supplied area developed in 3 (one apical aneurysm), and moderate hypok in one. In 10 pts (71%) IV-STR re-opened the COR. One pt developed severe and 2 pts moderate hypok in the COR supplied area. **Group I** and **II** did not differ significantly for any of the parameters analyzed. In **Group I**, 10 pts (40%) and in **Group II**, 7 pts (50%), had no evidence of muscle damage on ventriculography or on direct inspection at surgery. CABG (3.3 ± 0.9 graft/pt) were performed

without operative or early postoperative mortality. In conclusion, STR appears to be a useful agent to salvage myocardium and JV-STR may be as effective as ICOR-STR. IV-STR has advantages of earlier administration, ($p < 0.05$), no invasive procedure and lesser cost.

3:30 p.m. Adjourn

*By Invitation

WEDNESDAY AFTERNOON, May 9, 1984

1:30 p.m. Scientific Session - Grand Ballroom - Third Floor

38. Bronchoscopy After Cardiopulmonary Transplantation

JOHN C. BALDWIN, STUART W. JAMIESON*,
PHILIP E. OVER*, EDWARD B. STINSON*,
NORMAN E. SHUMWAY and JAMES B.D. MARK
Stanford, California*

Fifteen combined heart and lung transplants were performed between March, 1981 and August, 1983. The technical aspects of this operation, including the use of continuous polypropylene anastomoses, has been described. Six of these patients have undergone bronchoscopy at varying intervals after transplantation; five of these procedures were done for specific clinical indications; one was done incidentally during another surgical procedure requiring general anesthesia. We report the endoscopic and pathologic findings in these patients.

All patients had intact, healing tracheal anastomotic suture lines; there were no instances of tracheal stenosis. One patient had minimal granulation tissue along the suture line. The distal tracheobronchial tree appeared endoscopically normal in the transplanted lungs, except in areas of known infiltrates. Four of the patients had endobronchial biopsies, and all showed evidence of chronic inflammation in the submucosa. Eosinophilic proteinaceous exudate was noted in the alveolar air spaces in three of the four patients biopsied. No patient was bronchoscoped during a period of cardiac rejection documented by endomyocardial biopsy.

Controversy exists as to the optimal technique for tracheal anastomosis, but in the case of the steroid-treated, immunosuppressed transplant patient, the technique of continuous anastomosis with polypropylene yielded satisfactory results, free of recognized potential complications of early leakage, failure of healing, stenosis, and development of suture-related granulation tissue. Transbronchoscopic endobronchial biopsy may not be helpful in diagnosing pulmonary rejection. All patients in this group who were biopsied showed submucosal chronic mononuclear cellular infiltrates, and most had intra-alveolar eosinophilic exudates. These findings were not associated with evidence of cardiac rejection in these patients.

*By Invitation

39. Bronchial Carcinoids: A Review of 111 Cases

BRIAN C. McCAUGHAN, NAEL MARTINI
and MANJIT S. BAINS*
New York, New York*

The medical records of 111 patients with bronchial carcinoids seen between 1949 and 1983 were reviewed. There were 59 females and 52 males. The age range was 12 to 82 years (median 55 years).

Ten of the tumors were incidental pathologic findings at autopsy or surgery. These were excluded from survival data determinations. At the time of diagnosis 87 patients had disease localized to one hemithorax, 14 had distant metastases. The latter were more commonly male and smokers and their tumors had a more malignant histologic appearance compared to the patients

with localized disease. Those with distant disease were treated with external radiation and/or chemotherapy and their median survival was 6 months.

Of the 87 with localized disease endobronchial resection was performed in 5 and pulmonary resection in 82 (pneumonectomy 11, bilobectomy 8, lobectomy 45, sleeve resection 3, segmentectomy 15). Disease free actuarial survival (Kaplan-Meier) following pulmonary resection was 91% at 5 years and 81% at 10 years. Factors predisposing to recurrence were central location of the tumor, a more malignant histologic appearance and regional lymph node metastases. Disease free survival at 5 and 10 years in 12 patients who had regional lymphatic metastases was 63% and 48% compared with 96% and 88% in those without lymphatic metastases ($p = .003$).

Complete resection of tumor and involved lymph nodes was associated with long term disease free survival in 4 of these 12 patients. Recurrence following endobronchial resection was observed in 3 of 5 patients.

We conclude that a) carcinoid tumors are malignant and 10% present with metastases and b) for those with clinically localized tumors, the prognosis is determined by the status of the regional lymph nodes which must be assessed at thoracotomy.

*By Invitation

40. Management of Recalcitrant Median Sternotomy Wounds

PETER C. PAIROLERO and PHILLIP G. ARNOLD**

Rochester, Minnesota

Sponsored by: GORDON K. DANIELSON

Rochester, Minnesota

During the past 7 years, 35 patients (30 males and 5 females) had repair of a chronically infected median sternotomy wound. Ages ranged from 13 to 73 years (mean 54.4 years). Sternotomy was performed for cardiac disease in 32 patients and for tumor in 3. Four patients had prior mediastinal radiation. Infection had been present a mean of 7.3 months (range 1 to 78 months). Skin pathogens were the most frequently cultured organisms; 3 patients had fungal infections; 9 patients had associated costochondritis.

All patients required sternal debridement; 7 had full thickness resection. Sternal rewiring was performed in 12 patients. Prosthetic material was not utilized. Reconstruction was with muscle transposition in 31 patients, omental transposition in 2, and both in 2. The pectoralis major muscle was transposed in 30 patients; 25 had simultaneous bilateral transpositions. The number of operations (including debridement) to reconstruct the sternum ranged from 1 to 6 (mean 2.7). The wound was closed at the time of muscle transposition in 26 patients. There were no operative deaths or immediate postoperative wound infections. Mean hospitalization was 18.4 days (range 5 to 44 days).

Follow-up ranged from 2 to 65 months (mean 22.9 months). There were 4 late deaths, none related to wound reconstruction. Two patients developed recurrent sternal infections; both responded to further debridement and reutilization of the previously transposed muscle. One patient developed a subphrenic abscess. All 35 patients eventually had a healed, stable wound. We conclude that muscle transposition is an excellent method of management for recalcitrant median sternotomy wounds.

*By Invitation

41. Encircling Endocardia! Resection With Complete Removal of Endocardial Scar Without Intraoperative Mapping for the Ablation of Drug Resistant Ventricular Tachycardia

RODERICK W. LANDYMORE, CECIL E. KINLEY*,*

MARTIN J. GARDNER and DAVID A. MURPHY*

Halifax, Nova Scotia

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without intraoperative mapping. Reproducible sustained VT was induced in all patients preoperatively with programmed electrical stimulation (PES). PES was performed at twice the diastolic threshold with single and double premature extra stimuli. All 10 patients had failed a trial of conventional antiarrhythmics; 7 patients required frequent cardioversion and 3 patients required overdrive suppression with transvenous pacing. Ejection fraction, estimated by bi-plane angiography, ranged between 20 - 56% (X 31), cardiac index ranged between 1.5 - 2.7 l/m² (X 2.4) and left ventricular end diastolic pressure at rest ranged between 15-32 mmHg (X 22). EER was performed in all patients with complete removal of endocardial scar. EER required reimplantation of the mitral apparatus in 9 patients. 8 patients underwent aneurysmectomy and 9 patients required concomitant aortocoronary bypass receiving a total of 13 grafts (X 1.3 grafts per patient). There were no spontaneous postoperative arrhythmias. PES was carried out following EER with single, double and triple premature extra stimuli; only 1 patient without postoperative clinical arrhythmias who had required daily preoperative cardioversion had inducible VT with postoperative PES but not after loading with Procainamide. Mean follow-up is 8.9 months. 8 patients are alive and well. There were 2 late deaths. 1 patient died with recurrent ventricular septal defects 2.5 months following extensive septal EER and 1 patient with massive pulmonary embolus and right heart failure at 4 months. This early experience suggests that EER with complete removal of endocardial scar successfully ablates reentrant VT. We feel that EER will prove to be more effective than LER because EER removes all ventricular sites that have the potential to generate reentrant VT. This data also indicates that ventricular septal defects are a potential hazard of extensive septal endocardial resection and has resulted in the use of a prophylactic septal patch in the last 2 patients.
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*CHRISTOPHER R. JONES**, *DOUGLAS NAGLE**,
*ALLAN S. WILENSKY**, *R. NEWELL FINCHUM**,
*ROBERT G. MARTIN**, *MARTIN T. BAILEY**
and *DONALD R. KAHN*
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3:30 p.m. Adjourn

*By Invitation

NECROLOGY

J. B. Amberson, M.D., Northford, CT
James R. Cantrell, M.D., Seattle, WA
B. Noland Carter, M.D., Cincinnati, OH
Richard J. Chodoff, M.D., Havertown, PA
Clarence Crafoord, M.D., Stockholm, Sweden
Louis R. Davidson, M.D., New York, NY

John L. Kee, M.D., Dallas, TX
N. Logan Leven, M.D., St. Paul, MN
A. L. Lockwood, M.D., Toronto, Ontario
James W. Nixon, M.D., San Antonio, TX
Joseph Peabody, M.D., Washington, DC
Thomas Ryan, M.D., State Park, SC
H. Brodie Stephens, M.D., Orinda, CA
Hugh E. Wilson, M.D., Oklahoma City, OK

American Association for Thoracic Surgery, 1983-1984
(Listed by Countries, States, Provinces and Cities)

Geographical - UNITED STATES

ALABAMA

BIRMINGHAM

Blakemore, William S.
Kahn, Donald R.
Kessler, Charles R.
Kirklin, John W.
Kouchoukos, Nicholas T.
McElvein, Richard B.
Pacífico, Albert D.

MONTGOMERY

Simmons, Earl M.

OPELIKA

Le Beck, Martin

ALASKA

ANCHORAGE

Phillips, Francis J.

ARIZONA

PHOENIX

Brown, Lee B.
Cornell, William P.
Fisk, R. Leighton
Melick, Dermont W.
Nelson, Arthur R.

SUN CITY

Read, C. Thomas

TUCSON

Burbank, Benjamin
Copeland III, Jack G.
Sanderson, Richard G.

ARKANSAS

JASPER

Hudson, W. A.

LITTLE ROCK

Campbell, Gilbert S.
Read, Raymond C.
Williams, G. Doayne

CALIFORNIA

ANAHEIM

Main, F. Beachley

ARCADIA

Silver, Arthur W.

CARMEL

Daniels, Albert C.

MARINA DEL REY

Davis, Lowell L.

MARTINEZ

Guernsey, James M.

MONTEBELLO

CHICO

Becker, Ronald M.

COVINA

Carter, P. Richard

DEL MAR

Angell, William W.

EL MACERO

Andrews, Neil C.

ESCONDIDO

Mannix, Edgar P., Jr.

FRESNO

Evans, Byron H.

HEMET

Hewlett, Thomas H.

IRVINE

Connolly, John E.

Miller, Don R.

Wakabayashi, Akio

LA CANADA

Aronstam, Elmore M.

LA JOLLA

Fosburg, Richard G.

Hutchin, Peter

LA MESA

Long, David M., Jr.

LOMA LINDA

Bailey, Leonard L.

Wareham, Ellsworth E.

LONG BEACH

Bloomer, William E.

Carlson, Herbert A.

Stemmer, Edward A.

LOS ANGELES

Baisch, Bruce F.

Benfield, John R.

Buckberg, Gerald D.

Fonkalsrud, Eric W.

Holmes, E. Carmack

Hughes, Richard K.

Kay, Jerome Harold

Lindesmith, George G.

Longmire, William, Jr.

Maloney, James V., Jr.

Matloff, Jack M.

Meyer, Bert W.

Morton, Donald L.

Mulder, Donald G.

Stiles, Quentin R.

Grimes, Orville F.

Hill, J. Donald

Kerth, William J.

Leeds, Sanford E.

McEnany, M. Terry

Lui, Alfred H. F.
OAKLAND
 Ecker, Roger R.
 May, Ivan A.
ORANGE
 Gazzaniga, Alan B.
 Mason, G. Robert
 Salyer, John M.
OXNARD
 Dart, Charles H., Jr.
PACIFIC PALISADES
 Ramsay, Beatty H.
 Weinberg, Joseph A.
PALM SPRINGS
 Goldman, Alfred
PALM DESERT
 Julian, Ormand C.
PALO ALTO
 Cohn, Roy B.
 Gonzalez-Lavin, Lorenzo
 Jamplis, Robert W.
PASADENA
 Ingram, Ivan N.
 Penido, John R. F.
S. LACUNA
 Oatway, William H., Jr.
S. PASADENA
 Brewer, Lyman A., III
SACRAMENTO
 Harlan, Bradley J.
 Hurley, Edward J.
 Miller, George E., Jr.
 Smeloff, Edward A.
 Tyson, Kenneth R. T.
SAN BERNADINO
 Flynn, Pierce J.
SAN DIEGO
 Baronofsky, Ivan D.
 Chambers, John S., Jr.
 Daily, Pat O.
 Lamberti, John J., Jr.
 Peters, Richard M.
 Trummer, Max J.
SAN FRANCISCO
 Culinier, Morris M.
 Ebert, Paul A.
 Ellis, Robert J.
 Fishman, Noel H.
 Gardner, Richard E.
 Gerbode, Frank

CONNECTICUT

HARTFORD
 Kemler, R. Leonard
NEW HAVEN
 Baue, Arthur E.
 Carter, Max G.
 Geha, Alexander S.
 Glenn, William W. L.
 Hammond, Graeme L.
 Laks, Hillel
 Lindskog, Gustaf E.
 Stansel, Horace C., Jr.
 Stern, Harold
NORWICH
 Kelley, Winfield O.

Richards, Victor
 Roe, Benson B.
 Rogers, W. L.
 Thomas, Arthur N.
 Turley, Kevin
 Ullyot, Daniel J.
SAN JOSE
 Oakes, David D.
SANTA ANA
 Pratt, Lawrence A.
SANTA BARBARA
 Higginson, John F.
 Jahnke, Edward J., Jr.
 Lewis, F. John
 Love, Jack W.
STANFORD
 Mark, James B. D.
 Miller, D. Craig
 Shumway, Norman E.
 Wilson, John L.
ST. HELENA
 Dugan, David J.
THOUSAND OAKS
 Tsuji, Harold K.
TORRANCE
 Carey, Joseph S.
 Cukingnan, Ramon A.
 Moore, Thomas C.
 Nelson, Ronald J.
 State, David

COLORADO

DENVER
 Blair, Emil
 Brown, Robert K.
 Burrington, John D.
 Condon, William B.
 Eiseman, Ben
 Grow, John B.
 Harper, Frederick R.
 Hopeman, Alan R.
 Kovarik, Joseph L.
 Newman, Melvin M.
 Pappas, George
 Paton, Bruce C.
 Pomerantz, Marvin
 Rainer, W. Gerald
 Van Way, Charles W., III
 Waddell, William R.
 Wright, George W.
LAKEWOOD
 Swan, Henry, II

LAKELAND

Brown, Ivan W., Jr.
MIAMI
 Beattie, Edward, Jr.
 Bolooki, Hooshang
 Center, Sol
 Daughtry, Dewitt C.
 Gentsch, Thomas O.
 Jude, James R.
 Kaiser, Gerard A.
 MacGregor, David C.
 Papper, Emanuel M.
 Reis, Robert L.
 Ripstein, Charles B.
 Thurer, Richard J.

SHARON
Wylie, Robert H.
WILTON
Pool, John L.

DELAWARE

WILMINGTON
Pecora, David V.

DISTRICT OF COLUMBIA

WASHINGTON
Aaron, Benjamin L.
Bowles, L. Thompson
Hufnagel, Charles A.
Keshishian, John M.
Midgley, Frank M.
Mills, Mitchell
Norman, John C.
Randolph, Judson G.
Simmons, Robert L.
Smyth, Nicholas P. D.
Wallace, Robert B.

FLORIDA

BELLELAIRE
Lasley, Charles H.
BOCA RATON
Seley, Gabriel P.
CORAL GABLES
Cooke, Francis N.
DELRAY BEACH
Geary, Paul
GAINESVILLE
Bartley, Thomas D.
JACKSONVILLE
Roster, John K.
Stephenson, Sam, Jr.

GEORGIA

ATLANTA
Graver, Joseph M.
Hatcher, Charles, Jr.
Hopkins, William A.
Jones, Ellis L.
King, Richard
Logan, William D., Jr.
Mansour, Kamal A.
Miller, Joseph I.
Rivkin, Laurence M.
Symbas, Panagiotis
AUGUSTA
Ellison, Robert G.
Rubin, Joseph W.
BRUNSWICK
Collins, Harold A.
MACON
Van De Water, Joseph
SAVANNAH
Langston, Hiram T.
Yeh, Thomas J.

HAWAII

HONOLULU
Ching, Nathaniel P.
Gebauer, Paul W.
McNamara, Joseph J.
KAILUA KONA
Fell, Egbert H.
TRIPLER AMC

MIAMI BEACH
Greenberg, Jack J.
Grondin, Pierre
Spear, Harold C.
NAPLES

Linberg, Eugene J.
Schuster, Samuel R.
NO. PALM BEACH
Dorsey, John M.

ORLANDO

Sherman, Paul H.
PONTE VEDRA BEACH

Gilbert, Joseph, Jr.
Stranahan, Allan

SOUTH MIAMI

Chesney, John G.
ST. PETERSBURG
Clerf, Louis H.
Daicoff, George R.
DeMatteis, Albert
Wheat, Myron W., Jr.

TALLAHASSEE

Kraeft, Nelson H.

TAMPA

Blank, Richard H.
Connar, Richard G.
Seiler, Hawley H.

TITUSVILLE

LaBrosse, Claude C.

WINTER HAVEN

Mauer, Elmer, P.R.

WINTER PARK

Bloodwell, Robert D.

Midell, Allen I.
Moran, John M.
Najafi, Hassan
Raffensperger, John
Replogle, Robert L.
Shields, Thomas W.
Skinner, David B.
Thomas, Paul A., Jr.
Vanecko, Robert M.
Weinberg, Milton, Jr.

EVANSTON

Fry, Willard A.
Tatooles, Constantine

GLENCOE

Rubenstein, L. H.

MAYWOOD

Keeley, John L.
Pifarre, Roque

NORTHBROOK

Lepley, Derward, Jr.

OAK BROOK

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PEORIA

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SPRINGFIELD

Wellons, Harry A., Jr.

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Mackler, S. Allen

INDIANA

INDIANAPOLIS

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 Ashbaugh, David G.
 Herr, Rodney H.

ILLINOIS

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 Baffes, Thomas G.
 Barker, Walter L.
 Campbell, Charles D.
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 Hanlon, C. Rollins
 Head, Louis R.
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 Hunter, James A.
 Idriss, Farouk S.
 Javid, Hushang
 Jensik, Robert J.
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 Kittle, C. Frederick
 Leininger, Bernard J.
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Sugg, Winfred L.

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Hood, Richard H., Jr.

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ARTICLE I. Name

The name of this Corporation is The American Association for Thoracic Surgery (hereinafter the "Association").

ARTICLE II. Purposes

The purposes of the Association shall be:

To associate persons interested in, and carry on activities related to, the science and practice of thoracic surgery, the cure of thoracic disease and the related sciences.

To encourage and stimulate investigation and study that will increase the knowledge of intrathoracic physiology, pathology and therapy, and to correlate and disseminate such knowledge.

To hold scientific meetings featuring free discussion of problems and developments relating to thoracic surgery, and to sponsor a journal for the publication of scientific papers presented at such meetings and other suitable articles.

To succeed to, and continue to carry on the activities formerly conducted by, The American Association for Thoracic Surgery, an unincorporated association.

ARTICLE III. Membership

Section 1. There shall be four classes of members: Honorary, Senior, Active and, for a time, Associate. Admission to membership in the Association shall be by election. Membership shall be limited, the limits on the respective classes to be determined by these By-Laws. Only Active and Senior Members shall have the privilege of voting or holding office, except as provided by these By-Laws.

Section 2. Honorary Membership shall be reserved for such distinguished persons as may be deemed worthy of this honor by the Council with the concurrence of the Association.

Section 3. The number of Senior Members shall be unlimited. Active Members automatically advance to Senior Membership at the age of sixty years. In addition, a younger Active Member may be eligible for Senior Membership if incapacitated by disability, but for no other reason.

Section 4. Active Membership shall be limited to six hundred. A candidate to be eligible must be a citizen of the United States of America or Canada, unless in unusual cases this citizenship requirement shall have been waived by the Council. The candidate shall have achieved distinction in the thoracic field or shall have made a meritorious contribution to knowledge pertaining to thoracic disease or its surgical treatment.

Section 5. Election to Honorary, Senior or Active Membership shall be for life, subject to the provisions of Section 9 following. There shall be no further additions to the Associate Membership. All new members shall be elected directly to Honorary or Active status.

Section 6. Associate Membership for those members elected after 1960 shall be limited to a five year period. During this limited period, an Associate Member, if properly qualified, may be elected to Active Membership. After the expiration of this limited period an Associate Member, if not yet qualified for Active Membership, must either be re-elected to an additional period of Associate Membership or dropped from the rolls of the Association.

Section 7. Candidates for membership in this Association must be formally nominated and seconded, in an approved manner, by not less than three Active or Senior Members. Such nomination must have been in the hands of the Membership Committee for not less than four months, and the name of the candidate must have been distributed to all members of the Association before final action may be taken on any new candidate for election to Active Membership. Provided the foregoing requirements have been met and the candidates have been approved by the Membership Committee and by the Council, their names shall be presented to the Association at a regularly convened annual meeting for final action. A three-fourths vote of those present and voting shall be required to elect. Any candidate for membership in this Association who has failed of election for three successive years shall automatically cease to be a candidate and may not be renominated until after a lapse of three years.

Section 8. The report of the Membership Committee shall be rendered at the second executive session of each annual meeting of the Association. Candidates shall be presented in groups in the following order: Candidates for Honorary Membership; retirement of Active Members to Senior Membership; Candidates for Active Membership, Associate Members for re-election; members dropped from the rolls of the Association.

Section 9. Membership may be voluntarily terminated at any time by members in good standing. The Council, acting as a Board of Censors, may recommend the expulsion of a member on the grounds of moral or professional delinquency, and submit his name, together with the grounds of complaint, to the Association as a whole at any of the regularly convened meetings, after giving such member ample opportunity to appear in his own behalf.

Section 10. The Council shall recommend that any Active or Associate Member whose dues are in arrears for two years, or who has been absent, without sufficient excuse, from three consecutive annual meetings, shall have his membership terminated.

Section 11. Notwithstanding Section 10, any member of the Association over 60 years of age is excused from the attendance requirement and upon his specific request may likewise be excused from the payment of dues.

ARTICLE IV. Board of Directors ("Council")

Section 1. The Board of Directors of the Association shall be called the Council and shall be composed of the President, Vice-President, Secretary, Treasurer and Editor of the Association, and five Councilors. All members of the Council must be Active or Senior Members of the Association, except that the Editor may be an Honorary Member.

Section 2. The Council shall be the governing body of the Association, and shall have full power to manage and act on all affairs of the Association, except as follows:

- a. It may not alter the initiation fees or annual dues, or levy any general assessments against the membership, except that it may, in individual cases, waive annual dues or assessments.
- b. It may not change the Articles of Incorporation or By-Laws.
- c. It may neither elect new members nor alter the status of existing members, other than to apply the provisions of Article III, Section 9.
- d. It may not deplete the principal of the Endowment Fund.

Section 3. At the conclusion of the annual meeting, the retiring President shall automatically become a Councilor for a one-year term of office. One of the other four Councilors shall be elected at each annual meeting of the Association to serve for a four-year term of office in the place of the elected Councilor whose term expires at such meeting, but no Councilor may be reelected to succeed himself. Any Councilor so elected shall take office upon the conclusion of the annual meeting at which he is elected.

Section 4. Vacancies in the office of Councilor shall be temporarily filled by the Council subject to approval of the Association at the next annual meeting of the Association.

ARTICLE V. Officers

Section 1. The officers of the Association shall be a President, a Vice-President, a Secretary, and a Treasurer. All officers must be Active or Senior Members of the Association. Said officers shall be ex officio members of the Council of the Association.

Section 2. The Council may, for the purposes of Article IX, give status as officers of the Association to the individual members of any ad hoc Committee appointed by the Council.

Section 3. The President, Vice-President, Secretary and Treasurer shall be elected at the annual meeting of the Association and shall take office upon conclusion of the meeting. The President and the Vice-President shall be elected for a one-year term of office and neither may be reelected to succeed himself in the same office, unless such officer is filling the unexpired term of an officer previously elected to such office. The Secretary and the Treasurer shall be elected for a one-year term of office and may be reelected indefinitely.

Section 4. The President of the Association shall perform all duties customarily pertaining to the office of President. He shall preside at all meetings of the Association and at all meetings of the Council.

Section 5. The Vice-President of the Association shall perform all duties customarily pertaining to the office of the Vice-President, both as to the Association and the Council. In the event of a vacancy occurring in the office of President, the Council shall advance the Vice-President to the Presidency and appoint a new Vice-President.

Section 6. The Secretary of the Association shall perform all duties customarily pertaining to the office of Secretary. He shall serve as Secretary of the Association and as Secretary of the Council. When deemed appropriate, an Active or Senior Member may be elected to serve as an understudy to the Secretary in anticipation of the latter's retirement from office.

Section 7. The Treasurer of the Association shall perform all duties customarily pertaining to the office of Treasurer. He shall serve as Treasurer of the Association and shall also serve as custodian of the Endowment Fund.

Section 8. The Editor of the Association is not an officer of the Association. He shall be appointed by the Council at its annual meeting; provided, however, that such appointment shall not become effective until approved by the Association

at the annual meeting of the Association. The Editor shall be appointed for a five-year term and may not be appointed to more than two successive terms; provided, however, that an Editor completing two years or less of the unexpired term of a previous Editor may be appointed for two successive five-year terms. The Editor shall serve as the Editor of the official Journal and shall be ex officio the Chairman of the Editorial Board and a member of the Council of the Association. Section 9. Vacancies occurring among the officers named in Section 1 or a vacancy in the position of Editor shall be temporarily filled by the Council, subject to approval of the Association at the next meeting of the Association.

ARTICLE VI. Committees

Section 1. The Council is empowered to appoint a Membership Committee, a Program Committee, a Necrology Committee and such other committees as may in its opinion be necessary or desirable. All such committees shall render their reports at an executive session of the Association, except that no ad hoc committee need report unless so directed by the Council.

Section 2. The Membership Committee shall consist of seven Active or Senior Members. The Council may appoint not more than one of its own members to serve on this Committee. The duties of the Membership Committee are to investigate all candidates for membership in the Association and to report its findings as expeditiously as possible to the Council through the Secretary of the Association. This Committee is also charged with searching the literature of this and other countries to the end that proper candidates may be presented to the Association for consideration. Appointment to this Committee shall be for a period of one year, and not more than five of the members may be reappointed to succeed themselves. This Committee is also charged with maintaining a record of membership attendance and participation in the scientific programs and reporting to the affected members and to the Council any deviations from the requirement of Article VIII, Section 4, of these By-Laws.

Section 3. The Program Committee shall consist of at least, six members: the President, the Vice President, the Secretary and the Editor of the Association, and at least two members-at-large appointed by the President. The duties of this Committee shall be to arrange, in conformity with instructions from the Council, the scientific program for the annual meeting.

Section 4. The Necrology Committee shall consist of one or more Active or Senior Members. Appointments to this Committee shall be for a one-year term of office. Any or all members of this Committee may be reappointed to succeed themselves. The Council may, if it so desires, appoint one of its own members to serve as Chairman of this Committee. The duties of the Necrology Committee shall be to prepare suitable resolutions and memorials upon all deaths of members of the Association and to report such deaths at every annual meeting.

Section 5. The Nominating Committee shall consist of the five (5) immediate Past Presidents of the Association. The most senior Past President shall serve as Chairman. This Committee shall prepare a slate of nominees for Officers and Councilors upon instruction from the Council as to the vacancies which are to be filled by election and shall present its report at the Second Executive Session of the Annual Meeting.

Section 6. The Association as a whole may authorize the Council to appoint Scientific or Research Committees for the purpose of investigating thoracic problems and may further authorize the Council to support financially such committees to a limited degree. When Scientific or Research Committees are authorized by the Association, the Council shall appoint the Chairmen of these Committees, with power to organize their committees in any way best calculated to accomplish the desired object, subject only to the approval of the Council. Financial aid rendered to such Committees shall not exceed such annual or special appropriations as may be specifically voted for such purposes by the Association as a whole. Members are urged to cooperate with all Scientific or Research Committees of the Association.

Section 7. The Everts A. Graham Memorial Traveling Fellowship Committee shall consist of six members: the President, Secretary, and Treasurer of the Association and three members-at-large, one member being appointed by the President each year to serve a term of three years. The Chairman shall be the member-at-large serving his third year. The duties of the committee shall be to recommend Fellowship candidates to the Graham Education and Research Foundation and to carry out other business pertaining to the Fellowship and the Fellows, past, present, and future.

Section 8. The Editorial Board shall be appointed by the Editor, subject only to the approval of the Council. The Editor shall be, ex officio, the chairman of this board and shall be privileged to appoint and indefinitely reappoint such members of the Association, regardless of class of membership, and such non-members of the Association as in his opinion may be best calculated to meet the editorial requirements of the Association.

Section 9. The Ethics Committee shall consist of five members appointed by the Council. No member shall serve more than four years. The Ethics Committee shall advise the Council concerning alleged breaches of ethics. Complaints regarding alleged breaches of ethics shall be received in writing by the Ethics Committee and shall be investigated by it. In addition, the Ethics Committee may investigate on its own initiative.

Section 10. The Committee on Manpower shall be a Joint Committee of this Association and The Society of Thoracic Surgeons. The Committee shall consist of two members of this Association, two members of The Society of Thoracic Surgeons, and a Chairman who shall be a member of this Association and The Society of Thoracic Surgeons. The duties of this Committee, and the manner of appointment and term of its members and chairman, shall be determined jointly by the Council of this Association and the Council of The Society of Thoracic Surgeons.

ARTICLE VII Finances

Section 1. The fiscal year of the Association shall begin on the first day of March and end on the last day of February each year.

Section 2. Members shall contribute to the financial maintenance of the Association through initiation fees, annual dues, and special assessments. The amount of the annual dues and the initiation fees shall be determined by these By-Laws. If, at the end of any fiscal year, there is a deficit in the current funds of the Association, the Council may send out notices to that effect and invite Active members to contribute the necessary amount so that no deficit is carried over from one fiscal year to another. The Association may, in any regularly convened meeting, vote a special assessment for any purpose consistent with the purposes of the Association, and such special assessment shall become an obligatory charge against the classes of members affected thereby.

Section 3. To meet the current expenses of the Association, there shall be available all revenue derived by the Association subject to the provisions of Section 4, following.

Section 4. Funds derived from the payment of initiation fees shall not be available for current expenses and shall be placed in a special fund, to be invested and reinvested in legal securities, to be held intact, and to be known as the Endowment Fund. The Council is responsible for the proper management of the Endowment Fund, and may divert any surplus in the current funds of the Association into this fund, but may not withdraw any of the principal of the Endowment Fund except in accordance with the provisions of Section 6, following.

Section 5. The income from the Endowment Fund shall be expended as the Council directs.

Section 6. The principal of the Endowment Fund may be withdrawn, in whole or in part, under the following conditions only: The amount of principal to be withdrawn shall have been approved by the Council; it shall have been approved by a majority of the members present and voting at a regularly convened annual meeting; it shall have been tabled for one year; it shall have been finally passed by a three-fourths vote of the members present and voting at the next regularly convened annual meeting.

Section 7. In the event of the dissolution of the Association, the Endowment Fund shall be distributed among national institutions of the United States and Canada in a proportion equal to the then existing ratio between the numbers of citizens of the two nations who are members of the Association.

ARTICLE VIII. Meetings

Section 1. The time, place, duration, and procedure of the annual meeting of the Association shall be determined by the Council and the provisions of these By-Laws.

Section 2. Notice of any meeting of the Association shall be given to each member of the Association not less than five nor more than forty days prior to any annual meeting and not less than thirty nor more than forty days prior to any special meeting by written or printed notice delivered personally or by mail, by or at the direction of the Council, the President or the Secretary. Such notice shall state the place, day and hour of the meeting and in the case of a special meeting shall also state the purpose or purposes for which the meeting is called.

Section 3. A special meeting of the Association may be called by the Council or on the written request of fifteen members delivered to the Council, the President or the Secretary. The specific purposes of the meeting must be stated in the request.

Section 4. Attendance at annual meetings and participation in the scientific programs shall be optional for all Honorary and Senior Members, but it shall be expected from all Active and Associate Members.

Section 5. Each annual meeting shall have at least two executive sessions.

Section 6. When the Association convenes for its annual meeting, it shall immediately go into the first executive session, but the business at this session shall be limited to:

1. Appointment of necessary committees.
2. Miscellaneous business of an urgent nature.

Section 7. The second executive session of the Association shall be held during the afternoon of the second day of the meeting. The business at this session shall include, but is not limited to:

1. Reading or waiver of reading of the minutes of the preceding meetings of the Association and the Council.
2. Report of the Treasurer for the last fiscal year.
3. Audit Report.
4. Report of the Necrology Committee.
5. Report of the Program Committee.
6. Action on amendments to the Articles of Incorporation and By-Laws, if any.
7. Action on recommendations emanating from the Council.
8. Unfinished Business.
9. New Business.
10. Report of the Membership Committee.
11. Election of new members.
12. Report of the Nominating Committee.
13. Election of officers.

Section 8. Except where otherwise required by law or these By-Laws, all questions at a meeting of the members shall be decided by a majority vote of the members present in person and voting. Voting by proxy is not permitted.

Section 9. Fifty voting members present in person shall constitute a quorum at a meeting of members.

Section 10. While the scientific session of the annual meeting is held primarily for the benefit of the members of the Association, it may be open to non-members who are able to submit satisfactory credentials, who register in a specified manner, and who pay such registration fee as may be determined and published by the Council from year to year.

Section 11. There shall be an annual meeting of the Council held during the annual meeting of the Association. Additional meetings of the Council may be called on not less than seven days' prior written or telephonic notice by the President, the Secretary or any three members of the Council.

Section 12. Five members of the Council shall constitute a quorum for the conduct of business at any meeting of the Council, but a smaller number may adjourn any such meeting.

Section 13. Whenever any notice is required to be given to any member of the Council, a waiver thereof in writing, signed by the member of the Council entitled to such notice, whether before or after the time stated therein, shall be deemed equivalent thereto.

Section 14. Any action which may be or is required to be taken at a meeting of the Council may be taken without a meeting if a consent in writing, setting forth the action so taken, shall be signed by all of the members of the Council. Any such consent shall have the same force and effect as a unanimous vote at a duly called and constituted meeting.

ARTICLE IX. Indemnification of Directors and Officers

Section 1. The Association shall indemnify any and all of its Councilors (hereinafter in this Article referred to as "directors") or officers or former directors or officers, or any person who has served or shall serve at the Association's request or by its election as a director or officer of another corporation or association, against expenses actually and necessarily incurred by them in connection with the defense or settlement of any action, suit or proceeding in which they, or any of them, are made parties, or a party, by reason of being or having been directors or officers or a director or officer of the Association, or of such other corporation or association, provided, however, that the foregoing shall not apply to matters as to which any such director or officer or former director or officer or person shall be adjudged in such action, suit or proceeding to be liable for willful misconduct in the performance of duty or to such matters as shall be settled by agreement predicated on the existence of such liability.

Section 2. Upon specific authorization by the Council, the Association may purchase and maintain insurance on behalf of any and all of its directors or officers or former directors or officers, or any person who has served or shall serve at the Association's request or by its election as a director or officer of another corporation or association, against any liability, or settlement based on asserted liability, incurred by them by reason of being or having been directors or officers or a director or officer of the Association or of such other corporation or association, whether or not the Association would have the power to indemnify them against such liability or settlement under the provisions of Section 1.

ARTICLE X. Papers

Section 1. All papers read before the Association shall become the property of the Association. Authors shall leave original copies of their manuscripts with the Editor or reporter, at the time of presentation, for publication in the official Journal.

Section 2. When the number of papers makes it desirable, the Council may require authors to present their papers in abstract, and may set a time limit on discussions.

ARTICLE XI. Initiation Fees, Dues and Assessments

Section 1. Honorary Members of the Association are exempt from all initiation fees, dues, and assessments.

Section 2. Annual dues for Active Members shall be \$75.00 and shall include a year's subscription to THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY.

Section 3. Annual dues for Associate Members shall be \$75.00 and shall include a year's subscription to THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY.

Section 4. Senior Members are exempt from dues.

Section 5. The initiation fee for those elected directly to Active Membership shall be \$15.00.

Section 6. If and when an Associate Member is elected to Active Membership, he shall pay an additional \$5.00 initiation fee.

Section 7. Associate and Active Members must subscribe to THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY to retain their membership status.

Section 8. Subscription to THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY is optional for Senior Members.

Section 9. Bills for membership dues and for subscriptions to THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY will be mailed to members by the Treasurer after the annual meeting.

ARTICLE XII. Parliamentary Procedure

Except where otherwise provided in these By-Laws or by law, all parliamentary proceedings at the meetings of this Association and its Council and committees shall be governed by the then current Sturgis Standard Code of Parliamentary Procedure.

ARTICLE XIII. Amendments

Section 1. These By-Laws may be amended by a two-thirds vote of the members present and voting at an executive session of a properly convened annual or special meeting of the Association provided that the proposed amendment has been moved and seconded by not less than three members at a prior executive session of that meeting or a prior meeting of the Association.

Section 2. These By-Laws may be suspended in whole or in part for a period of not more than twelve hours by a unanimous vote of those present and voting at any regularly convened meeting of the Association.

Meetings of the American Association for Thoracic Surgery

- 1918-Chicago..... President, Samuel J. Meltzer
- 1919-Atlantic City..... President, Willy Meyer
- 1920-New Orleans..... President, Willy Meyer
- 1921-Boston..... President, Rudolph Matas
- 1922-Washington..... President, Samuel Robinson
- 1923-Chicago..... President, Howard Lilienthal
- 1924-Rochester, Minn..... President, Carl A. Hedblom
- 1925-Washington..... President, Nathan W. Green
- 1926-Montreal..... President, Edward W. Archibald
- 1927-New York..... President, Franz Torek

1928-Washington..... President, Evarts A. Graham
 1929-St. Louis..... President, John L. Yates
 1930-Philadelphia..... President, Wyman Whittemore
 1931-San Francisco..... President, Ethan Flagg Butler
 1932-Ann Arbor..... President, Frederick T. Lord
 1933-Washington..... President, George P. Muller
 1934-Boston..... President, George J. Heuer
 1935-New York..... President, John Alexander
 1936-Rochester, Minn..... President, Carl Eggers
 1937-Saranac Lake..... President, Leo Eloesser
 1938-Atlanta..... President, Stuart W. Harrington
 1939-Los Angeles..... President, Harold Brunn
 1940-Cleveland..... President, Adrian V. S. Lambert
 1941-Toronto..... President, Fraser B. Gurd
 1944-Chicago..... President, Frank S. Dolley
 1946-Detroit..... President, Claude S. Beck
 1947-St. Louis..... President, I. A. Bigger
 1948-Quebec..... President, Alton Ochsner
 1949-New Orleans..... President, Edward D. Churchill
 1950-Denver..... President, Edward J. O'Brien
 1951-Atlantic City..... President, Alfred Blalock
 1952-Dallas..... President, Frank B. Berry
 1953-San Francisco..... President, Robert M. Janes
 1954-Montreal..... President, Emile Holman
 1955-Atlantic City..... President, Edward S. Welles
 1956-Miami Beach..... President, Richard H. Meade
 1957-Chicago..... President, Cameron Haight
 1958-Boston..... President, Brian Blades
 1959-Los Angeles..... President, Michael E. De Bakey
 1960-Miami Beach..... President, William E. Adams
 1961-Philadelphia..... President, John H. Gibbon, Jr.
 1962-St. Louis..... President, Richard H. Sweet (Deceased 1-11-62)
 President, O. Theron Clagett
 1963-Houston..... President, Julian Johnson
 1964-Montreal..... President, Robert E. Gross
 1965-New Orleans..... President, John C. Jones
 1966-Vancouver, B. C..... President, Herbert C. Maier
 1967-New York..... President, Frederick G. Kergin
 1968-Pittsburgh..... President, Paul C. Samson
 1969-San Francisco..... President, Edward M. Kent
 1970-Washington, D. C..... President, Hiram T. Langston
 1971-Atlanta..... President, Thomas H. Burford
 1974-Las Vegas..... President, Lyman A. Brewer, III
 1975-New York..... President, Wilfred G. Bigelow
 1976-Los Angeles..... President, David J. Dugan
 1977-Toronto..... President, Henry T. Bahnson
 1978-New Orleans..... President, J. Gordon Scannell
 1979-Boston..... President, John W. Kirklin
 1980-San Francisco..... President, Herbert Sloan
 1981-Washington, D.C..... President, Donald L. Paulson
 1982-Phoenix, Arizona..... President, Thomas B. Ferguson
 1983-Atlanta..... President, Frank C. Spencer

EVARTS A. GRAHAM MEMORIAL TRAVELING FELLOWS

1st	1951-52	L. L. Whytehead, M.D., F.R.C.S. 790 Sherbrooke St., Winnipeg, Manitoba, R3A 1M3 CANADA
2nd	1953-54	W. B. Ferguson, M.B., F.R.C.S. Royal Victoria Infirmary, Newcastle-upon-tyne, ENGLAND
3rd	1954-55	Lance L. Bromley, M.Chir., F.R.C.S. St. Mary's Hospital, London, W.2, ENGLAND
4th	1955-56	Raymond L. Hurt, F.R.C.S. The White House, 8 Loom Lane, Radlett Herts, ENGLAND
5th	1956-57	Mathias Paneth, F.R.C.S. Brompton Hospital, London, S.W. 3, ENGLAND
6th	1957-58	Peter L. Brunnen, F.R.C.S. Department of Thoracic Surgery, Woodend General Hospital Aberdeen, SCOTLAND
7th	1958-59	N. G. Meyne, M.D. University of Amsterdam, Wilhelmina-Gasthuis, Amsterdam, HOLLAND
8th	1960-61	Godrej S. Karai, M.D. Calcutta, INDIA
9th	1961-62	Fritz Helmer, M.D. Second Surgical Clinic, University of Vienna, Vienna, AUSTRIA
10th	1962-63	Theodor M. Scheinin, M.D. Oulun Laaninsairaala, Oulu, FINLAND
11th	1963-64	Masahiro Saigusa, M.D. National Nakano Chest Hospital, 3-14-20 Egata, Nakano-Ku, Tokyo 165, JAPAN
12th	1963-64	Adar J. Hallen, M.D. Department of Thoracic Surgery, University Hospital Uppsala, SWEDEN
13th	1964-65	Stuart C. Lennox, M.D. Marlowe House, 103 Dulwich Village., London, SE21 7BJ, ENGLAND
14th	1964-65	Elias Carapistolis, M.D., F.A.C.S. University Hospital A H E P A Surgical Clinic Department Aristotelian University of Thessaloniki, Thessaloniki, GREECE
15th	1965-66	Gerhard Friehs, M.D. Ghirugische University Klinik, Graz A-8036, AUSTRIA
16th	1965-66	Ary Blesovsky, M.D. London, ENGLAND
17th	1966-67	C. Peter Clarke, F.R.A.C.S. Ste. #4, 6th Floor, 55 Victoria Parade, Fitzroy 3065 AUSTRALIA
18th	1966-67	G. B. Parulkar, M.D. K.E.M. Hospital & Seth G.S., Medical College, Bombay 400 012, INDIA
19th	1967-68	Claus Jessen, M.D. Surg. Dept. D, Rigshospitalet, Blegdamsvej 9, Copenhagen, DENMARK
20th	1969-70	Peter Bruecke, M.D. AM Steinbruch 29 Linz-Puchenau, A-4020, AUSTRIA
21st	1970-71	Michel S. Slim, M.D. Department of Surgery, American University Hospital, Beirut, LEBANON
22nd	1971-72	Severi Pellervo Mattila, M.D. Department of Thoracic Surgery, Helsinki University Central Hospital, Helsinki 29, FINLAND
23rd	1972-73	Yasuyuki Fujiwara, M.D. Department of Cardiovascular Surgery, Tokyo Medical College Hospital, Shinjuku, Tokyo, JAPAN
24th	1973-74	Marc Roger deLeval, M.D. 8 Thornton Way, Hampstead Garden Suburb, London NW 11, ENGLAND
25th	1974-75	J. J. DeWet Lubbe, M.D. Dept. of Cardie-Thoracic Surgery, University of Stellenbosch P.O. Box 53, Bellville, REPUBLIC OF SOUTH AFRICA
26th	1975-76	Mieczyslaw Trenkner, M.D. c/o Dr. Sidney Levitsky, P.O. Box 6998, Chicago, IL 60680
27th	1976-77	Bum Koo Cho, M.D. Yonsei University, P.O. Box 71 Severance Hospital, Seoul, KOREA
28th	1977-78	Alan William Gale, M.D., FRACP, FRACS 171 Sutherland, Paddington 2021 Sidney, AUSTRALIA
29th	1978-79	Eduardo Otero Coto, M.D. Servicio de Cirugia Cardiovascular, Ciudad Sanitaria "Le Fe"

30th	1981-82	Valencia, SPAIN Richard Firmin, M.D. The London Chest Hospital, Bonner Road London E2 9JX ENGLAND
31st	1981-82	Claudio A. Salles, M.D. Rua Niquel 237 Belo Horizonte MG, BRAZIL
32nd	1982-83	Yasuhisa Shimazaki, M.D. 1013 A Beacon Parkway, East Birmingham, Alabama 35209
33rd	1983-84	Georg S. Kobinia, M.D. 1 Devonshire Place, Apt. 1914 Boston, Massachusetts 02109
34th	1984-85	Aram Smolinsky, M.D. Department of Cardiac Surgery, The Sheba Medical Center Tel Hashomer 52631, ISRAEL