1981 ANNUAL MEETING PROGRAM

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1980 – 1981

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May 1981 Meeting

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American Association for Thoracic Surgery
61ST ANNUAL MEETING
Scientific Program

MONDAY MORNING, MAY 11, 1981

8:30 A.M. Business Session (Limited to Members)
International Ballroom

8:45 A.M. Scientific Session
International Ballroom

1. The Significance of Positive Superior Mediastinal Nodes Identified at Mediastinoscopy in Patients with Resectable Cancer of the Lung

F. GRIFFITH PEARSON, NORMAN C. DELARUE, RIIVO ILVES, THOMAS R. J. TODD*, and JOEL D. COOPER, Toronto, Ontario*

A literature review reveals seven papers reporting survival data in patients with resectable lung cancer, in whom metastases to mediastinal nodes were identified at *thoracotomy* and completely resected. Five year survival in these series ranges from 0% to 30%. In only two reports is the precise location of involved nodes defined, and in none of these reports does the survival data consider the incidence of non-resectability, incomplete resection, or operative mortality. Adjuvant radiotherapy, and/or chemotherapy was used in three of the seven series.

There are four papers describing the results of resection in patients with involved superior mediastinal nodes identified by *mediastinoscopy,* - prior to deliberate exploration and resection. In three of the four reports, there were no five year survivors. These data suggest that superior mediastinal nodes identified at mediastinoscopy may have a different implication on prognosis than mediastinal nodes identified at the time of thoracotomy and resection.

This paper describes our experience between 1964 and 1978 in 55 patients with positive nodes identified at mediastinoscopy, who were managed by preoperative irradiation followed by thoracotomy. This is a highly selected subset of 55 cases with relatively localized, ipsilateral mediastinal involvement, and comprises no more than 20% of the positive nodes identified by mediastinoscopy in presumably operable cases.

Of the 55 patients, nine were non-resectable and there were 10 postoperative deaths (8 early and 2 late). The high operative mortality is attributed to the complications of relatively high dose preoperative irradiation employed. In the 36 patients surviving resection, the absolute five year survival rate is 13.9% (5 of 36). In the 23 patients surviving resection for squamous cell tumors, the absolute five year survival rate 17.4% (4 of 23). Absolute survival figures are reported since follow-up is complete in all patients, and all patients who are currently alive were operated on prior to 1973. These data suggest that ipsilateral, localized, superior mediastinal node involvement which is identified at mediastinoscopy, and managed by preoperative irradiation and resection is associated with a disappointingly low long-term survival.

*By invitation

2. Trial of Extended Indications for Resection in Small Cell Carcinoma of the Lung.

JOHN A. MEYER, ROBERT L. COMIS*. SANDRA J. GINSBERG*, PHILLIP M. IKINS*, WILLIAM A. BURKE* and FREDERICK B. PARKER, JR., Syracuse, New York*

Treatment of "limited" small cell carcinoma of the lung by intensive chemotherapy and irradiation results in clinically complete remission (CR) in 60-80% of cases. The commonest single site of relapse after CR is within the chest, 60-77% of relapses in some reviews, suggesting that resection with adjuvant chemotherapy might be superior in clinical Stage I and II cases. We have treated ten such patients by initial resection since

1975; one died of a pulmonary embolus on the 7th day. All others remain in CR with 6 off treatment at 19-63 months after resection, unmaintained for 5-48 months. Survival data are as of October 1980.

Since February 1979, carefully studied Stage III-MO cases (T3 and/or N2) have been treated with chemotherapy and evaluated for resection at 6 weeks. Patients were excluded for carinal involvement, malignant pleurisy, severe SVC syndrome, contralateral mediastinal node involvement, inadequate physiologic status, or response inadequate to allow clean resection. Of 8 patients entered to date, one was excluded for inadequate response; one because of profound thrombocytopenia necessitating discontinuation of treatment. Two patients showing little or no response at 6 weeks received radiotherapy followed by resection, and died at 8 and 10 months. Since then, such patients have been excluded from resection. In 4 patients responding to chemotherapy, grossly complete removal of the primary tumor and dissection of mediastinal nodes were possible. None of these have shown relapse; 2 are off treatment at 20 and 17 months, unmaintained for 7 and 6 months; the other 2 are still maintained. Prophylactic cranial irradiation is given to all patients.

We conclude that: 1) TNM staging is useful in subclassification of "limited disease" patients; 2) Best treatment for Stage I and II cases appears to be surgical resection and adjuvant chemotherapy; 3) In a defined subset of Stage III-MO cases, clean surgical resection is feasible after initial response to chemotherapy. No relapses have yet been encountered under these limiting conditions.

*By invitation

3. Surgical Adjuvant Treatment for Lung Cancer - Preliminary Report of the National Cancer Institute Lung Cancer Study Group (LCSG)

CLIFTON F. MOUNTAIN, Houston, Texas

The LCSG is conducting clinical trials of surgical adjuvant treatment designed to test the efficacy of a number of therapeutic approaches reported to favorably influence survival and disease free interval in patients with non-small cell lung cancer. A trial was designed to reproduce the experiment of McKneally who reported significant benefit for completely resected stage I patients treated with a single postoperative intrapleural injection of BCG followed by isoniazid (INH), compared with a group receiving Placebo + INH. As of 8/11/80, 405 eligible patients have been randomized to a double-blinded clinical trial duplicating the McKneally experiment except that control patients were given INH Placebo and lymph node biopsies were required for staging. There have been 73 recurrences (including 5 second primaries) and 56 deaths (15 non-cancer). With a median follow-up of 13 months no significant evidence in favor of either treatment arm can be demonstrated, and the trial has not confirmed the efficacy of intrapleural BCG as a surgical adjuvant.

For patients with completely resected stage II and III adeno or large cell carcinoma, a trial is in progress to test the efficacy of polychemotherapy versus immunotherapy. The chemotherapy consists of Cytoxan + Adriamycin + Cis-platinum and the immunotherapeutic regimen of intrapleural BCG + INH + Levamisole. Based on 55 eligible patients, with a median follow-up of 8 months, one arm of this trial shows promising, but not statistically significant results.

A third trial evaluates the efficacy of adjuvant radiotherapy to influence the outcome in patients with stage II and III completely resected squamous cell carcinoma. Seventy-nine eligible patients have been randomized and with a median follow-up duration of 10 months the deaths and recurrences have occurred equally in the treatment arms with no significant differences.

*By invitation

4. Survival Following Resection for Second Primary Bronchogenic Carcinoma

ROBERT J. JENSIK, L. PENFIELD FABER,
C. FREDERICK KITTLE, and RONALD L. MENG,*
Chicago, Illinois

The increasing incidence of bronchogenic carcinoma forecasts the possible development of a second primary in those patients successfully treated for their initial lesion. Guidelines for appropriate surgical therapy of the second primary are needed and evaluation of results in this group of patients will provide necessary information for future management.

A second pulmonary resection has been done in 60 patients for a simultaneous or successive primary bronchogenic carcinoma, with an interval between the two surgical procedures varying from 2 months to 17 years. The cumulative probability of second tumor occurrence was shown to be 27% by the end of the first year, rising to 58% by the end of the third year. Three patients developed a second tumor 11 to 17 years after their first operation.

The surgical procedures performed for the second lesion were completion pneumonectomy-12, lobectomy-8, and segmentectomy-40.

Twenty-one patients are alive with 3 surviving between 12 to 15 years, free of cancer. Life table analysis of survival following the second resection is 33% at 5 years, 20% at 10 years, and 12% at 15 years. The 6 operative deaths represent a 10% postoperative mortality.

The possibility of the development of a second tumor emphasizes the importance of continued long term surveillance of patients undergoing an initial successful resection. A second primary lung cancer can be succussfully treated by a second resection.

INTERMISSION - VISIT EXHIBITS

*By invitation

5. Automatic Defibrillation in Man: The Initial Surgical Experience

LEVI WATKINS, JR., M. MIROWSKI*, PHILIP R. REID*, MORTON M. MOWER*, MYRON L. WEISFELDT*, and VINCENT L. GOTT, Baltimore, Maryland*

The automatic implantable defibrillator (AD) is an electronic device that continuously monitors cardiac electrical activity, recognizes malignant ventricular tachyarrhythmias (MVT) and delivers corrective 25 joules de-fibrillatory shocks. Ten patients age 16-72 underwent implantation of the AD for documented MVT refractor to medical therapy. All had survived at least 2 episodes of sudden death and preoperative programmed electrical stimulation demonstrated inducible MVT in 7.

Implantation of the device requires positioning of a superior vena cava (SVC) catheter electrode within the right atrium, attachment of an apical electrode extrapericardially over the left ventricular apex and placement of the pulse generator subcutaneously in the abdomen. 3 of the first 4 patients had undergone previous cardiac surgery so implantation was performed via a left thoracotomy. In this approach the SVC electrode is introduced into the left internal jugular vein, localization within the right atrium is confirmed by x-ray or fluoroscopy. In patients without previous surgery or in patients in whom implantation is done concomitantly with open-heart procedures a median sternotomy approach is employed. With this technique, the SVC catheter is introduced into the innominate vein and localization within the atrium confirmed by palpation. There were no operative deaths or major surgical complications.

After implantation seven documented episodes of spontaneous MVT occurred and each was successfully terminated. Preliminary results are encouraging and demonstrate that the AD is capable of correcting lethal ventricular arrhythmias in man. This new therapeutic modality continues to expand the role of surgery in the treatment of cardiac arrhythmias.

*By invitation

6. Cardiac Transplantation in Perspective for the Future: Attainable Results, Long-Term Complications, Rehabilitation, and Cost

JOHN L. PENNOCK, PHILIP E. OVER*, BRUCE A. REITZ*, STUART W. JAMIESON*, CHARLES P. BIEBER*, EDWARD B. STINSON* and NORMAN E. SHUMWA Y, Stanford, California*

Two hundred and twelve cardiac transplants have been performed in 194 patients from Jan. 1968 to Sept. 1980. Postoperative survival rates (PSR), calculated by the actuarial method for program yrs 1968-73 (66 pts) are 44, 35, 27, 21, and 18% at 1, 2, 3, 4, and 5 yrs postop. PSR for program yrs 1974-80 (128 pts) are 63±4, 54±5, 52±5, 44±5, and 40±6% at 1-5 yrs postop. This increase results primarily from improvement in survival achieved during the first three months postop. (59±7%, 1968-73 vs. 80±4%, 1974-80), reflecting changes in early postop. management. Such changes include the introduction of antithymocyte globulin of rabbit origin, T-cell monitoring for the early diagnosis of rejection, transvenous graft biopsy, and retransplantation.

Infection remains the primary cause of death following transplantation -63/114 pts (55%), followed by acute rejection - 22/114 pts (19%), graft arteriosclerosis (GAS) - 13/114 pts (11%), and malignancy - 6/114 pts (5%). The development of GAS has been examined in 85 one-year survivors defined by annual coronary arteriograms. Twenty-one pts developed coronary lesions and in 11 pts the disease resulted in graft failure. HLA-A2 incompatibility was associated with a higher incidence of GAS than was apparent for all other A locus incompatibilities ($p < .0003$). Likewise, post-op, serum triglyceride levels greater than 280 mg% were associated with the development of GAS ($p < .0002$). Lymphoma/leukemia (L) has been shown to be associated with recipient age (<20 yrs - 3/7 pts, 21% L/yr - 14.3 risk yrs vs. 41-50 yrs - 3/61 pts, 1.9% L/yr - 154.3 risk yrs), diagnosis (idiopathic cardiomyopathy - 9/53 pts, 6.9% L/yr - 129.6 risk yrs vs. atherosclerosis - 2/71 pts, 0.9% L/yr - 217.3 risk yrs), and transplant order (1st transplant - 7/124 pts, 2.1% L/yr - 336.3 risk yrs vs. 2nd transplant -4/10 pts, 32.1% L/yr - 12.5 risk yrs).

Ninety-six patients have survived at least one year after transplantation; 83% of these achieved rehabilitation at that time interval and returned to employment or activity of choice. The longest survival time is now 10 years and 8 months.

Cost-benefit considerations have recently been the focus of increasing societal attention. Therefore, discussion of the historical costs of cardiac transplantation at our institution will be presented, together with the outlook for reduction of such costs in the future.

11:30 A.M. **Presidential Address**
A TIME FOR ASSESSMENT
Donald L. Paulson

MONDAY AFTERNOON, May 11, 1981

2:00 P.M. Scientific Session
International Ballroom

7. Anatomic Correction of Transposition of the Great Arteries

ADIB D. JATENE, VALMIR F. FONTES*,*
*LUIZ CARLOS BENTO DE SOUZA *, PAULO P. PAULISTA *,*
CAMILO ABDULMASSIH NETO and*
J. EDUARDO M. R. SOUZA, Sao Paulo, Brazil*
Sponsored by: E. J. Zerbini, Sao Paulo, Brazil

Twenty-seven patients had anatomic correction for transposition of the great arteries since 1975, when we first reported this technique. Twelve of them were under 6 months, and 19 under 1 year of age. In all but one the pressure in the left ventricle was systemic. The ventricular septal defect was present in 24 cases. Persistent ductus was present in 6 cases, in 4 of them associated to the ventricular septal defect. Only 1 patient had absence of PDA and VSD. The hospital mortality for the entire group was 59.2%. In 10 patients the indication for the operation was considered inadequate; in 9 due to an exceedingly high pulmonary vascular resistance, and in 1 to a low left ventricular pressure. All of them died. The 17 remaining patients, all with VSD, had left ventricular pressure at systemic level. Ten of these patients without any significant pulmonary outflow tract stenosis have low pulmonary vascular resistance. Four of these patients died (40.0%) in relation to the operation. In 3 of them the fatality could possibly have been avoided. The remaining 7 patients had pulmonary outflow tract obstruction; sub-valvular stenosis in 3 cases, and previous pulmonary banding in 4. The hospital mortality was 28.5% (2 patients). Eleven patients survived the operation. One of them presented late pulmonary stenosis and died at the re-operation, 5 years after the initial correction. One patient has partial recurrence of the VSD and is under evaluation for a possible re-operation to repair this residual defect. Follow-up studies in the remaining 9 patients from 2 to 51 months revealed an evolution considered very satisfactory. Five successful cases in the last 6 consecutive operations suggest the usefulness of this technique in proper selected cases.

*By invitation

8. Primary Definitive Repair of Interrupted Aortic Arch, VSD and PDA - Early and Late Results

ANTHONY L. MOULTON and*
FREDERICK O. BOWMAN, JR., Baltimore, Maryland
and New York, New York

Type B Interrupted aortic arch (IAA) with ventricular septal defect (VSD) and patent ductus arteriosus (PDA) usually presents with severe congestive failure in the first few weeks of life. It remains a highly lethal lesion and controversy exists about the optimal management of these patients. Most reported "repairs" have involved the use of prosthetic tubes or sacrifice of some of the arch vessels, often with simultaneous artery banding. This reports our experience with primary definitive repair of the aortic arch and closure of the VSD.

Since March 1974, seven patients, aged 7 days to 5 months, with Type B IAA + VSD + PDA were treated at the Columbis-Presbyterian Medical Center. Five of these patients underwent total correction utilizing deep hypothermia and circulatory arrest. Repair involved resection of all ductal tissue, primary anastomosis of the

aortic arch, closure of the foramen ovale and patch closure of the VSD. All arch vessels were preserved and no prosthetic material was used to reconstruct the aortic arch.

One patient developed a coagulopathy and died 48 hours postoperatively. All others (80%) survived to hospital discharge. The patient repaired at 5 months of age had undergone pulmonary artery banding at another institution 3 months earlier; he died 8 months after correction from recurrent respiratory infections. Three patients are alive and well two to six years after repair. Two have undergone repeat cardiac catherization which demonstrated good growth of the anastomosis and no residual gradient. Primary definitive correction of Type B IAA + VSD + PDA provides distinct advantages over palliative or other surgical procedures with excellent long-term results.

*By invitation

9. Experience with Surgery for Hypoplastic Left Heart Syndrome

WILLIAM I. NORWOOD, PETER LANG*,*
ALDO R. CASTANEDA and DAVID N. CAMPBELL,*
Boston, Massachusetts

Aortic atresia (hypoplastic left heart syndrome: HLHS) is a common, uniformly lethal form of congenital cardiac anomaly with no established surgical management. From 1/79 to 11/80, 11 infants (4 female, 7 male) ranging in age from 1 day to 6 months (median 5 days) entered a study of staged repair of HLHS. All had aortic atresia (AA) except 1 with severe aortic and mitral stenosis and a markedly hypoplastic left ventricle (LV). Nine had associated mitral atresia (6) or mitral stenosis (3) with miniscule or no LV. Two had an associated ventricular septal defect (VSD) with only mild LV hypoplasia. One with AA and a VSD had associated Type C interrupted aortic arch (1AA) as well. The principles of the first stage in all were to establish a permanent communication from right ventricle (RV) to systemic circulation, normalize pulmonary flow and pressure, and insure unrestricted pulmonary venous inflow. The first 3 had placement of a valved conduit from RV to thoracic aorta (Ao), banding of main pulmonary (PA), ligation of PDA, and creation of ASD. One of these 3 subsequently had end-to-side anastomosis of proximal PA to augmented Ao and arch along with a systemic to PA central shunt. The last 7 had the latter reconstruction as stage one. There are 4 survivors. Early mortality was 48% (5/11) from hemorrhage (1), hypoxemia (2), and iatrogenic myocardiac ischemia (2). Late mortality was 33% (2/6) from aspiration (1) and throm-botic stenosis of valved RV to Ao conduit (1)6 and 4 months postopera-tively. Late (13 months) postop cath of the oldest survivor revealed a growing reconstructed Ao, no RV to thoracic Ao pressure gradient, 12 mm Hg mean PA pressure, 75% Ao O^2saturation and he is awaiting last stage modified Fontan repair. One with AA, VDS, and 1AA is clinically well and thriving 11 months following complete repair by apical-aortic conduit, graft interposition between ascending and thoracic Ao and VSD closure initiated at age 4 days.

Much has been learned and much remains to be learned but a surgical solution for HLHS appears possible.

*By invitation

10. Long-Term Results of Repair of Incomplete Persistent Atrioventricular Canal

DANIEL M. GOLDFADEN, MICHAEL JONES* and*
ANDREW G. MORROW, Bethesda, Maryland

We evaluated the late results following the repair of otherwise uncomplicated incomplete persistent atrioventricular canal in 39 consecutive patients who underwent operation at our institution prior to 1976. Average follow-up duration was 13 years (range 5-24 years). Median age at operation was 12 years (range 1 to 68 years). In all patients the repair included patch closure of the atrial septal defect and direct suture repair of the cleft anterior mitral valve leaflet. Thirty-five patients (90%) had postoperative cardiac catheterizations at an average of 11 months after operation. Five patients (14%) had mild to moderate mitral regurgitation demonstrated by elevated mean pulmonary arterial wedge or left atrial pressures (12 - 15 mm Hg), with abnormally elevated v waves. Two patients (6%) had severe residual mitral regurgitation, with mean pulmonary arterial wedge pressures greater than 20 mm Hg. Clinically significant serious arrhythmias, including complete heart block (one early and two late), sudden death, nodal rhythm, and the development of chronic atrial fibrillation occurred in 7 patients (18%). Two patients required reoperation for mitral regurgitation at one and ten years after the initial operation. Seven patients currently are symptomatic because of mitral regurgitation. Of these, five had mitral regurgitation demonstrated at early postoperative catheterization; the other two developed it late. Twenty-six patients are asymptomatic at most recent evaluation. Actuarial survival is 88 ± 6% at 13 years after operation; survival free without reoperation is 82 ± 6%. However, survival and free of any late complications, including late death, reoperation, arrhythmia, or symptomatic mitral regurgitation is 52 ± 10% at 13 years.

INTERMISSION - VISIT EXHIBITS

*By invitation

11. Continuing Improvements in Valvular Bioprosthesis

ALAIN F. CARPENTIER, CHARLES DUBOST, JEAN-NOEL FABIANI*, ALAIN DELOCHE*, SYLVAIN CHAUVAUD* and JOHNRELLAND*, Paris, France*

Since the introduction of Glutaraldehyde in the preservation of valvular bioprosthesis in 1968, extensive research has been carried out to minimize three persistent drawbacks: transvalvular gradients, fatigue lesions and calcifications.

Since transvalvular gradients result from the impedance caused by the stent and the aortic remnant supporting the cusps, valve design has been recently modified so as to implant the valve in the supra-annular position. Only the cusps of the supra-annular valve (SAV) remain exposed to the blood column. In vitro tests comparing the SAV with disc valves have shown the gradients to be comparable (SAV 8.5 mmHg, Bjork 14.4 mmHg, St. Jude 8 mmHg at 15 1/minute). Other changes in the stent design include optimized flexibility of the stent so as to be similar to that of a normal aortic root and reduction of strut height of the mitral model so as to minimize protrusion within the ventricular cavity.

Many reports have shown that most of the commercially available bio-prostheses display various histological lesions even prior to their implantation. These lesions are different in severity from one commercial laboratory to another and from one valve to another in the same laboratory. Fatigue testing using pulse duplicators has proven that the variability in histological lesions was well correlated with durability of the valve which averaged 450 million cycles with a wide range from 10 to more than 600 million cycles.

Extensive review of the entire process of valve preparation revealed that these variations in histological structure and durability resulted from inadequate preservation of the valve during the shipping process and large variations of the intervals between harvesting and Glutaraldehyde treatment (from 12 to 90 hours). A technique using a balanced salt solution which will be described in detail was therefore developed to improve shipping conditions and fixation was accomplished imperatively within the first 48 hours. Electron microscopic studies have shown that histological lesions have been eliminated. Fatigue tests studies have shown an improved average durability up to 650 million cycles with limited variations.

As shown both experimentally and clinically, calcifications result from various factors: turbulence, histological lesions prior to implantation, calcium metabolism, age of the patient, diet, etc. Reduction of turbulences by the supra-annular concept and improved preservation of the valve should hopefully minimize the incidence of calcification. The feasibility and possible benefit of low calcium diet is currently under investigation. Thirty-four SAV have been implanted clinically in the past 6 months with no mortality and no complication thus far. Post-operative hemodynamic data are available in 10 patients.

*By invitation

12. Three Years Experience with the St. Jude Medical Valve Prostheses: Clinical and Hemodynamic Results

DEMETRE M. NICOLOFF, ROBERT W. EMERY, KIT V. AROM, WILLIAM F. NORTHRUP, III*, CHARLES F. JORGENSEN*, YANG WANG* and WILLIAM G. LINDSA Y*, Minneapolis, Minnesota*

During a three year period beginning October 1977, 222 St. Jude Medical (SJM) mechanical heart valve prostheses were implanted in 210 patients with ages ranging from 18 months to 82 years, (116 aortic, 104 mitral and two tricuspid). The operative mortality (OM) for the aortic valve replacement (AYR) alone was 6.4% (78 cases) and 7.8% when valve surgery was combined with coronary artery bypass, mitral valve replacement (MVR) and ascending aorta replacement (38 cases). The OM was 5.3% for MVR (75 cases) and 8.7% when combined with other procedures (29 cases). None of these early deaths were related to valve failure. There were also **NO** significant early post-operative complications. Prior to discharge, the Hgb and platelet counts were compared to those of pre-operative valves; LDH was mildly elevated (319 ± 10 in AYR, 350 ± 22 in MVR).

In the mitral position, 926 patient-months follow-up revealed two hemolyses, two paravalvular leaks, two infections, and one embolus. There was NO valve malfunction or thrombosis. There was one death (after five months) from a coronary embolus. In the aortic position, 1153 patient-months follow-up revealed NO LATE COMPLICATIONS. There were two deaths, one at six months and one at eight months (1-CVA, 1-other cause).

At this time, 33 (22 AVR, 11 MVR) elective cardiac re-catheterizations have been performed (5 ± .3 months) showing the cardiac output (CO) to be improved from 5.1 ± .3 to 6.0 ± .3 L/min. ($p<.001$) in AVR and 3.6 ± .3 to 4.1 ± .3 L/min. ($p<0.01$) in MVR. PCWP decreased 14 ± 2 to 8 ± 1 mmHg ($p<.005$) in AVR and 22 ± 2 to 16 ± 2 mmHg ($p<.01$) in MVR. Transvalvular aortic peak systolic gradient (PSG) at rest varied from 0 to 12.0 mmHg (13/22 had 0 gradient) and 0 to 6.0 mmHg (8/11 had 0 gradient) in the mitral position. Effective valve area is not calculated since 21 patients had no transvalvular gradient. Following exercise, the PSG increased from 1 ± 1 to 4 ± 1(11 AVR) and 1 ± 1 to 5 ± 2 mmHG (5 MVR) and the CO increased to 10 ± 1.0 L/min. (11 AVR) and 7 ± 1.0 L/min. (5 AVR).

CONCLUSION: Three year follow-up of the SJM cardiac valve prostheses showed low transvalvular gradients, minimal hemolysis, and no thrombosis.

*By invitation

13. Tricuspid Valvulectomy Without Prosthetic Replacement: Ten Years of Clinical Expeience

AGUSTIN ARBULU and INGIDA ASFAW, Detroit, Michigan

The purpose of this paper is to report 54 patients that underwent tricuspid valvulectomy (TV) without replacement for bacterial endocarditis. Twenty-two cases were operated upon by the authors and 32 by other surgeons in the United States and Europe for a period ranging 1 to 10 years. Forty-eight patients were addicted to intravenous narcotics and six were not. In 34, the infection was due to gram negative bacteria. In 15, it was due to gram positive bacteria. In three patients the organism was a fungus; in one the infection followed trauma and in the last patient followed cancer invasion of the tricuspid leaflets. In 33 patients the diagnosis of right-sided endocarditis was made by the clinical picture alone. In three cases the cardiac catheterization was diagnostic. In 14, the combination of the clinical picture and cardiac catheterization, and in four echocardiogram was necessary to establish the diagnosis. In all patients intensive intravenous antibiotic treatment given for an average period of seven weeks, failed to cure the infection prior to the operation.

In 50 patients (93%) the endocarditis was cured after the TV. Subsequent to this operation 13 patients required a tricuspid prosthesis for various reasons. Of the 37 patients that did not require a tricuspid prosthesis 27 (73%) are in good condition and three in fair condition. In this group, seven patients died; two accidental, and five of a second endocarditis. None of these deaths were related to the TV. Of the 13 patients that required a prosthesis, eight (62%) are in good condition, one is in fair condition and four have died with infected prostheses.

WE CONCLUDE that TV is a curative operation for intactable right-sided endocarditis in more than 90% of the patients. The insertion of a prosthesis in these patients does not improve survival and quality of life. No patient had died as a consequence of the TV. In contrast, after a period of bacteriological cure, four patients (30%) died due to an infected tricuspid prosthetic valve.

*By invitation

14. The Hospital Mortality of Re-Replacement of the Aortic Valve: Incremental Risk Factors

FRED E. WIDEMAN, EUGENE H. BLACKSTONE*,*
JOHN W. KIRKLIN, ROBERT B. KARP, and
NICHOLAS T. KOUCHOUKOS, Birmingham, Alabama

Two hundred patients had re-replacement of the aortic valve as an isolated procedure or combined with coronary artery bypass grafting or resection of ascending aortic aneurysm between January 1, 1975 and July 1, 1979. 10 patients (5%, CL 3.4%-7.1%) died in hospital, compared with 24 deaths (2.8%, CL 2.3%-3.6%) among 842 patients undergoing isolated or combined primary replacement ($p = 0.12$). 6 of the 10 patients died with acute cardiac failure, 2 with hemorrhage (both from accidents at sternotomy), and 2 with neurologic deficits (each with innominate vein transection and then ligation). 17 (3.9%, CL 2.4%-6.0%) of 181 patients died in hospital after the first re-replacement (p for difference from initial replacement = 0.5), but 3 (15%, CL 7%-29%) of 19 died after the second or third re-replacement ($p = 0.001$). By simple contingency table analysis, NYHA Class IV increased the risk of hospital death after re-replacement ($p = 0.002$), as did active endocarditis of the previously implanted valve, and lack of use of cardioplegia ($p = 0.03$). Logistic multi-variate analysis showed high NYHA Functional Class III or IV ($p = 0.02$), absence of cardioplegia ($p = 0.09$), and long ischemic time ($p = 0.03$) to be incremental risk factors. These findings, and the suspected increased proportion of paravalvar leaks after multiple re-replacements, and perhaps of infection, indicate that: 1) patients with infected aortic valve bio-prosthesis or prostheses, or with paravalvar leaks, should have reoperation before acute or severe hemodynamic deterioration. 2) The sternotomy for reoperations should be made with special attention to avoiding damage to underlying structures. 3) Cardioplegia should be used, but even with this

cardiac ischemic time should be as short as possible. 4) The first re-replacement should be with a well-proven prosthetic valve.
*By invitation

15. Valve Replacement in Children: A 15 Year Perspective

TIMOTHY J. GARDNER, J. MICHEL ROLAND* and*
JAMES S. DONAHOO, Baltimore, Maryland

Since 1965, valve replacement has been performed on 64 children between the ages of two months and 19 years. Two of the patients underwent a second successful valve replacement eight and ten years following their initial surgery, while 19 additional patients had multiple cardiac surgical procedures performed. Isolated aortic valve replacement was accomplished in 28 patients with one early and two late deaths. Twenty-three patients had isolated mitral valve replacement with two hospital deaths and with three late deaths, also valve-related. Tricuspid valve replacement was performed in nine patients, two of whom died early postoperatively. Double valve replacement was carried out on four children without early or late mortality. Overall hospital mortality was 7.8%.

Of 19 patients with heterograft valves, all implanted since 1975, one developed valve degeneration in the mitral position, three years postoperatively. There have been no other tissue valve failures. Three children with mechanical valves developed severe tissue overgrowth two to ten years postoperatively. One fatal valve thrombosis occurred in the tricuspid position and an additional patient with an aortic Bjork-Shiley valve sustained a massive stroke. There has been one major anticoagulant complication, massive hematuria, which necessitated nephrectomy in a patient with a Starr-Edwards prosthesis. Four children, including three infants, have recently had successful mitral valve replacement with St. Jude prostheses. These four children have undergone postoperative catheteriza-tions which confirm excellent prosthetic valve function.

The late survival noted in the entire group and the infrequency of either thromboembolic or anticoagulant-related morbidity is enouraging. In addition, the current availability of the St. Jude prosthesis which has excellent hemodynamic characteristics in small annulus sizes allows for greater flexibility in valve substitution for children.
*By invitation

MONDAY AFTERNOON, May 11, 1981

2:00 P.M. Scientific Session
International Ballroom

7. Anatomic Correction of Transposition of the Great Arteries

ADIB D. JATENE, VALMIR F. FONTES*,*
*LUIZ CARLOS BENTO DE SOUZA *, PAULO P. PAULISTA *,*
CAMILO ABDULMASSIH NETO and*
J. EDUARDO M. R. SOUZA, Sao Paulo, Brazil*
Sponsored by: E. J. Zerbini, Sao Paulo, Brazil

Twenty-seven patients had anatomic correction for transposition of the great arteries since 1975, when we first reported this technique. Twelve of them were under 6 months, and 19 under 1 year of age. In all but one the pressure in the left ventricle was systemic. The ventricular septal defect was present in 24 cases. Persistent ductus was present in 6 cases, in 4 of them associated to the ventricular septal defect. Only 1 patient had absence of PDA and VSD. The hospital mortality for the entire group was 59.2%. In 10 patients the indication for the operation was considered inadequate; in 9 due to an exceedingly high pulmonary vascular resistance, and in 1 to a low left ventricular pressure. All of them died. The 17 remaining patients, all with VSD, had left ventricular pressure at systemic level. Ten of these patients without any significant pulmonary outflow tract stenosis have low pulmonary vascular resistance. Four of these patients died (40.0%) in relation to the operation. In 3 of them the fatality could possibly have been avoided. The remaining 7 patients had pulmonary outflow tract obstruction; sub-valvular stenosis in 3 cases, and previous pulmonary banding in 4. The hospital mortality was 28.5% (2 patients). Eleven patients survived the operation. One of them presented late pulmonary stenosis and died at the re-operation, 5 years after the initial correction. One patient has partial recurrence of the VSD and is under evaluation for a possible re-operation to repair this residual defect. Follow-up studies in the remaining 9 patients from 2 to 51 months revealed an evolution considered very satisfactory.

Five successful cases in the last 6 consecutive operations suggest the usefulness of this technique in proper selected cases.
*By invitation

8. Primary Definitive Repair of Interrupted Aortic Arch, VSD and PDA - Early and Late Results

ANTHONY L. MOULTON and*
FREDERICK O. BOWMAN, JR., Baltimore, Maryland
and New York, New York

Type B Interrupted aortic arch (IAA) with ventricular septal defect (VSD) and patent ductus arteriosus (PDA) usually presents with severe congestive failure in the first few weeks of life. It remains a highly lethal lesion and controversy exists about the optimal management of these patients. Most reported "repairs" have involved the use of prosthetic tubes or sacrifice of some of the arch vessels, often with simultaneous artery banding. This reports our experience with primary definitive repair of the aortic arch and closure of the VSD.

Since March 1974, seven patients, aged 7 days to 5 months, with Type B IAA + VSD + PDA were treated at the Columbis-Presbyterian Medical Center. Five of these patients underwent total correction utilizing deep hypothermia and circulatory arrest. Repair involved resection of all ductal tissue, primary anastomosis of the aortic arch, closure of the foramen ovale and patch closure of the VSD. All arch vessels were preserved and no prosthetic material was used to reconstruct the aortic arch.

One patient developed a coagulopathy and died 48 hours postoperatively. All others (80%) survived to hospital discharge. The patient repaired at 5 months of age had undergone pulmonary artery banding at another institution 3 months earlier; he died 8 months after correction from recurrent respiratory infections. Three patients are alive and well two to six years after repair. Two have undergone repeat cardiac catherization which demonstrated good growth of the anastomosis and no residual gradient. Primary definitive correction of Type B IAA + VSD + PDA provides distinct advantages over palliative or other surgical procedures with excellent long-term results.
*By invitation

9. Experience with Surgery for Hypoplastic Left Heart Syndrome

WILLIAM I. NORWOOD, PETER LANG*,*
ALDO R. CASTANEDA and DAVID N. CAMPBELL,*
Boston, Massachusetts

Aortic atresia (hypoplastic left heart syndrome: HLHS) is a common, uniformly lethal form of congenital cardiac anomaly with no established surgical management. From 1/79 to 11/80, 11 infants (4 female, 7 male) ranging in age from 1 day to 6 months (median 5 days) entered a study of staged repair of HLHS. All had aortic atresia (AA) except 1 with severe aortic and mitral stenosis and a markedly hypoplastic left ventricle (LV). Nine had associated mitral atresia (6) or mitral stenosis (3) with miniscule or no LV. Two had an associated ventricular septal defect (VSD) with only mild LV hypoplasia. One with AA and a VSD had associated Type C interrupted aortic arch (1AA) as well. The principles of the first stage in all were to establish a permanent communication from right ventricle (RV) to systemic circulation, normalize pulmonary flow and pressure, and insure unrestricted pulmonary venous inflow. The first 3 had placement of a valved conduit from RV to thoracic aorta (Ao), banding of main pulmonary (PA), ligation of PDA, and creation of ASD. One of these 3 subsequently had end-to-side anastomosis of proximal PA to augmented Ao and arch along with a systemic to PA central shunt. The last 7 had the latter reconstruction as stage one. There are 4 survivors. Early mortality was 48% (5/11) from hemorrhage (1), hypoxemia (2), and iatrogenic myocardiac ischemia (2). Late mortality was 33% (2/6) from aspiration (1) and throm-botic stenosis of valved RV to Ao conduit (1)6 and 4 months postopera-tively. Late (13 months) postop cath of the oldest survivor revealed a growing reconstructed Ao, no RV to thoracic Ao pressure gradient, 12 mm Hg mean PA pressure, 75% Ao O^2saturation and he is awaiting last stage modified Fontan repair. One with AA, VDS, and 1AA is clinically well and thriving 11 months following complete repair by apical-aortic conduit, graft interposition between ascending and thoracic Ao and VSD closure initiated at age 4 days.

Much has been learned and much remains to be learned but a surgical solution for HLHS appears possible.
*By invitation

10. Long-Term Results of Repair of Incomplete Persistent Atrioventricular Canal

DANIEL M. GOLDFADEN, MICHAEL JONES* and*
ANDREW G. MORROW, Bethesda, Maryland

We evaluated the late results following the repair of otherwise uncomplicated incomplete persistent atrioventricular canal in 39 consecutive patients who underwent operation at our institution prior to 1976. Average follow-up duration was 13 years (range 5-24 years). Median age at operation was 12 years (range 1 to 68 years). In all patients the repair included patch closure of the atrial septal defect and direct suture repair of the cleft anterior mitral valve leaflet. Thirty-five patients (90%) had postoperative cardiac catheterizations at an average of 11 months after operation. Five patients (14%) had mild to moderate mitral regurgitation demonstrated by elevated mean pulmonary arterial wedge or left atrial pressures (12 - 15 mm Hg), with abnormally elevated v waves. Two patients (6%) had severe residual mitral regurgitation, with mean pulmonary arterial wedge pressures greater than 20 mm Hg. Clinically significant serious arrhythmias, including complete heart block (one early and two late), sudden death, nodal rhythm, and the development of chronic atrial fibrillation occurred in 7 patients (18%). Two patients required reoperation for mitral regurgitation at one and ten years after the initial operation. Seven patients currently are symptomatic because of mitral regurgitation. Of these, five had mitral regurgitation demonstrated at early postoperative catheterization; the other two developed it late. Twenty-six patients are asymptomatic at most recent evaluation. Actuarial survival is 88 ± 6% at 13 years after operation; survival free without reoperation is 82 ± 6%. However, survival and free of any late complications, including late death, reoperation, arrhythmia, or symptomatic mitral regurgitation is 52 ± 10% at 13 years.

INTERMISSION - VISIT EXHIBITS

*By invitation

11. Continuing Improvements in Valvular Bioprosthesis

ALAIN F. CARPENTIER, CHARLES DUBOST,*
JEAN-NOEL FABIANI, ALAIN DELOCHE*,*
SYLVAIN CHAUVAUD and JOHNRELLAND*, Paris, France*

Since the introduction of Glutaraldehyde in the preservation of valvular bioprosthesis in 1968, extensive research has been carried out to minimize three persistent drawbacks: transvalvular gradients, fatigue lesions and calcifications.

Since transvalvular gradients result from the impedance caused by the stent and the aortic remnant supporting the cusps, valve design has been recently modified so as to implant the valve in the supra-annular position. Only the cusps of the supra-annular valve (SAV) remain exposed to the blood column. In vitro tests comparing the SAV with disc valves have shown the gradients to be comparable (SAV 8.5 mmHg, Bjork 14.4 mmHg, St. Jude 8 mmHg at 15 1/minute). Other changes in the stent design include optimized flexibility of the stent so as to be similar to that of a normal aortic root and reduction of strut height of the mitral model so as to minimize protrusion within the ventricular cavity.

Many reports have shown that most of the commercially available bio-prostheses display various histological lesions even prior to their implantation. These lesions are different in severity from one commercial laboratory to another and from one valve to another in the same laboratory. Fatigue testing using pulse duplicators has proven that the variability in histological lesions was well correlated with durability of the valve which averaged 450 million cycles with a wide range from 10 to more than 600 million cycles.

Extensive review of the entire process of valve preparation revealed that these variations in histological structure and durability resulted from inadequate preservation of the valve during the shipping process and large variations of the intervals between harvesting and Glutaraldehyde treatment (from 12 to 90 hours). A technique using a balanced salt solution which will be described in detail was therefore developed to improve shipping conditions and fixation was accomplished imperatively within the first 48 hours. Electron microscopic studies have shown that histological lesions have been eliminated. Fatigue tests studies have shown an improved average durability up to 650 million cycles with limited variations.

As shown both experimentally and clinically, calcifications result from various factors: turbulence, histological lesions prior to implantation, calcium metabolism, age of the patient, diet, etc. Reduction of turbulences by the supra-annular concept and improved preservation of the valve should hopefully minimize the incidence of calcification. The feasibility and possible benefit of low calcium diet is currently under investigation. Thirty-four SAV have been implanted clinically in the past 6 months with no mortality and no complication thus far. Post-operative hemodynamic data are available in 10 patients.

*By invitation

12. Three Years Experience with the St. Jude Medical Valve Prostheses: Clinical and Hemodynamic Results

DEMETRE M. NICOLOFF, ROBERT W. EMERY, KIT V. AROM, WILLIAM F. NORTHRUP, III*, CHARLES F. JORGENSEN*, YANG WANG* and WILLIAM G. LINDSA Y*, Minneapolis, Minnesota*

During a three year period beginning October 1977, 222 St. Jude Medical (SJM) mechanical heart valve prostheses were implanted in 210 patients with ages ranging from 18 months to 82 years, (116 aortic, 104 mitral and two tricuspid). The operative mortality (OM) for the aortic valve replacement (AYR) alone was 6.4% (78 cases) and 7.8% when valve surgery was combined with coronary artery bypass, mitral valve replacement (MVR) and ascending aorta replacement (38 cases). The OM was 5.3% for MVR (75 cases) and 8.7% when combined with other procedures (29 cases). None of these early deaths were related to valve failure. There were also **NO** significant early post-operative complications. Prior to discharge, the Hgb and platelet counts were compared to those of pre-operative valves; LDH was mildly elevated (319 ± 10 in AYR, 350 ± 22 in MVR).

In the mitral position, 926 patient-months follow-up revealed two hemolyses, two paravalvular leaks, two infections, and one embolus. There was NO valve malfunction or thrombosis. There was one death (after five months) from a coronary embolus. In the aortic position, 1153 patient-months follow-up revealed NO LATE COMPLICATIONS. There were two deaths, one at six months and one at eight months (1-CVA, 1-other cause).

At this time, 33 (22 AVR, 11 MVR) elective cardiac re-catheterizations have been performed (5 ± .3 months) showing the cardiac output (CO) to be improved from 5.1 ± .3 to 6.0 ± .3 L/min. ($p<.001$) in AVR and 3.6 ± .3 to 4.1 ± .3 L/min. ($p<0.01$) in MVR. PCWP decreased 14 ± 2 to 8 ± 1 mmHg ($p<.005$) in AVR and 22 ± 2 to 16 ± 2 mmHg ($p<.01$) in MVR. Transvalvular aortic peak systolic gradient (PSG) at rest varied from 0 to 12.0 mmHg (13/22 had 0 gradient) and 0 to 6.0 mmHg (8/11 had 0 gradient) in the mitral position. Effective valve area is not calculated since 21 patients had no transvalvular gradient. Following exercise, the PSG increased from 1 ± 1 to 4 ± 1(11 AVR) and 1 ± 1 to 5 ± 2 mmHG (5 MVR) and the CO increased to 10 ± 1.0 L/min. (11 AVR) and 7 ± 1.0 L/min. (5 AVR).

CONCLUSION: Three year follow-up of the SJM cardiac valve prostheses showed low transvalvular gradients, minimal hemolysis, and no thrombosis.

*By invitation

13. Tricuspid Valvulectomy Without Prosthetic Replacement: Ten Years of Clinical Expeience

AGUSTIN ARBULU and INGIDA ASFAW, Detroit, Michigan

The purpose of this paper is to report 54 patients that underwent tricuspid valvulectomy (TV) without replacement for bacterial endocarditis. Twenty-two cases were operated upon by the authors and 32 by other surgeons in the United States and Europe for a period ranging 1 to 10 years. Forty-eight patients were addicted to intravenous narcotics and six were not. In 34, the infection was due to gram negative bacteria. In 15, it was due to gram positive bacteria. In three patients the organism was a fungus; in one the infection followed trauma and in the last patient followed cancer invasion of the tricuspid leaflets. In 33 patients the diagnosis of right-sided endocarditis was made by the clinical picture alone. In three cases the cardiac catheterization was diagnostic. In 14, the combination of the clinical picture and cardiac catheterization, and in four echocardiogram was necessary to establish the diagnosis. In all patients intensive intravenous antibiotic treatment given for an average period of seven weeks, failed to cure the infection prior to the operation.

In 50 patients (93%) the endocarditis was cured after the TV. Subsequent to this operation 13 patients required a tricuspid prosthesis for various reasons. Of the 37 patients that did not require a tricuspid prosthesis 27 (73%) are in good condition and three in fair condition. In this group, seven patients died; two accidental, and five of a second endocarditis. None of these deaths were related to the TV. Of the 13 patients that required a prosthesis, eight (62%) are in good condition, one is in fair condition and four have died with infected prostheses.

WE CONCLUDE that TV is a curative operation for intactable right-sided endocarditis in more than 90% of the patients. The insertion of a prosthesis in these patients does not improve survival and quality of life. No patient had died as a consequence of the TV. In contrast, after a period of bacteriological cure, four patients (30%) died due to an infected tricuspid prosthetic valve.

*By invitation

14. The Hospital Mortality of Re-Replacement of the Aortic Valve: Incremental Risk Factors

FRED E. WIDEMAN, EUGENE H. BLACKSTONE*, JOHN W. KIRKLIN, ROBERT B. KARP, and NICHOLAS T. KOUCHOUKOS, Birmingham, Alabama*

Two hundred patients had re-replacement of the aortic valve as an isolated procedure or combined with coronary artery bypass grafting or resection of ascending aortic aneurysm between January 1, 1975 and July 1, 1979. 10 patients (5%, CL 3.4%-7.1%) died in hospital, compared with 24 deaths (2.8%, CL 2.3%-3.6%) among 842 patients undergoing isolated or combined primary replacement ($p = 0.12$). 6 of the 10 patients died with acute cardiac failure, 2 with hemorrhage (both from accidents at sternotomy), and 2 with neurologic deficits (each with innominate vein transection and then ligation). 17 (3.9%, CL 2.4%-6.0%) of 181 patients died in hospital after the first re-replacement (p for difference from initial replacement = 0.5), but 3 (15%, CL 7%-29%) of 19 died after the second or third re-replacement ($p = 0.001$). By simple contingency table analysis, NYHA Class IV increased the risk of hospital death after re-replacement ($p = 0.002$), as did active endocarditis of the previously implanted valve, and lack of use of cardioplegia ($p = 0.03$). Logistic multi-variate analysis showed high NYHA Functional Class III or IV ($p = 0.02$), absence of cardioplegia ($p = 0.09$), and long ischemic time ($p = 0.03$) to be incremental risk factors. These findings, and the suspected increased proportion of paravalvar leaks after multiple re-replacements, and perhaps of infection, indicate that: 1) patients with infected aortic valve bio-prosthesis or prostheses, or with paravalvar leaks, should have reoperation before acute or severe hemodynamic deterioration. 2) The sternotomy for reoperations should be made with special attention to avoiding damage to underlying structures. 3) Cardioplegia should be used, but even with this cardiac ischemic time should be as short as possible. 4) The first re-replacement should be with a well-proven prosthetic valve.

*By invitation

15. Valve Replacement in Children: A 15 Year Perspective

TIMOTHY J. GARDNER, J. MICHEL ROLAND* and JAMES S. DONAHOO, Baltimore, Maryland*

Since 1965, valve replacement has been performed on 64 children between the ages of two months and 19 years. Two of the patients underwent a second successful valve replacement eight and ten years following their initial surgery, while 19 additional patients had multiple cardiac surgical procedures performed. Isolated aortic valve replacement was accomplished in 28 patients with one early and two late deaths. Twenty-three patients had isolated mitral valve replacement with two hospital deaths and with three late deaths, also valve-related. Tricuspid valve replacement was performed in nine patients, two of whom died early postoperatively. Double valve replacement was carried out on four children without early or late mortality. Overall hospital mortality was 7.8%.

Of 19 patients with heterograft valves, all implanted since 1975, one developed valve degeneration in the mitral position, three years postoperatively. There have been no other tissue valve failures. Three children with mechanical valves developed severe tissue overgrowth two to ten years postoperatively. One fatal valve thrombosis occurred in the tricuspid position and an additional patient with an aortic Bjork-Shiley valve sustained a massive stroke. There has been one major anticoagulant complication, massive hematuria, which necessitated nephrectomy in a patient with a Starr-Edwards prosthesis. Four children, including three infants, have recently had successful mitral valve replacement with St. Jude prostheses. These four children have undergone postoperative catheteriza-tions which confirm excellent prosthetic valve function.

The late survival noted in the entire group and the infrequency of either thromboembolic or anticoagulant-related morbidity is enouraging. In addition, the current availability of the St. Jude prosthesis which has excellent hemodynamic characteristics in small annulus sizes allows for greater flexibility in valve substitution for children.

*By invitation

TUESDAY MORNING, May 12, 1981

8:30 A.M. Scientific Sessions
International Ballroom

16. Management of Acute Myocardial Infarction By Intra-coronary Lysis (ICL) and Subsequent Surgical Revascularization

HANS J. KREBBER, D. MATHEY*, K. H. KUCK*,*

P. KALMAR and G. RODEWALD*, Hamburg, Germany*

Sponsored by: J. Donald Hill, San Francisco, California

With the introduction of ICL for coronary thrombosis into clinical medicine a new regimen for the management of acute M.I. has developed. Patients with acute M.I., admitted within less than 4 hours following the onset of symptoms, are catheterized immediately, and angiography is performed. In the presence of coronary thrombosis recannulation is attempted by local application of streptokinase (55 patients). When recannulation is achieved and the clinical situation is stable, or when no recannulation is achieved and tansmural M.I. develops, the patients are treated medically (40 patients) and surgical revascularization is performed at 4-6 weeks when indicated (4 patients). However, when ICL is successful, but symptoms of angina persist, reoccur or early thrombosis is to be expected, aortocoronary bypass surgery is performed immediately. In this last group of 11 patients (8 males, 3 females, mean age 53.3 years) with successfully recannulated coronary arteries (6 x LAD, 4 x RCA, 1 circ.) were surgically revascularized within hours up to 12 days following ICL. One to 4 aortocoronary venografts (mean 1.6 per patient) were implanted according to the extent of the disease. The mitral valve was replaced and a left ventricular aneurysm was resected in 1 patient each. All patients survived and had an uneventful course without signs of reperfusion damage or postoperative M.I. The behavior of CPKMB levels are comparable to those of patients operated on electively. Ventricular function was improved in more than two thirds of the patients. Early results will be discussed on the basis of angiography.

The staged management of acute M.I. using ICL and subsequent surgical revascularization is a safe method with promising early results as far as preservation of the left ventricular function is concerned.

*By invitation

17. The Optimum in Coronary Revascularization

RICHARD D. WEISEL, BERNARD S. GOLDMAN,*

RONALD J. BAIRD, HUGHE. SCULLY,

LEONARD SCHWARTZ, MICHAEL J. McLOUGHLIN*,*

KEVIN H. TEOH, PETER R. McLAUGHLIN* and*

HAROLD E. ALDRIDGE, Toronto, Ontario*

Early patency rates after aorto-coronary bypass (ACB) surgery are critically dependent on the surgeon's selection of arteries for bypass, and high patency rates may not represent the optimum in coronary revascularization.

One hundred consecutive patients (pts) were recatheterized 6 to 10 days after ACB. The patency rate was 83% (202/243). A multivariate (discriminate) analysis identified three factors which independently influenced early patency: arterial size (from preoperative angiograms and intraluminal probes), arterial quality (assessed pre and intraoperatively) and the surgeon's intraoperative prediction of patency. These factors significantly ($p<.01$) predicted patency rates (%):

Size (mm)		**Quality**		**Surgeon's Prediction**	
<1.0	57%	Poor	60%	Poor	53%
1.1 - 1.5	73%	Fair	74%	Fair	70%
1.6- 2.0	86%	Good	88%	Good	85%
>2.0	87%	Excellent	92%	Excellent	98%

One hundred and eighty-nine grafts performed to arteries of good size and quality were designated intraoperatively as *primary grafts* and fifty-four small, diseases arteries were selected for *secondary grafts.* The patency rates for primary grafts (94%) were significantly ($p<.01$) better than for secondary grafts (43%). If only primary grafts had been constructed, the patency rate would have been greater (94%), but the number of patent grafts per patient (1.78) would have been less than in our series (2.02). The difference was more pronounced in pts with triple vessle (TV) than double vessel (DV) or single vessel (SV) disease.

		Primary Grafts Only		**Primary & Secondary Grafts**	
	Pts	**Patency**	**Patent Grafts/Pt**	**Patency**	**Patent Grafts/Pt**
SV	24	96%	1.0	96%	1.1
DV	49	93%	1.8	83%	2.0
TV	29	94%	2.3	80%	2.8

The construction of secondary grafts did not increase peri-operative cardiac injury. Eight myocardial infarctions (new Q waves) occurred in the distribution of the 189 primary grafts (4 were patent) and two infarcts occurred in the distribution of the 54 secondary grafts (1 was patent). The highest postoperative CK-MB value for those patients receiving only primary grafts (24 ± 8 IU/L) was not different than for those patients also receiving secondary grafts (26 ± 7 IU/L).

The construction of secondary as well as primary grafts, reduces the patency rate but produces more patent grafts, without producing myocar-dial injury. Late recatheterization with an assessment of ventricular function will be required to determine whether the performance of secondary grafts improves long term cardiac perfusion. The optimum in early myocardial revascularization is not attainment of the highest patency rate, but the creation of the largest number of patent grafts per patient.

*By invitation

18. Coronary Artery Disease with Minimal Angina - Medical Versus Surgical Therapy

DENIS H. TYRAS, HENDRICK B. EARNER,

GEORGE C. KAISER, D. GLENN PENNINGTON,*

JOHN E. CODD, VALLEE L. WILLMAN and

J. G. MUDD, St. Louis, Missouri*

This study examines the response to therapy of 447 patients with significant coronary artery disease (at least one major coronary artery with>70% stenosis) who had minimal angina (Canadian Heart Association Class 0, I, or II). Patients with left main coronary stenosis, valvular disease or ventricular aneurysm were excluded. Treatment assignment to operation or non-operative care was nonrandom by patient or physician preference. Isolated coronary bypass grafting was performed in 284 patients as initial therapy; of 163 patients initially managed non-operatively, 22 subsequently underwent operation because of increasing angina. Average followup is 38.6 months (range 18-64).

	Medical (N = 163)	Surgical (N = 284)	p value
Avg Age (range)	52.3 yrs (34-65)	52.1 yrs (34-70)	N.S.
% Single Vessel Disease (SVD)	23.9	12.0	<0.005
% Normal Preop Left Ventricle	74.8	53.9	<0.001
% Class 0 Angina Preop	22.1	12.0	<0.025
Operative Mortality	--------	0.3%	--------
Cumulative 3 yr Survival	94.1 ± 2.3%	98 .4 ± 0.9%	N.S.
Incidence Myocardial Infarction (MI)	9.2%	7.8%	N.S.
Cross-over to Surgical or 2nd operation	13. 5%	0.3%	
Event-free 3 yr Survival (death, MI, cross-over)	73.5 = 3.7%	90.4 = 1.8%	<0.0001
% Class 0 Angina now	44.3	80.4	<0.0001

In patients with SVD, only one *non*-cardiac death and three nonfatal Mis occurred among those either medically or surgically treated. In patients with double- or triple-vessel disease, 3 year cumulative survival was significantly higher in those managed operatively (98.6 ± 0.8% vs 91.5 ± 3.2%, p 0.04). Event-free 3 year survival was also better in surgical multivessel disease patients (90.1 ± 1.9% vs 67.5 ± 4.5%, p 0.001). These data suggest that, even in patients with minimal angina, operative management of double or triple vessel disease leads to better survival and continued angina relief. Angiographic findings of double or triple vessel disease create an anatomic imperative in favor of operative therapy regardless of severity of angina symptoms.

*By invitation

19. Should Coronary Arteries With Less Than 50% **Stenosis Be Bypassed?**

DELOS M. COSGROVE, FLOYD D. LOOP,

CRAIG L. SAUNDERS, BRUCE W. LYTLE* and*

JOHN R. KRAMER, Cleveland, Ohio*

The unpredictability of progressive coronary atherosclerosis has caused a trend towards grafting arteries with <50% stenosis. To evaluate the patency of these grafts and the effect on the native circulation, 92 patients (80 men and 12 women) with 302 coronary arteries were reviewed. The age range was 34 to 66 years (mean, 51.8 years). Of 226 bypassed arteries, 100 had <50% stenosis. The mean interval between surgery and catheterization was 13 months. Forty-five patients underwent routine postoperative studies; the remainder were symptomatic or had sustained a cardiac event.

Patency rates were similar for grafts placed to arteries with 50%stenosis (79%) and to arteries with >50% stenosis (81%). Forty internal mammary artery grafts (IMA) had a 95% patency; 96.3% to vessels with >50% stenosis and 92.3% to vessels with >50%. Two hundred twenty-six vein grafts had a 77.4% patency, with 76.8% to arteries with 50% stenosis and 78.2% to arteries with >50% stenosis. No difference in patency rates occurred for subsets of vein grafts to the right, circumflex, or anterior descending coronary arteries.

Progressive atherosclerosis (PA) in coronary arteries was defined as an increase in estimated stenosis of at least 20% or progression to total occlusion. PA was demonstrated in 17.5% of 40 nongrafted arteries with <50% stenosis; 63% of 100 grafted vessels with <50% stenosis; and 51.6% of 93 vessels with >50% stenosis. Thirty-three percent had PA when grafted with IMA while 66% had PA when vein grafts were employed ($p<0.01$). No difference in PA was noted whether grafts were occluded (45%) or patent (57.5%).

We conclude that 1) grafts to arteries with <50% stenosis have patency rates similar to those with >50% stenosis. 2) IMA grafts are associated with a higher patency rate than vein grafts in arteries with <50% stenosis. 3) In <50% stenotic areries, PA is greater in grafted than nongrafted vessels.

INTERMISSION - VISIT EXHIBITS

*By invitation

20. Two-Dimensional Ultrasound and Cardiac Surgery

HENRY M. SPOTNITZ, New York, New York*

Sponsored by: James R. Malm, New York, New York

Although the utility of two-dimensional echocardiography in closed chest patients is well known, its potential advantages in the open chest during cardiac surgery have not been fully explored. Accordingly, two-dimensional echocardiography was employed in 50 patients for anatomical and physiologic "studies during cardiac surgery. Standard, commercially available phased-array echocardiography equipment with a gas sterilized transducer was found to produce surprisingly clear echocardiographic images in the open chest without the need for water paths or conductive gel. Unusual perspectives not permitted by the bony thorax were readily obtained.

Two-dimensional echocardiography detected micro-bubbles entrapped within the left ventricle in 19 patients at the conclusion of cardiac surgery. It facilitated careful planning of a surgical

approach across the interatrial septum to cardiac tumors in two patients. It clearly elucidated the relationship between struts of prosthetic mitral valves and the aortic outflow in twelve patients during mitral valve replacement. In 35 patients, alterations in left ventricular ejection fraction during surgery were detected and characteristically related to specific surgical procedures for acquired coronary and valvular heart disease. Increased ejection fraction after surgery for constrictive pericarditis was also demonstrated.

In the closed chest, detection of acute pericardial tamponade and acute mitral insufficiency with preservation of left ventricular function (avoiding cardiac catheterization) were also demonstrated. Increasing left ventricular mass following cardiac transplantation in a single patient was also demonstrated, suggesting a non-invasive method for detecting cardiac rejection.

In summary, two-dimensional echocardiography is extremely useful for definition of anatomic and physiologic changes occurring during cardiac surgery. The potential limitations and demonstrated utility of this method should be familiar to cardiac surgeons working in institutions with access to this modality.

*By invitation

21. Endomyocardial Fibrosis: Early and Late Results of Surgery in 20 Patients

DOMINIQUE METRAS, ANDRE QUEZZIN COULIBALY*,*

KOUAME OUATTARA, JACQUES CHAUVET*,*

*ALAIN EKRA * and EDMOND BERTRAND*,*

Abidjan, Ivory Coast
Sponsored by: Aldo R. Castaneda, Boston, Massachusetts

Twenty patients with endomyocardial fibrosis (E.M.F.), the largest series reported to date, were operated upon between June 1978 and June 1980. Eleven were male, ages ranged from 6 to 23 years, (mean 13.3 years). There were 7 right ventricle (R.V.) E.M.F., 6 left ventricle (L.V.) E.M.F., 7 bilateral E.M.F. (predominant in L.V. 5, in R.V. 2). The procedure included in all patients endocardectomy (8 R.V., 8 L.V., 4 bilateral) and atrio-ventricular valve replacement with xenograft (9 tricuspid, 11 mitral). Four patients had an additional valvular annuloplasty (2 mitral, 2 tricuspid). There were 4 postoperative deaths (all bilateral E.M.F.): low cardiac output (2), hepatic failure (1), cerebral malaria (1). There was one late death from serum hepatitis. The other patients had a relatively uncomplicated postoperative course. None of the twenty patients had atrio-ventricular block (A.V.B.). The longest followup of the 15 survivors is 28 months (mean 16.7 months). All patients are symptom-free, 3 patients take digitalis and/or diuretics. Ten have been recatheterized from 6 months to 1 year after surgery. Intracardiac pressures, the ventricular cineangiogram, liver and heart-size, returned to normal in patients with L.V. E.M.F.; in R.V. E.M.F., despite clinical improvement, most of these parameters remained abnormal. Of special interest proved (1) recognitions of early type of L.V. E.M.F., and (2) surgical preservation of a thin juxta-annular rim of fibrosis in the R.V. to avoid A.V.B. Surgery is indicated in all patients with L.V. E.M.F., despite greater risk. Early intervention is advised in R.V. E.M.F., to avoid irreversible liver damage and cardiac enlargement.

11:30 A.M. Address of Honored Speaker
AN EVALUATION OF THE LONG-TERM RESULTS OF SURGERY FOR BRONCHIAL CARCINOMA
Roger Abbey Smith
Coventry, England

12:15 P.M. Cardiothoracic Residents' Luncheon

*By invitation

TUESDAY AFTERNOON, MAY 12, 1981

2:00 P.M. Scientific Session
International Ballroom

22. Lye Ingestion: Clinical Patterns and Therapeutic Implications

DAVID D. OAKES, JOHN P. SHERCK* and*
JAMES B. D. MARK, San Jose and Stanford, California

During the past ten years we have admitted 42 patients following ingestion of caustic substances. This report evaluates the efficacy and safety of traditional diagnostic and therapeutic maneuvers - specifically diagnostic endoscopy, early dilitation, and steroid therapy. It also examined the role of emergency esophagogastrectomy as advocated by Kirsh *et al.* There were 16 children (ages 1-7, mean 2.6 years) and 26 adults (ages 17-70, mean 34.7 years). The substance ingested was liquid in 29 cases, solid in 8, and in-determinant in 5. Twenty-four patients underwent early endoscopy, 27 had esophagograms, 13 had both studies, and 5 had neither. All patients were started immediately on antibiotic and steroid therapy. In selected patients early esophageal dilatation was attempted. There were three clinical groups: *Group I* - Twenty-two patients proved to have no significant esophago-gastric injury. Burns were limited to the lips, anterior tongue, or cheeks - with only edema or erythema in the oropharynx. History suggested that weak agents or small quantities had been ingested. Endoscopy was performed in 12 patients and confirmed the clinical impression. *Group II* - Thirteen patients had small burns of the posterior oropharynx. Esophageal involvement was seen at endoscopy in 8 (diffuse "esophagitis" 2, segmental burns or ulcers 4, unspecified "burns" 2). Three patients had gastric lesions (2 had ingested capsules). The final two patients had no dysphagia and were not endoscoped; one had a normal esophagogram. All recovered uneventfully with antibiotics, steroids, and supportive care. *Group III* - Seven patients sustained extensive burns of the mouth and esophagus and - in spite of steroid therapy - required bypass procedures. Early dilatation led to three perforations. No patient required emergency esophagogastrectomy, although one gastrectomy was necessary on the eleventh hospital day. In every case the extensive nature of the injury was apparent from the initial examination. CONCLUSIONS: Precise knowledge of the agent ingested combined with examination of the oropharynx will allow most patients to be classified as to the probability of esophageal injury. Rapid, accurate clinical assessment - aided by cautious early endoscopy - will affect therapy in that steroids are unnecessary in Group I and ineffective and potentially dangerous in Group III. (Although widely used, their value in Group II is moot.) Early dilatation is dangerous and ineffective. Emergency esophago-gastrectomy has not been required in our experience.
*By invitation

23. Treatment of Gastroesophageal Reflux in Children with Thai's Fundoplication

KEITH W. ASHCRAFT, THOMAS M. HOLDER and
RAYMOND A. AMOURY, Kansas City, Missouri*

The surgical treatment of gastroesophageal influx in childhood is necessary when positional treatment feedings fail to relieve the symptoms of relux. Nissen's fundoplication has been advocated most frequently as being the ideal operative treatment. We present a series of 362 patients treated surgically by a partial wrap (Thai fundoplication) over a period of seven years. This fundoplication has the distinct advantage in permitting the child to vomit if necessary postoperatively.

Operative indications in this group of 362 patients included 203 whose primary symptoms were respiratory, 26 with esophagitis and 126 with intractable vomiting or nutritional failure. Seven patients had fundoplication done along with gastrostomy for feeding for CNS disorders to prevent aspiration. Two-hundred and sixty patients were under the age of one year. Twenty-seven patients were lost to follow-up leaving 335 patients followed for a minimum of eight months and up to seven years. The results of Thai's fundoplication are shown in the Table.

	Pts.	**Followed**	**ED***	**Failed**	**Excellent**
Apnea (aborted SIDS)	80	80	4	4	68
Cough, Choking, Croup	49	42	2	2	38
Recurrent Pneumonitis	74	71	6	3	62
Esophagitis	26	26	1	2	23
Intractable vomiting	58	54	0	3	51
Nutritional Failure	66	57	2	3	52
Starvation	2	2	0	0	2
Other	7	7	0	0	7
	362	335	15(%)	17(%)	303(90%)

The 17 patients who failed initially were redone for a 95% satisfactory outcome. The patients frequently were able to burp postoperatively and certainly could vomit when necessary. There were no instances of the gas/bloat syndrome. There were no deaths due to operation. The usual hospital stay is 3 days.

The Thai fundoplication appears to be a very satisfactory alternative to the Nissen fundoplication with some disinct advantages for the growing child.

*Error in assuming GER responsible for symptoms.

*By invitation

24. Esophageal Replacement Using Jejunum in Children - An 18 to 33 Year Follow-up

W. STEVES RING, RICHARD L. VARCO, PHILIPPE R. L'HEUREUX* and JOHNE. FOKER*, Minneapolis, Minnesota*

Esophageal substitutes in children must provide satisfactory long-term function and freedom from problems. Colon and stomach tubes are most frequently used for esophageal replacement but functional and pathologic abnormalities have been reported with each which raise concern over their long-term suitability. The jejunum is a nearly disease-free organ, and therefore has a thoretical advantage over both colon and stomach as an esophageal substitute. From 1947 through 1962, staged juejunal interposition was performed in 16 children with esophageal atresia. There were no failures of the jejunum to reach the neck, loss of graft or operative mortality. Cervical fistulas occurred following esophagojejunostomy in 25% (4/16) but closed spontaneously in all patients and did not result in stenosis requiring dilatation or surgical revision. Stenosis of the cervical anastomosis sufficient to require dilatation but not revision occurred in one patient (6%). Long-term follow-up (range 18-33 yrs.; mean 27 yrs.) was obtained in 100% (16/16) of patients. A barium swallow was performed in 81% (13/16) at a mean of 25 yrs. (range 14-33 yrs.) following initial reconstruction. No or minimal swallowing difficulties were reported by 88% (14/16) and they eat a completely normal diet at normal speed. Two patients (12%) reported moderate dysphagia. No obstruction was demonstrated by barium swallow in one patient. The other was found to have an esophageal diverticulum proximal to the cervical anastomosis which was recently excised, 27 years following the initial reconstruction. In all 13 patients studied, the interposed jejunum had normal peristalsis and mucosal pattern. The maximum jejunal caliber was normal (4 cm) in 7/13 (64%) and only mildly dilated (4-7 cm) in 4/13 (36%). No stomal ulcers have occurred. Over the past ten years this technique has been utilized in an additional 13 patients, again with no failure of the jejunum to reach the neck, loss of graft or operative mortality. Series of colon or stomach tube replacements with much shorter follow-up have uniformly reported no peristalsis in the segment. In addition, ulcers and other organ related problems have occurred and the incidence of these is likely to increase with time. In conclusion, when performed as a staged procedure, the jejunum can

be reliably and safely utilized for esophageal replacement in children with excellent long-term functional results.
*By invitation

25. Eradication and Palliation of Squamous Cell Carcinoma of the Esophagus with Chemotherapy, Radiotherapy and Surgery

ZWI STEIGER and ROBERT F. WILSON,*
Detroit, Michigan

From April, 1977 through October 1980, 71 patients with squamous cell carcinoma (CA) of the esophagus were treated with pre-operative combined chemotherapy (CT) and radiotherapy (XRT). This consisted of (A) mitomycin-C (10 mg/M^2) or cis-platinum (100 mg/M^2) on days one and 21, (B) 5-fluorouracil (1000 mg/MVday) on days 1-4 and 29-32, and (C) 3000 rads days 1-5, 8-12, and 15-19.

In 29 patients, the therapy was primarily palliative because of poor medical condition (9), and bronchoesophageal fistula (8), distant metastases (7), and other prior malignancies (5). In all of these patients except two, the mucosal lesion disappeared with CT and XRT. The bronchoesophageal fistuli were managed surgically successfully with gastric bypass.

Six patients with potentially curable lesions refused surgery because of the excellent palliation with CT and XRT. Of 35 patients having surgery for potential cure after CT and XRT, 3(9%) died of post-op pulmonary complications. Ten patients (29%) had no histologic evidence of residual CA in the resected esophagus or lymph nodes. None of these patients have died or have recurrent CA esophagus; however, two have developed oropharyngeal CA. In another six patients (17%) only small microscopic islands of tumor cells were found in the resected esophagus. Of these six patients, none have recurrent esophageal CA but, one has developed oropharyngeal CA. Follow-up triple endoscopy in these patients is important.
*By invitation

26. Factors Affecting Response to Thymectomy for Myasthenia Gravis

JOSEPH W. RUBIN, ROBERTO. ELLISON,
HOLLAND V. MOORE and GANESH P. PAI*,*
Augusta, Georgia

Timing of surgery, thymic pathology, and immunological factors affect results of thymectomy for myasthenia gravis (MG). Review of hospital records of 97 patients with MG revealed 19 (14F, 5M) who had undergone thymectomy from 1961-1979. There were no surgical deaths. Pathologic examination recorded thymic hyperplasia in 10, no pathology in 5, involuted glands in 2, and thymoma in 1. Thymectomy resulted in 19%improvement: complete remission in 10, mild residual weakness in 5, and no change in 4. This study demonstrates that factors predictive of symptom amelioration were short duration of disease, thymic hyperplasia with abundant germinal centers, and acetylcholine receptor (AChR) antibodies present before and absent following complete transsternal thymectomy. Factors predictive of delayed or no response to thymectomy were long duration of disease before operation, thymic atrophy or no demonstrable pathology, incomplete excision and persistent AChR antibodies. Response was independent of sex and age. Our findings support the theory that the thymus in MG participates in the production of AChR antibodies which interfere with motor endplates and neuromuscular transmission causing myasthenic weakness. The autoimmunizing event is unknown. Excision of hyperplastic thymus early in the course of MG is associated with early remission. Prolonged postthymectomy impairment may be expected in some patients who have endured MG for years prior to surgery. Measurement of AChR antibodies routinely before and after thymectomy may yield valuable prognostic data and distinguish patients with active autoimmune disease possibly due to residual or regenerated thymus from those with endstage muscle weakness.

INTERMISSION - VISIT EXHIBITS

*By invitation

TUESDAY - MAY 12, 1981

4:00 P.M. Executive Session
International Ballroom

6:30 P.M. President's Reception
Corcoran Gallery of Art

WEDNESDAY MORNING, MAY 13, 1981

8:30 A.M. Scientific Session
International Ballroom

(Forum Papers)

27. Computerized Fluoroscopy-A New Technique for the Noninvasive Evaluation of the Aorta, Coronary Artery Bypass Graft Patency, and Left Ventricular Function

P. DAVID MYEROWITZ, ANDREW B. CRUMMY*,*

DAVID L. ERGUN, CHORNG-GANG SHAW*,*

PARAMJEET S. CHOPRA, HERBERT A. BERKOFF,*

GEORGE M. KRONCKE, GEORGE G. ROWE*,*

*CHARLES A. MISTRETTA * and WILLIAM D. TURNIPSEED*,*

Madison, Wisconsin

A computerized fluoroscopy system (C.F.) has been developed based on real time digital processing of x-ray transmission data from traditional image-intensified fluoroscopy equipment. High quality visualization of any part of the arterial system is obtained following intravenous injection of 0.5 to 0.75 ml/kg of iodinated contrast materials. Previous reports from this institution have outlined the usefulness of C.F. for visualizing carotid, peripheral, and renal arteries following intravenous contrast injections. This report describes the use of this technique to evaluate the aortic arch, left ventricular function, and coronary artery bypass graft patency. Fifty intravenous studies were performed in 25 patients. Among 20 patients with coronary artery bypass grafts, C.F. correctly identified 11 of 15 patent grafts and 11 of 11 occluded grafts as confirmed by standard coronary arteriography in 11 of these patients. Unlike computerized tomography, our technique gives a longitudinal view of the bypass graft much like direct coronary angiography. Aortic arch studies included demonstration of a right aortic arch with a small left subclavian artery, a coarctation, and a normal aortic arch in a trauma patient with a wide mediastinum. Segmental wall motion abnormalities have been clearly identified by a modification of the technique which produces a negative outline on the ventriculogram in dyskinetic segments. Ejection fractions may be calculated by analyzing the amount of iodine in the ventricle in systole and diastole. This technique may also be used to evaluate carotid disease in patients undergoing coronary artery bypass surgery. C.F., therefore, allows evaluation of the entire cardiovascular system by the relatively noninvasive technique of intravenous angiography.

28. Establishment of Right Ventricle to Hypoplastic Pulmonary Artery Continuity Without the Use of Extracorporeal Circulation: A New Surgical Technique

*FRANCISCO J. PUG A * and GIDEON URETZKY*,*

Rochester, Minnesota
Sponsored by: Dwight C. McGoon, Rochester, Minnesota

A technique that allows establishment of continuity between the right ventricle and hypoplastic pulmonary confluence without the use of extracorporeal circulation in patients with pulmonary atresia and ventricular septal defect has been applied successfully in the laboratory and in four consecutive patients. Exposure is achieved by an anterolateral thoracotomy through the left third intercostal space. A Dacron tubular graft of appropriate size is anastomosed to the hypoplastic but confluent pulmonary artery bifurcation. A fine, stranded, multifilament steel wire is passed through the anterior wall of the outflow portion of the right ventricle so that a two to three centimeter loop lies in the right ventricular cavity. The proximal end of the nonvalved tubular graft is anastomosed to the epicardial surface of the right ventricle around the exit points of the wire. The ventricular incision is achieved by sawing through the right venricular wall with the wire in a manner similar to a Gigli saw. No systemic heparinization is used. The characteristics and adequacy of the right ventriculotomy were studied on the right ventricular outflow tract of two dogs, while a third animal was remained alive and well up to two months after undergoing the procedure in addition to interruption of its main pulmonary artery. Four consecutive patients, ages 22, 12, 8 and 2 years, have undergone this procedure. All had confluent but hypoplastic pulmonary arteries measuring 6, 5, 5 and 3 mm. in diameter. There were no surgical deaths. Average blood loss was 200 cc. and all patients showed an increase in peripheral arterial oxygen saturation. All patients underwent postoperative cardiac catheterization and angiography. All patients had patent conduits and pulmonary arteries which had increased in diameter. Advantages of the procedure are: avoidance of the median sternotomy which may simplify future closure of the VSD; simplification of an effective technique which under extracorporeal circulation is complicated by profuse collateral flow that tends to obscure the operative field and distend the heart; minimal bleeding resulting from avoidance of systemic heparinization which in these severely cyanotic patients can lead to severe bleeding diathesis; and, hopefully, a decrease in the risk of this type of reconstruction.
*By invitation

29. Successful Orthotopic Canine Heart Transplantation After 24 Hour *In Vitro* Preservation

ALBERT J. GUERRATY, PETER A. ALIVIZATOS*,*

MARK W. WARNER, MICHAEL L. HESS* and*

RICHARD R. LOWER, Richmond, Virginia

Prolonged *in vitro* preservation of donor hearts may be of importance in the future expansion of clinical cardiac transplantation to extend the distance over which donor hearts may be transported and to allow for more extensive preoperative histocompatibility testing.

A protocol was developed to provide continuous, hypothermic, nonpulsatile perfustion with an oxygenated balanced electrolyte solution for preservation of the isolated canine heart during 24 hours prior to orthotopic transplantation. Important features of the cardiectomy technique include the use of a calcium channel blocker, potassium arrest and rapid cooling of the myocardium. The donor heart is then perfused at a pressure of 18-22 cm. of water and at an average flow of 75

cc/mm/100/gm. of tissue. The septal temperature is maintained at 5-7°C and the perfusate pH at 7.25-7.35. Subcellular function after 24 hours of perfusion and transplantation, as assessed by sarcoplasmic reticulum and myofibrilar ATPase activity were not significantly different from control values.

Two groups of mongrel dogs were studied after orthotopic transplantation: Group I (N= 15) received hearts perfused by the above protocol for 24 hours and Group II (N = 9) received hearts removed by the same cardiectomy technique, but transplanted immediately. All grafts functioned well initially with support of the circulation after bypass. Eleven animals in Group I survived 4 days to 2 months and six animals in Group II survived 4 days to 3 weeks postoperatively. Measurements of heart rate, cardiac output, pulmonary capillary wedge pressure, left ventricular pressure and peak developed left ventricular pressure, before and after dobutamine infusion, were normal in all animals and there were no statistical differences between Group I and Group II animals.

Thus, a reliable and reproducible method for 24-hour *in vitro* perfusion of the canine heart has been obtained and should be applicable in clinical cardiac transplantation, when periods of preservation for longer than a few hours are required.

*By invitation

30. Prostacyclin Infusion During Cardiopulmonary Bypass - Clinical Experiences

KJELL RADEGRAN and*

CHRISTOS PAPACONSTANTINOU, Gothenburg, Sweden*

and Saloniki, Greece

Sponsored by: David P. Hall, Chattanooga, Tennessee

Prostacyclin is an integral part of the body's defense against platelet aggregation and intravascular coagulation. It has been shown in experimental studies on dogs to preserve platelet number and function during cardiopul-monary bypass (CPB). The present study reports our initial experiences with prostacyclin infusion during CPB in man.

The study comprises 74 adult patients operated for acquired heart disease during the period June 1979 - June 1980. CPB was by roller pump and bubble oxygenator primed with a crystalloid solution. Moderate hypothermia was used in all cases. Heparin was given in a dose of 3 mg/kg b.w. Anticoagulation was checked by activated clotting time measurements (ACT). Twenty-eight patients serving as controls did not receive prostacyclin. Ten patients were infused with prostacyclin 2-20 ng/kg/min throughout the CPB period, while twenty-two patients got 50 ng/kg/min for the first 30 min of CPB only and fourteen patients got 100 ng/kg/min from start of CPB until 5-20 min before termination of CPB.

Results: Infusion of prostacyclin 50-100 ng/kg/min resulted in a consistent protection of the platelet count. Even after 2 hours of bypass when in the control group the platelets had decreased to 70 ± 14% (x ± S.D.) of pre-CPB value, corrected for hemodilution, the platelet count was in the 50 and 100 ng groups resp. 93 ± 17 and 102 ± 20%. This difference remained also one hour after CPB when protamine had been administered. The high dosages of prostacyclin had pronounced effects also on arterial pressure and systemic vascular resistance (SVR) during CPB. During hypothermia the arterial pressure was in average around 20 mm Hg and the SVR was reduced to less than half of that in the control group. Prostacyclin, 50-100 ng/kg/min also prolonged the ACT to more than 1000 sec as compared with 544 ± 117 sec in the control group.

There were three deaths among the 28 control patients and 2 deaths among the 46 patients infused with prostacyclin. There was one instance of reversible hemiplegia in the control group and one among the prostacyclin patients, both in patients with aortic valve replacement.

No difference in intraoperative blood loss was observed between control and prostacyclin patients. In the postoperative period prostacyclin patients bled on an average about 25% less than control patients, i.e. 580 ± 250 versus 810 ± 450 ml.

*By invitation

31. Four Year Clinical Experience With the Gelatine-Resorcine-Formol Biological Glue in Acute Aortic Dissection

JEAN E. BACHET, CLAUDE LAURIAN*,*

OLIVIER BICAL, BERTRAND GOUDOT* and*

DANIEL GUILMET, Suresnes, France*

Sponsored by: Charles DuBost, Paris, France

From Jan. 1977 to Sept. 1980, the Gelatine-Resorcine-Formol (G.R.F.) biological glue was used for tissue reinforcement in 25 patients operated on for acute dissection involving the ascending aorta.

The results of these patients (GRF group) were compared to results of 25 patients operated on between 1970 and 1976 with "classical techniques" (CT group). There were no significant differences between the 2 groups regarding the age, the preoperative clinical and anatomical data.

The ascending aorta was replaced in all patients; the aortic valve was replaced twice (8%) in the GRF group and in 12 cases (48%) of the CT group the coronary arteries were by-passed or reimplanted in 20% patients of each group. Average intra-operative blood transfusion volume was 5800 ml in the CT group and 2100 in the GRF group (p 0.01). Four (16%) preoperative deaths were registered in the CT group and none in the GRF group.

Postoperative renal failure, cerebral ischemia, persisting peripheral ischemia and infection were more frequent in the CT group. They were responsible for 8 hospital deaths in this group and for two in the GRF group (p 0.01). Hospital mortality was therefore reduced from 48% (CT group to 8% (group GRF) (p 0.01) 2 late deaths were registered in the CT group and none in the GRF group, all survivors being in good clinical condition.

Sixteen patients of the GRF group underwent 19 control angiograms, 2 to 36 months following surgery, which documented 2 moderate aortic incompetence (8%), 3 persisting dissections of the descending aorta, but good and stable repair in the other patients.

In conclusion, the use of the GRF glue significantly reduce:

- the number of aortic valve replacements;

- the intra and postoperative bleeding;

- the frequency and severity of postoperative complications.

Therefore, long-term (4 years) survival rate has been raised from 40% to 92%.

*By invitation

32. In-Vitro Assessment of Anti-Neoplastic Therapy: A New Indication for Thoracotomy

LARRY R. KAISER, E. CARMACK HOLMES and DAVID KERN*, Los Angeles, California*

Selection and determination of the efficacy of antineoplastic agents has been dependent upon the trial and error method of observing measurable disease. Such methods not only subject the patient to loss of precious time, but to needless toxicity if the drug is ineffective. The clonogenic assay, a technique for evaluating the patient's response to neoplastic agents, has been developed which has the potential for individualizing therapy. In this assay, tumor cells exposed to various drugs are cloned into colonies. Of the 14 primary and 17 metastatic pulmonary tumors tested with this technique, a growth rate of 80-85% was achieved. Fifty percent of the primary tumors and 60% of the metastatic lesions responded in vitro to one or more of the test drugs. The correlation between in vitro and in vivo response was 60%. No drug that was inactive in vitro had activity in vivo. Prior knowledge of in vitro sensitivity may dictate a more aggressive surgical approach to pulmonary metastatic disease, whereas in vitro resistance would call for more conservative treatment. Just as with estrogen receptor status in breast cancer, data derived from the clonogenic assay may ultimately be of such import that thoracotomy would be warranted solely for the purpose of obtaining tissue for the assay.
*By invitation

33. An Endobronchial Blocker for One-Lung Anaesthesia

ROBERT JASON GINSBERG, Toronto, Ontario, Canada

One-lung anaesthesia is a valuable adjunct in the conduct of pulmonary and esophageal anaesthesia. The standard technique for one-lung anaesthesia employs a double-lumen endotracheal tube (Robertshaw, Carlens). These tubes have many disadvantages. A simpler method has been developed. All that is required is an 8-14 Fogarty occlusion catheter, a fiberoptic bronchoscope and a standard cuffed endotracheal tube.

After induction of the anaesthetic, the Fogarty catheter is passed through the larynx into the lower trachea and, then, the endotracheal tube is inserted. Using the fiberoptic bronchoscope, the tip of the Fogarty catheter is positioned in either main-stem bronchus under direct vision. The cuff of the endotracheal tube is then inflated, fixing the catheter in position. One-lung anaesthesia can then be accomplished simply by inflating the balloon of the Fogarty catheter.

This method has been used in over 150 thoracotomies. It has always been successful with no complications except in right posterolateral thoracotomies where occasional dislodgement of the catheter can occur. The advantages of this method over the double-lumen tube include:

- Simple (no need for anaesthetic experise for insertion of a double-lumen tube).
- Applicable in small patients.
- More reliable and faster.
- Does not interfere with bronchial closure at the carina.
- It can be repositioned under direct vision any time during the operation, (although rarely necessary in our experience).
- It allows for large-bore endotracheal and endobronchial suctioning.

Because of its simplicity, this method has also been used as an adjunct to anterior mediastinoscopy, pleuroscopy and talc poudrage. It allows for total visualization of the pleural space during these diagnostic and therapeutic procedures.

34. The Relationship of a Hiatal Hernia to the Function of the Body of the Esophagus and Gastroesophageal Reflux

TOM R. DeMEESTER, LAWRENCE F. JOHNSON,*

EDWIN LaFONTAINE and DAVID B. SKINNER,*

Chicago, Illinois and Washington, D.C.

Sixty-nine patients referred to our esophageal function laboratory without endoscopic esophagitis were divided into two groups based on the presence or absence of a hiatal hernia on both a radiographic study and endoscopic examination. Fifty-one patients had a hiatal hernia and 18 patients did not have a hiatal hernia. Both groups had esophageal manometry, 24-hour esophageal pH monitoring and esophageal mucosal biopsy to evaluate the effect of a hiatal hernia on esophageal function. There was no difference in the length of esophagus exposed to the positive pressure environment of the abdomen between the two groups. Patients with a hiatal hernia had a statistically lower distal esophageal sphincter pressure ($p<001$), and calculated closing force of the cardia (length x pressure x 1.33 assuming a standard breadth of esophagus) ($p<.01$). The body of the esophagus in the presence of a hiatal hernia was less effective in clearing refluxed acid back into the stomach ($p<.025$). This occurred only in the supine position and not while upright, when gravity assisted clearance. These functional impairments were reflected by abnormal epithelial change (Pope's criteria), indicating mucosal damage by refluxed acid, and prolonged acid mucosal contact time in patients with a hiatal hernia ($p<.025$).

To determine if the inability of the body of the esophagus to clear acid in the presence of a hernia was due to the lack of anchoring the esophagus at its distal end to the lumbar spine as occurs normally, the pre and postoperative studies of 13 hiatal hernia patients who had a posterior abdominal gastropexy without imbrication of the cardia were reviewed. A significant improvement in esophageal clearance and amount of mucosal acid exposure over pre-operative levels was noted, indicating that anchoring the distal esophagus improved the ability of the body of the esophagus to clear its luminal contents ($p<.05$).

Conclusions: (1) The presence of a hiatal hernia was associated with poor esophageal clearance in the supine position, a reduced distal esophageal sphincter pressure, and a normal length of abdominal esophagus. (2) Patients with a hiatal hernia had more acid reflux into the esophagus than those without a hernia. (3) Reduction of the hernia and anchoring the distal esophagus corrected the clearance abnormality and reduced esophageal acid exposure. (4) The presence of a hiatal hernia with its detrimental effect on clearance by the body of the esophagus contributes to the pathologic effects of gastro esophageal reflux from an incompetent cardia.

*By invitation

35. Use of the Silastic Tracheal "T" Tube for the Management of Complex Tracheal Injuries

JOEL DAVID COOPER, THOMAS R. J. TODD,*

RIIVO ILVES and FREDERICK GRIFFITH PEARSON,*

Toronto, Ontario, Canada

This paper reports on the use of the silastic Montgomery "T" tube as a useful adjunct in 18 patients with complex problems requiring tracheal resection and reconstruction.

In five cases, the "T" tube was used to maintain a patent airway at a time when the general condition of the patient, or of the tracheal lesion itself, would not permit resection and reconstruction. In these five patients, the tube was in place for an average of 13 months before resection and primary anastomosis were undertaken.

In three cases with complicated subglottic strictures, the mucosa at the proximal resection line was unhealthy and the upper limb of the "T" tube was used to stent the subglottic airway postoperatively. The average duration of stenting in these cases was 13 months, and all were successfully ex-tubated. In an additional five cases, the "T" tube was inserted postoperatively when it was determined that a primary anastomosis was failing. Two of these five were subsequently successfully extubated, two died of unrelated disease, and one is still under treatment.

In the remaining five patients the tracheal pathology was considered unsuitable for resection and reconstruction and the "T" tube was used to maintain an airway. Following an average of 12 months of such stenting, four of the five were extubated and required no further treatment.

It is concluded that the Montgomery "T" tube is a valuable adjunct in the management of selected complex tracheal problems. In subglottic lesions the upper limb of the tube may be positioned between the vocal cords, and yet these patients maintain a functional voice and aspiration has not been a problem. Furthermore, cord function was normal upon extubation. Since humidification is through the normal route, crusting and obstruction of the tube does not occur and the tubes can be left in place for long periods without the need for change.

INTERMISSION - VISIT EXHIBITS

*By invitation

MYOCARDIAL PRESERVATION SYMPOSIUM

Moderator: Quentin R. Stiles

Discussor: John W. Kirklin

36. Myocardial Damage Caused by Keeping pH 7.4 During Systemic Deep Hypothermia

HEINZ BECKER, JAKOB VINTEN-JOHANSEN*,*

GERALD D. BUCKBERG, JOHN M. ROBERTSON and*

JERRY D. LEAF, Los Angeles, California*

With rare exception, hypothermia is routine during cardiac operations and pH (measured at 37°C) is kept at 7.4. This clinical constraint does not occur in nature where poikilotherms vary blood pH in concordance with a temperature dependent neutrality point of water. This study tests

the hypothesis that keeping pH 7.4 during hypothermia produces a degree of myocardial damage and limitation of effectiveness of cardioplegic protection which is avoidable by appropriate pH management.

Methods: In 14 puppies, body temperature was lowered to 22°C with surface hypothermia, then to 17°C with extracorporeal circulation. During 60 minutes of circulatory arrest all hearts were protected with the same miltidose K + cardioplegic solution. In 7 dogs, pH was kept at 7.4 and in 7 others pH was varied as in poikilotherms (i.e. 7.9 at 17°C) principally by adjusting pCO_2 during cooling and rewarming.

Results: During surface cooling, keeping pH at 7.4 caused inadequate cardiac output (hypotension, systemic lactic acidosis, 11 ± 5%production). Conversely, pH adjustment allowed 25%* higher cardiac output with normal systemic lactate metabolism. Cerebral blood flow at 22°C, pH of 7.4, pCO_2 40 mmHg fell 75%* (from 26 ± 6 to 10 ± 3 cc/100/min); raising pH to 7.75 by lowering pCO_2 below 10 mmHg allowed twice as much cerebral flow (20 ± 6 cc/100gm/min*). Despite optimum myocardial protection with blood cardioplegia during circulatory arrest, postischemic myocardial performance was depressed 50% by keeping pH 7.4. In contrast, postischemic performance was normal when pH was varied appropriately during cooling and rewarming (stroke work index 0.62 vs 1.27 at 25 mmHg LAP)*.

Conclusion: Constraining pH to 7.4 during hypothermia causes a degree of myocardial damage and limitation of cardioplegic protection which is avoidable by adjusting pH the way poikilotherms do. These findings have major implication in the routine management of hypothermia during all cardiac operations.

*p .05

*By invitation

37. **Does Topical Hypothermia Prevent Sublethal Intraoperative Injury During Coronary Artery Bypass Surgery**

RODERICK W. LANDYMORE, DAVID TICE,*

NARESH TREHAN and FRANK C. SPENCER,*

New York, New York

Recent reports have suggested that myocardial protection is inadequate during coronary artery bypass surgery for severely diseased coronary arteries. Since methods of myocardial preservation vary considerably between cardiac centers, this study was designed to determine whether or not topical hypothermia is a necessary adjunct to systemic hypothermia and potassium cardioplegia during myocardial revascularization, in patients (pts) with diffuse coronary artery disease. Twenty-two pts ages 47-68 yrs were included in the study. Pts were placed on bypass and cooled to 28° centigrade (c). Temperature (temp) was measured over the right and left coronary distributions. The aorta was then cross-clamped and 1000cc of potassium blood cardioplegia 5.7-11°c (X 8.7) was infused into the aortic root at a pressure of 100-120 mm hg. Temp was measured and then 6 liters of cold plasmalyte 2.3-5.1°c (X 3.5) was poured over the heart into the pericardial well. Temp was again measured. In addition cold plasmalyte was continuously dripped over the heart during the cross-clamp.

Anatomical Region		Myocardial Temperature Effect of Systemic Hypothermia 28 °c	Degrees Centigrade Temp after 1000cc Blood Cardioplegia	Temp after cold Topical
RCA	Normal	30.4 ± 0.33*	14.3 ± 0.87	12.3 ± 0.65
	Stenotic	31.8 ± 0.39	20.7 ± 1.10	13.9 ± 0.37**
	Occluded	31.5 ± 0.22	23.3 ± 0.52	13.7 ± 0.53**
LAD	Stenotic	31.2 ± 0.21	19.1 ± 0.38	12.8 ± 0.44**
	Occluded	30.6 ±0.61	24.6 ± 1.25	13.3 ± 0.87**
OM	Normal	30.6 ± 0.26	14.5 ± 0.43	10.6 ± 0.31
	Stenotic	30.4 ± 0.45	17.7 ±1.17	11.6 ± 0.89**
	Occluded	31.2 ± 0.00	23.8 ± 0.00	13.8 ± 0.00

*SEM + -Standard Error of The Mean

**Students T-Test P<0.01

Systemic hypothermia and potassium (K +) cardioplegia uniformally failed to protect the myocardium in regions supplied by severely Stenotic or occluded arteries. The addition of cold topical reduced myocardial temperature to the safe operative range. This data demonstrates that combined systemic hypothermia and K+ cardioplegia alone do not provide adequate protection in pts with diffuse coronary disease. We conclude that the addition of topical hypothermia ensures adequate protection during coronary bypass surgery and recommend the routine use of intra-operative myocardial temp monitoring.

*By invitation

38. Myocardial Protection During Aortic Valve Replacement. Comparison of Different Methods by Intraoperative Coronary Sinus Blood Sampling and Postoperative Serial Serum Enzyme Determinations.

CHRISTIAN L. OLIN, VOLLMER BOMFIM*,*

LENNART KAIJSER, CHRISTER SYLYEN* and*

STELLAN STROM, Stockholm, Sweden*

Sponsored by: Viking J. Bjork, Stockholm, Sweden

Ninety-seven patients undergoing isolated aortic valve replacement were studied during operation by simultaneous blood sampling from the coronary sinus and brachial artery and after operation by serial determinations of myocardium specific serum enzymes. Myocardial protection was accomplished by selective coronary perfusion in 26 patients, hypothermic potassium cardioplegia in 38, single dose blood cardioplegia in 15 and continuous blood cardioplegia in 18 patients. The continuous blood cardioplegia method consisted of a slow pulsatile infusion of 15°C cold oxygenated blood from the heart-lung machine (with 20 mekv K+ and 16 mekv Mg + + per liter added) selectively into the left coronary artery during aortic cross-clamping. The intraoperative blood samples were analysed for PO_2, O_2-saturation, O_2-content, PcO_2, pH, lactate, pyruvate, glucose, potassium and myoglobin, the postoperative blood samples for creatine kinase (CK) its isoenzyme (CK-MB), and aspartate aminotransferase (ASAT, equivalent to S-GOT). Myocardial biopsies were taken from the left ventricle on commencement and termination of cardioplegia in

the blood cardioplegia groups and analysed for adenosine triphosphate (ATP), creatine (C) and creatinephosphate (CP).

In the coronary perfusion group, one patient (4%) died of left ventricular failure due to ischemic myocardial damage and three (12%) needed vasopressor support postoperatively. In the three cardioplegia groups (71 patients), there was no mortality and none of the patients needed vasopressor support.

The metabolic studies showed that selective coronary perfusion failed to protect the myocardium completely in spite of high coronary flow. Ten minutes after bypass there was still a production of lactate by the heart. The metabolic pattern was similar in the three cardioplegia groups and was characterized by an early washout of lactate and other metabolic products, decreased oxygen extraction, increased potassium and myoglobin release. The CK-MB activity peaked between 3 and 4 hours after reperfusion. If the three cardioplegia methods were compared, the continuous blood cardioplegia method was the best. The metabolic changes were significantly smaller and normalized more quickly during reperfusion. Blood samples from the coronary sinus during cardioplegia showed that the heart extracted oxygen in spite of its relaxed state. The myocardial biopsies also showed significantly less ATP and CP decrease in the continuous blood cardioplegia patients.

*By invitation

39. The First American Clinical Trial of Nifedipine in Cardioplegic Solution for Myocardial Preservation: A Preliminary Report

RICHARD E. CLARK, IGNACIO Y. CHRISTLIEB,*

THOMAS B. FERGUSON, CLARENCE S. WELDON,

JOHN P. MARBARGER, PHILLIP N. WEST*,*

BUR TON E. SOBEL, ROBER T ROBERTS*,*

DANIEL R. BIELLO and BARBARA K. CLARK*,*

St. Louis, Missouri

A continuing prospective, FDA approved, clinical trial of high risk cardiac patients was begun in May, 1980 after five years of extensive evaluation in dogs of the efficacy of the addition of nifedipine, a calcium antagonist, to cold hyperkalemic cardioplegic solutions. Protocol patients received preoperative and postoperative (0-72 hrs., 1 and 6 wks) determinations of ejection fraction and wall motion by radionuclide ventriculography (4/pt), MB-CK isoenzyme (33/pt), myocardial pyrophosphate scans (‰¥2/pt) for evidence of biochemical and morphologic changes and extensive and frequent intra and postoperative hemodynamic measurements to assess functional status and six 24 hr. ECG recordings. Thirty-six patients have received nifedipine in cardioplegic solution, 21 within the protocol and 15 outside the protocol for emergent reasons. 28 of the 36 had Class III or IV severe left ventricular dysfunction and required single, multiple and/or re-placement valvular surgery (10), CABG (9) or a combination of both (9). During the same calendar interval, 37 patients with equally poor ventricular dysfunction and similar distribution of operations (5 within the protocol) have had cardioplegic solution (CPS) *without* nifedipine. The results to date are:

	CPS ONLY		NIFEDIPINE	
		%		%
No. of High Risk Patients	37		36	
Low Output Deaths	5	(14)	0	(0)
IABP	11	(30)	4	(11)

These preliminary results are reported because of the reduction in mortality, threefold decrease in use of IABP, and concordant data of functional, biochemical and morphologic improvement in nifedipine treated patients which will be reported. It is concluded that high risk patients with severe ventricular dysfunction who have been treated with nifedipine in cold cardioplegic solution have superior clinical outcomes in comparison to those treated with cold cardioplegic solution alone.

*By invitation

40. Preservation of Myocardial Ultrastructure and High Energy Phosphates in Humans

SAMUEL C. BALDERMAN, JOGINDER N. BHAYANA*,*

PAUL BINETTE, ARTHUR CHAN* and*

ANDREW A. GAGE, Buffalo, New York*

Sponsored by: Richard H. Adler, Buffalo, New York

To establish whether multidose crystalloid potassium hypothermia car-dioplegia provides adequate preservation of myocardial ultrastructure and high energy phosphates, 25 patients with EF of ‰¥50%, undergoing cardiac surgery were studied. Eight patients had three biopsies taken for ATP and CP determination from the left ventricular apex. Biopsies were taken immediately prior to aortic cross clamping immediately after the release of the aortic cross clamp and 30 minutes after the release of the cross clamp. Seventeen patients had six biopsies taken from the left ventricular apex at the above stated time. Three for ATP and CP determination and three additional biopsies for electron microscopy. One patient sustained a small perioperative infarction and another patient died on the 5th postoperative day from an aortic dissection. The mitochondria on the electron microscopic specimens were graded on a scale from 0 - 4 (4 = severe changes).

		Pre clamp	Post clamp	30 minutes Post clamp
ATP	N = 25	4.19 ± 1.52	3.3[1] ± 1.12	3.33[2] ± 1.44
CP	N = 25	2.5 ± 1.7	.81[3] ± .96	1.66[4] ± 1.22
MITOCONDRIAL SCORE	N = 17	1.23 ± .53	1.36 ± .45	1.50 ± .59

[1]p‰¤.01 [2]p‰¤.025 [3]p‰¤.005 [4]p‰¤.05

There was no significant difference in the mitochondial scores. The preservation of high energy phosphates was less complete. ATP was reduced to 78% of control and CP was reduced in the immediate post clamp period to 32% of control.

The differences are particularly significant if one looks at patients whose aortic cross clamp time was ‰¥90 minutes (12 patients). In this group, ATP and CP preservation was 71% (3.33/4.60 m moles/kg, wet weight) and 53% (1.48/2.81) respectively 30 min. after clamp removal. (p‰¤.01)

Conclusion: Hypothermic potassium cardioplegia gives excellent preservation of the myocardial ultrastructure in humans. However, the preservation of high energy phosphates with this technique is imperfect.

*By invitation

WEDNESDAY AFTERNOON, MAY 13, 1981

WEDNESDAY AFTERNOON - MAY 13, 1981

2:00 P.M. Scientific Session
International Ballroom

41. Pulmonary Fungus Infections: Survey of 140 Cases With Surgical Aspects

JAMES D. HARDY and BARRY D. NEWSOM,*
Jackson, Mississippi

Fungus diseases of the lungs usually regress spontaneously or respond to drug therapy. However, in a significant number of patients some type of sugical intervention is required for either diagnosis or management. We have reviewed the 140 patients treated in the University Hospital. Exclusive of OB-GYN, the hospital populations of white vs. blacks, and of men vs. women, are approximately equal. There were 66 cases of blastomycosis (46 ™, and 20 ™€; 50 black abd 16 white), 30 cases of histoplasmosis proven by tissue or culture (18d ™,, 12™€; 20 white, 10 black), 17 cases of aspergillosis (8 fungus balls), 13 cases cryptococcosis, 8 cases nocardosis, 6 cases actinomycosis. Of course, the diagnosis of histoplasmosis had been assigned to a rather larger number of patients who exhibited the widespread pulmonary calcifications so often seen in our region secondary to this disease, but these cases were excluded from this study unless the diagnosis was supported by tissue or culture. Instances of coccidioidomycosis, mucormycosis, and sporotricosis were met in our adjacent V.A. Hospital but the substantial number of cases in that institution was not analyzed in detail. Epidemiology and pulmonary fungal infections in immunodepress-ed patients were of special interest.

Operative intervention was required for diagnosis, chronic unresponsive infiltrate, cavitation, decortication, hemorrhage or bronchopleural fistula, variously, in 18 blactomycosis and 20 histoplasmosis patients, among others. Operations required were pneumonectomy (2), lobectomy (7), seg-mental resection (7), with wedge resection, open biopsy, decortication and closure of bronchopleural fistula the rest. Drugs included Kl, Stilbamidine and Amphotericin B. Treatment problems and results with different fungi will be presented.

Conclusions: Blastomycosis constituted the major pulmonary fungal challenge in our area. When drug therapy was not curative for fungus disease, surgical treatment was generally satisfactory and usually without complications.

*By invitation

42. The Role of Bronchoplastic Procedures in the Surgical Management of Benign and Malignant Pulmonary Lesions

JAMES E. LOWE, ALBERT H. BRIDGMAN* and*
DAVID C. SABISTON, JR., Durham and Ashville,
North Carolina

Conventional resectional procedures such as segmentectomy, lobectomy or pneumonectomy represent the appropriate surgical treatment for the majority of pulmonary lesions requiring operation. However, a small but definite number of patients with carcinoma and perhaps the

majority of patients with benign endobronchial neoplasms in the proximal airways should be considered as candidates for conservative resectional procedures. The term conservative is used to indicate that normal lung is preserved by these operations. A variety of terms have been applied to these procedures relating to the amount of lung actually removed, but most commonly these operations are referred to as "sleeve resections." As this term indicates, a portion of bronchus is removed with or without lobectomy and a primary bronchial reanastomosis is performed in order to preserve the remaining distal airway and subsequent ventilatory function.

Bronchoplastic techniques are applicable to traumatic airway injuries, benign strictures such as tuberculous bronchostenosis, benign endobronchial lesions as well as tumors of low malignant potential such as bronchial adenomas and a select group of patients with carcinoma of the lung. From 1947 to 1980, 565 bronchoplastic procedures have been reported in the literature as follows:

Adenoma	**Stenosis**	**Trauma**	**Carcinoma**
51	6	4	504

Of the 504 patients treated by sleeve lobectomy for carcinoma, long term follow-up is available in 480 as follows:

Operative		Survival	
Mortality	1 Year	5 Year	10 Year
(32/480) 7%	(129/162) 79%	(53/159) 33%	(15/71)21%

Our series of bronchoplastic procedures consists of 28 patients undergoing operation with no mortality and with minimal morbidity. The pathological diagnoses were carcinoma 20, adenoma 6, hamartoma 1, and 1 post-traumatic. Four patients had prolonged atelectasis requiring repeated bronchoscopy and one had a bronchopleural fistula. The remainder of these patients have done well.

In summary, bronchoplastic procedures represent appropriate surgical therapy for benign endobronchial tumors and for correction of traumatic airway injuries. They are also applicable to a select group of patients with carcinoma and in such patients long term survival is comparable to the results achieved by pneumonectomy. When properly performed these procedures are safe and perhaps used too seldom.

*By invitation

43. Bullet Wounds of the Trachea

PANAGIOTIS N. SYMBAS, CHARLES R. HATCHER, JR. and SUE E. VLASIS, Atlanta, Georgia*

During the last ten years, 18 patients, 16 male and 2 female with ages ranging from 15 to 60 years were admitted to Grady Memorial Hospital with gunshot wound of the trachea. Thirteen of them had wounds of the cervical trachea and five had wounds of the intrathoracic trachea. In addition to the tracheal injuries, four patients had injuries to major vessels and six patients, three of whom had tracheoesophageal fistula, had esophageal injury. The diagnosis of tracheal injury was suspected because of the site of the wound and the clinical manifestations; hemoptysis, air escaping from the cutaneous wound, subcutaneous emphysema, etc. This was confirmed by tracheoscopy in 7 patients or at the time of surgery in 11 patients.

The treatment of the tracheal injury was dependent upon the magnitude of the tracheal wound and the presence of injury to adjacent organs. Seven patients underwent primary repair of the tracheal wound, two patients had primary repair with reinforcement of the suture line with pleural flaps, three patients had repair of the tracheal wound and tracheostomy, one patient underwent tracheocutaneous stoma construction, 2 patients had temporary orotracheal intubation for 24-48 hours, and 3 patients were observed. Seventeen patients recovered from the injuries and 1 patient died from respiratory insufficiency.

This study suggests that the management of bullet wounds of the trachea should be individualized according to the magnitude of the wound and the presence of other organ injury. Primary repair can be accomplished in the majority of civilian victims with gratifying results.

*By invitation

44. The Relationship of Whole Body Oxygen Consumption to Perfusion Flow Rate During Hypothermic Cardiopulmonary Bypass

LAWRENCE S. FOX, EUGENE H. BLACKSTONE*, JOHN W. KIRKLIN, ROBERT W. STEWART* and PAUL N. SAMUELSON*, Birmingham, Alabama*

Whole body oxygen consumption (VO_2) and its relationship to arterial perfusion flow rate (Q) were determined in 17 adult patients undergoing routine coronary artery bypass grafting. The patients were cooled (t = 21.3 ± 0.47 °C) by the perfusate after which Q's of 0.25, 0.5, 1.0, 1.5, or 2.0 1-min" -m" were selected by randomization. After Q of 10 minutes, blood samples were obtained, a new Q selected, and he process repeated. The median number of Q per patient was 4. The results were (mean one standard deviation):

Perfusion Flow Rate + ($1\text{-min}^{-1}\ m^{-2}$)	No. of Observations	Oxygen Consumption ($m1\text{-min}^{-2}\ m^{-2}$)	% of Asymptote	Venous 0_2 Saturation(%)+ +	
				Mixed	Jugular + + +(n)
0.25 ± 0.084	11	14 ± 5.4	39%	29 ± 7.9	25 ± 8.1(7)
0.54 ± 0.101	17	20 ± 5.4	55%	54 ± 10.8	41 ± 7.8(9)
1.02 ± 0.107	13	25 ± 5.7	71%	78 ± 10.7	58 ± 16.0(7)
1.56 + 0.129	15	28 ± 5.8	80%	94 ± 9.2	69 ± 10.0(8)
2.08 ± 0.180	27	33 ± 8.2	93%	99 ± 0.6	82 ± 16.9(19)

+ Obtained by volumetric pump calibration following each case.
+ + Measured at 37 °C and transformed to 20 °C for tabular presentation
+ + + Measured in 10 of the 17 patients (number in parenthesis is number of observations).

VO_2 increased markedly as perfusion flow rate was increased ($p< 0.001$), but the increase was progressively smaller at higher flow rates. The relation of Q and VO_2 at 20 °C is expressed by a hyperbolic equation, from which is obtained the asymptote maximal (VO_2 = 38 ml-min" -m"), and the % of this at various Q's. Mixed venous oxygen saturation was strongly correlated with perfusion flow rates below a Q of about 1.3 ($r = 0.9$, $p< 0.0001$), but were less strongly correlated ($r = 0.4$) at higher flow rates. Internal jugular venous oxygen saturation was lower than mixed venous oxygen levels, and remained strongly correlated with flow rate throughout the range of flows studied. Thus despite the effect on metabolism of hypothermia during cardiopulmonary bypass, the oxygen demands are not fully met at flows used clinically.

*By invitation

45. Longterm Survival with Partial Left Heart Bypass Following Peri-operative Myocardial Infarction and Shock

DANIEL M. ROSE, STEVEN B. COLVIN*, ALFRED T. CULLIFORD*, JOSEPH N. CUNNINGHAM, O. WAYNE ISOM and FRANC C. SPENCER, New York, New York*

In the last 24 months a partial left heart bypass (LHD), (modified from the technique originally described by Litwak), and an intra-aortic balloon pump (IABP), were used in 11 seriously ill patients who could not be weaned from cardiopulmonary bypass with inotropic agents and IABP alone. Venous cannulation was done with a 28-32 French venous cannula inserted into the left atrial appendage and arterial cannulation with a 5-6mm Roe cannula inserted into the ascending aorta and advanced beyond the left subclavian artery. The cannulae were connected with silastic tubing through a roller pump. Flow rates up to 3500ml/min. could be obtained. The activated clotting time was kept in the range of 120-150 seconds, requiring only small amounts of heparin.

Five of the 11 patients survived. One died from cardiac arrest four months later, while four are well, six, nine, 14, and 17 months after discharge.

Two of the six deaths were in patients with severe aortic stenosis and triple vessel coronary artery disease. Severe coronary disease was present in three of the six who died and four of the five who recovered. All deaths were characterized by progressive failure of myocardial function. All survivors, by contrast, had significant improvement in ventricular function following 12-24 hours of partial LHB, which was stopped after 20-52 hours. IABP was stopped 2-7 days after insertion.

During LHB thrombocytopenia (platelet counts of 30-60 x $10^3 mm^3$) required platelet transfusions, but none of the survivors had serious bleeding. There was no significant pulmonary

or renal injury. These data indicate that some patients with peri-operative cardiogenic shock can survive with the prompt use of the left bypass if IABP is ineffective. The fact that in surviving patients cardiac function improved markedly after 12-24 hours of LHB suggests that benefit resulted from preventing the progression of myocardial edema to extensive myocardial infarction.
*By invitation

46. Improved Results for Dissecting Aneurysms with Intraluminal Sutureless Prosthesis

GERALD M. LEMOLE, MICHAEL D. STRONG,*
*PASCHAL M. SPAGNA * and PETER KARMELOWEICZ*,*
Browns Mills, New Jersey and Philadelphia, Pennsylvania

Surgery for dissection of the thoracic aorta has had a high mortality rate. This has been due in part to hemorrhage from the prosthesis and the suture lines. A method of treatment has been developed utilizing an intraluminal prosthesis that requires no end-to-end anastomosis. We have used this method in 14 patients of whom 8 had acute thoracic aortic dissections and 6 had chronic dissections. We asembled our own prosthesis in the first 5 patients. More recently we have utilized an intraluminal prosthesis provided by USCI. Eight of the patients had Type I dissection of whom 5 required concommitant aortic valve replacement, and 3 coronary artery bypass grafting; 1 had a Type II dissection and 5 had a Type III dissection. The age range was 31 to 71 years with a mean of 58. There were 12 males and 2 females. There were no intraoperative mortalities, however, one patient died 10 days postoperatively of a perforated ulcer and 1 patient died at 6 months with empyema. Follow-up has been from 2 to 45 months with a mean of 14 months. There has been no evidence of compromise of the aortic lumen, and no prosthetic problems such as erosion, migration or thrombisis. This technique provides a safe and simple way to repair dissecting aneurysms of the thoracic aorta and has proven to have long term reliability. We have subsequently used this graft for 3 patients with aneurysm of the aorta without dissection with favorable results. We presently recommend this technique for dissecting, atherosclerotic and Marfanoid aneurysm of the thoracic aorta.

Adjourn

*By invitation

A1 Hemodynamic Comparison of Dopamine and Dobutamine in the Postoperative Volume Loaded, Pressure Loaded, and Normal Ventricle

VERDI J. DiSESA, EDWARD BROWN*,*
GILBERT H. MUDGE, JOHN J. COLLINS, JR. and*
LAWRENCE H. COHN, Boston, Massachusetts

Though improved myocardial protection techniques have reduced the use of postoperative pressor support, when catecholamines are indicated selection of an agent should be predicated on its hemodynamic as well as myocardial effects. We compared the hemodynamic effects of Dopamine and Dobutamine in 17 postoperative patients evaluating both drugs in a randomized crossover study using each patient as his own control; 6 had valve replacement for mitral or aortic insufficiency (volume-loaded ventricle), 5 had valve replacement for aortic stenosis (pressure-loaded ventricle), and 6 had coronary bypass (normal ventricle). Heart rate (HR), right atrial (RAP), left atrial (LAP), pulmonary artery (PAP) and systemic arterial (SAP) pressures were monitored. Thermodilution cardiac output, pulmonary vascular resistance (PVR), systemic vascular resistance (SVR), and cardiac index (Cl) were calculated. Data were collected 24 hours postoperatively before and during elective infusion of Dopamine and Dobutamine at 2.5 and 5.0 ug/kg/min. A 60-minute infusion of the first drug was followed by a 60-minute control period followed by a 60-minute infusion of the second drug. Control values before each drug, control period versus peak response at 5.0 ug/kg/min, and the absolute values and the mean percent changes from control were compared statistically.

	Dopamine			Dobutamine		
	Vol. Load	**Pressure Load**	**Normal**	**Vol. Load**	**Pressure Load**	**Normal**
HR	+ 31**	+ 21	+ 8*	+ 36**	+ 23	+ 20*
PVR	- 18	- 5	+ 14*	- 14	- 21	- 19*
SAP	+ 27**	- 3	+ 7	NC*	- 3	NC
SVR	- 11*	- 10	+ 6	- 26*	- 19	- 13**
CI	+ 33**	+ 17	+ 10	+ 32**	+ 24	+ 19**

*statistically significant dopamine versus dobutamine (p<,05)
**statistically significant versus control (p<.05)

In the volume-loaded ventricle Dopamine and Dobutamine equally augment heart rate and cardiac output but Dobutamine reduces left ventricular afterload significantly more than Dopamine. In the normal ventricle, Dobutamine is more chronotropic, causes a greater increase in cardiac output and a greater reduction in SVR and PVR. Neither agent produces significant hemodynamic changes in the pressure-loaded ventricle although likewise there is a trend toward greater reduction of left ventricular afterload with Dobutamine.

*By Invitation

A1 - Alternate Paper

American Association for Thoracic Surgery, 1980-1981

(Listed by Counties, States, Provinces and Cities)

Geographical - UNITED STATES

ALABAMA

BIRMINGHAM
Kahn, Donald R.
Karp, Robert B.
Kessler, Charles R.
Kirklin, John W.
Kouchoukos, Nicholas
Labrosse, Claude C.
Pacifico, Albert D.
MONTGOMERY
Simmons, Earl M.
OPELIKA
Le Beck, Martin

ALASKA

ANCHORAGE
Phillips, Francis J.

ARIZONA

PHOENIX
Brown, Lee B.
Cornell, William P.
McPhail, Jasper L.
Melick, Dermont W.
Nelson, Arthur R.
SUN CITY
Read, C. Thomas
TUCSON
Burbank, Benjamin
Sanderson, Richard G.

ARKANSAS

JASPER
Hudson, W. A.
LITTLE ROCK
Campbell, Gilbert S.

COVINA
Carter, Paul R.
DAVIS
Andrews, Neil C.
DUARTE
Benfield, John R.
ESCONDIDO
Mannix, Edgar P., Jr.
FLINTRIDGE
Hughes, Richard K.
FRESNO
Evans, Byron H.
HEMET
Hewlett, Thomas H.
HILLSBOROUGH
Ullyot, Daniel J.
INGLEWOOD
Carey, Joseph S.
IRVINE
Bartlett, Robert H.
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.
Pratt, Lawrence A.
LOMA LINDA
Wareham, Ellsworth E.
LONG BEACH
Bloomer, William E.

Read, Raymond C.
Williams, G. Doyne
PINE BLUFF
Tillou, Donald J.

CALIFORNIA

ANAHEIM
Main, F. Beachley
CARMEL
Daniels, Albert C.
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.
MARINA DELRAY
Davis, Lowell L.
MONTEBELLO
Lui, Alfred H. F.
OAKLAND
Dugan, David J.
Ecker, Roger R.
May, Ivan A.
ORANGE
Salyer, John M.
PAC. PALISADES
Weinberg, Joseph A.
PALM SPRINGS
Goldman, Alfred
PALM DESERT
Julian, Ormand *C.*
PALO ALTO
Cohn, Roy B.
Gonzalez-Laven, L.
Jamplis, Robert W.
Wilson, John L.
PASADENA
Cotton, Bert H.
Ingram, Ivan N.
Penido, John R. F.
Silver, Arthur W.
PIEDMONT
Samson, Paul C.
S. LACUNA
Oatway, William, Jr.
S. PASADENA
Brewer, Lyman A., III
SACRAMENTO
Hurley, Edward J.
Miller, George E., Jr.
Smeloff, Edward A.
Treasure, Robert L.
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.
Utley, Joe R.
Carlson, Herbert A.
Stemmer, Edward A.
LOS ANGELES
Baisch, Bruce F.
Buckberg, Gerald D.
Fonkalsrud, Eric W.
Holmes, E. Carmack
Kay, Jerome Harold
SAN FRANCISCO
Culiner, Morris M.
Ebert, Paul A.
Ellis, Robert J.
Fishman, Noel H.
Gardner, Richard E.
Gerbode, Frank
Grimes, Orville F.
Hill, J. Donald
Kerth, William J.
Leeds, Sanford E.
Richards, Victor
Roe, Benson B.
Rogers, W. L.
Thomas, Arthur N.
SAN JOSE
Angell, William W.
SANTA ANA
Gazzaniga, Alan B.
SANTA BARBARA
Higginson, John F.
Jahnke, Edward J., Jr.
Lewis, F. John
Love, Jack W.
SANTA MONICA
Ramsay, Beatty H.
STANFORD
Mark, James B. D.
Shumway, Norman E.
THOUSAND OAKS
Tsuji, Harold K.
TORRANCE
Nelson, Ronald J.
State, David
VENTURA
Dart, Charles H., Jr.
WALNUT CREEK
Stephens, H. Brodie

COLORADO

DENVER
Brown, Robert K.
Blair, Emil
Burrington, John D.
Condon, William B.
Eiseman, Ben
Grow, John B.
Hopeman, Alan R.
Kovarik, Joseph L.
Newman, Melvin M.
Pappas, George
Paton, Bruce C.
Pomerantz, Marvin
Rainer, W. Gerald
Waddell, William R.
Wright, George W.

LAKEWOOD
Swan, Henry, II
WHEAT RIDGE
Harper, Frederick R.

CONNECTICUT

HARTFORD
Kemler, R. Leonard
NEW HAVEN
Baue, Arthur E.
Carter, Max G.
Geha, Alexander S.
Glenn, William W. L.
Hammond, Graeme L.
Laks, Hillil
Lindskog, Gustaf E.
Stansel, Horace, Jr.
Stern, Harold
NORTHFORD
Amberson, J. B.
NORWICH
Kelley, Winfield O.
SHARON
Wylie, Robert H.
WILTON
Pool, John L.

DELAWARE

WILMINGTON
Pecora, David V.

DISTRICT OF COLUMBIA

WASHINGTON
Aaron, Benjamin L.
Hufnagel, Charles A.
lovine, Vincent M.
Keshishian, John M.
Mills, Mitchell
Peabody, Joseph, Jr.
Randolph, Judson G.
Simmons, Robert L.
Smyth, Nicholas P. D.
Wallace, Robert B.

FLORIDA

BELLEAIRE
Lasley, Charles H.
BOCA RATON
Seley, Gabriel P.
CORAL GABLES
Cooke, Francis N.
DELRAY BEACH
Geary, Paul
FT. LAUDERDALE
Maurer, Elmer P. R.
GAINESVILLE
Bartley, Thomas D.
JACKSONVILLE
Stephenson, Sam, Jr.
LAKELAND
Brown, Ivan W., Jr.
MIAMI
Bolooki, Hooshang
Daughtry, Dewitt C.
Gentsch, Thomas O.
Jude, James R.
Kaiser, Gerard A.
MacGregor, David C.
Papper, Emanual M.
Reis, Robert L.
Ripstein, Charles B.
Stanford, William
Thurer, Richard J.
MIAMI BEACH
Greenberg, Jack J.
Grondin, Pierre
Spear, Harold C.
NAPLES
Linberg, Eugene J.
ORLANDO
Sherman, Paul H.
PONTE VERDRA BEACH
Gilbert, Joseph, Jr.
Stranahan, Allan
SOUTH MIAMI
Chesney, John G.
ST. PETERSBURG
Clerf, Louis H.
Daicoff, George R.
Wheat, Myron W., Jr.
DeMatteis, Albert
TALLAHASSEE
Kraeft, Nelson H.
TAMPA
Blank, Richard H.
Connar, Richard G.
Seiler, Hawley H.
WEST NAPLES
Battersby, Arthur E.
WINTER PARK
Bloodwell, Robert D.

GEORGIA

ATLANTA
Hatcher, Charles, Jr.
Hopkins, William A.
Jones, Ellis L.
King, Richard
Logan, William D., Jr.
Mansour, Kamal A.
Rivkin, Laurence M.
Symbas, Panagiottis
Ellison, Robert G.
Rubin, Joseph W.
SAVANNAH
Yeh, Thomas J.

HAWAII

HONOLULU
Ching, Nathaniel P.
Gebauer, Paul
OAK BROOK
Nigro, Salvatore L.
PALO HEIGHTS
DeMeester, Tom R.
PEORIA
Collins, Harold A.
DeBord, Robert A.

McNamara, Joseph J.
KAILUA KONA HI
Fell, Egbert H.

IDAHO

BOISE
Ashbaugh, David G.
Herr, Rodney H.

ILLINOIS

CHICAGO
Anagnostopoulos, C.
Barker, Walter L.
Hanlon, C. Rollins
Head, Louis R.
Hudson, Theodore R.
Hunter, James A.
Idriss, Farouk S.
Javid, Hushang
Jensik, Robert J.
Kittle, C. Frederick
Langston, Hiram T.
Leininger, Bernard J.
Levitsky, Sidney
Michaelis, Lawrence
Midell, Allen I.
Moran, John M.
Najafi, Hassan
Raffensperger, John
Replogle, Robert L.
Shields, Thomas W.
Skinner, David B.
Thomas, Paul A., Jr.
Weinberg, Milton, Jr.
EVANSTON
Dorsey, John M.
Fry, Willard A.
Tatooles, Constantine
GLENCOE
Rubenstein, L. H.
GLENVIEW
Fox, Robert T.
LA GRANGE
Faber, L. Penfield
LINCOLNWOOD
Lees, William M.
MAYWOOD
Keeley, John L.
Pifarre, Roque
SKOKIE
Baffes, Thomas G.
WINNETKA
Mackler, S. Allen

INDIANA

INDIANAPOLIS
King, Harold
King, Robert D.
Shumacker, Harris, Jr.
Siderys, Harry
SOUTH BEND
Van Fleit, William E.

IOWA

CEDAR RAPIDS
Lawrence, Montague S.
DES MOINES
Dorner, Ralph A.
Watkins, David H.
IOWA CITY
Doty, Donald B.
Ehrenhaft, Johan L.
Rossi, Nicholas P.
Wright, Creighton B.

KANSAS

CUNNINGHAM
Allbritten, F. F., Jr.
KANSAS CITY
Barnhorst, Donald A.
Friesen, Stanley R.
WICHITA
Tocker, Alfred M.
WINFIELD
Snyder, Howard E.

KENTUCKY

LEXINGTON
Crutcher, Richard R.
Dillon, Marcus L., Jr.
LOUISVILLE
Bryant, J. Ray
Harter, John S.
Mahaffey, Daniel E.
Ransdell, Herbert, Jr.

LOUISIANA

ALEXANDRIA
Knoepp, Louis F.
BATON ROUGE
Beskin, Charles A.
METAIRIE
Ochsner, Alton, Jr.
NEW ORLEANS
Blalock, John B.
DeCamp, Paul T.
Glass, Bertram A.
Hewitt, Robert L.
Lindsey, Edward S.
Mills, Noel L.
Moulder, Peter V.
Ochsner, Alton
Ochsner, John L.
Pearce, Charles W.

MASSACHUSETTS

BELLINGHAM
Varco, Richard L.
BOSTON
Austen, W. Gerald
Barsamian, Ernest M.
Berger, Robert L.
Bernhard, William F.
Bougas, James A.
Braunwald, Nina S.
Buckley, Mortimer J.
Burke, John F.
Castaneda, Aldo R.
Cleveland, Richard J.
Clowes, George, Jr.
Cohn, Lawrence H.
Collins, John J.
Daggett, Williard M.

Rosenberg, Dennis M.
Schramel, Robert J.
Strug, Lawrence H.
Webb, Watts R.

MAINE

KENNEBUNK
Hurwitz, Alfred
PORTLAND
Drake, Emerson H.
Hiebert, Clement
ROCKPORT
Swenson, Orvar

MARYLAND

BALTIMORE
Attar, Safuh M.A.
Baker, R. Robinson
Brantigan, Otto C.
Brawley, Robert K.
Cowley, R. Adam
Donahoo, James
Gott, Vincent L.
Haller, J. Alex, Jr.
Hankins, John R.
Mason, G. Robert
McLaughlin, Joseph S.
Michelson, Elliott
Rienhoff, William, Jr.
Turney, Stephen Z.
BETHESDA
Morrow, Andrew G.
POTOMAC
Zajtchuk, Rostik
WORTON
Walkup, Harry E.

NEWTON LOWER FALLS
Laforet, Eugene G.
Strieder, John W.
S. WEYMOUTH
Malcolm, John A.
SPRINGFIELD
Engleman, Richard M.
STOUGHTON
Black, Harrison

MICHIGAN

ANN ARBOR
Behrendt, Douglas M.
Gago, Otto
Kirsh, Marvin M.
Morris, Joe D.
Orringer, Mark B. Sloan, Herbert
DETROIT
Arbulu, Augustin
Arciniegas, Eduardo
Day, J. Claude
Dodrill, Forest D.
Lam, Conrad R.
Magilligan, D. J., Jr. Wilson, Robert F.
GRAND RAPIDS
Harrison, Robert W.
Meade, Richard H.
Rasmussen, Richard A.
GROSSE POINTE
Benson, Clifford D.
Gerbasi, Francis S.

Deterling, Ralph, Jr.
Frank, Howard A.
Gaensler, Edward A.
Grillo, Hermes C.
Moncure, Ashby C.
Neptune, Wilford B.
Overholt, Richard H.
Rheinlander, Harold
Russell, Paul S.
Scannell, J. Gordon
Schuster, Samuel R.
Starkey, George W.
Weintraub, Ronald
Wilkins, Earle W., Jr.
BROOKLINE
Madoff, Irving M.
BURLINGTON
Boyd, David P.
Ellis, F. Henry, Jr.
Watkins, Elton, Jr.
CAMBRIDGE
Harken, Dwight E.
CONCORD
Soutter, Lamar
LYNNFIELD
Wesolow, Adam
MEDFORD
Boyd, Thomas F.
Des forges, Gerard
Taylor, Warren J.
METHUEN
Wilson, Norman J.
N. ANDOVER
Cook, William A.
NANTUCKET
Mahoney, Earle B.

ROCHESTER
Bernatz, Philip E.
Clagett, O. Theron
Danielson, G. K., Jr.
Kaye, Michael P.
McGoon, Dwight C.
Moersch, Herman
Olsen, Arthur M.
Payne, W. Spencer
Pluth, James R.
ST. PAUL
Nicoloff, Demetre M.
Leven, N. Logan
Lillehei, C. Walton
Miller, Fletcher A.
Perry, John F., Jr.

MISSISSIPPI

JACKSON
Hardy, James D.
Johnston, J. H., Jr.
Neely, William A.
Netterville, Rush E.

MISSOURI

COLUMBIA
Silver, Donald
KANSAS CITY
Adelman, Arthur
Ashcraft, Keith W.
Benoit, Hector W., Jr.

Taber, Rodman E.
KALAMAZOO
Neerken, A. John
ROYAL OAK
Timmis, Hilary H.

MINNESOTA

CROOKSTON
Deniord, Richard N.
DULUTH
Fuller, Josiah
MINNEAPOLIS
Anderson, Robert W.
Arom, Kit V.
Garamella, Joseph J.
Humphrey, Edward W.
Johnson, Frank E.
Kiser, Joseph C.
Lillehei, Richard C.
Wangensteen, Owen H.

NEBRASKA

OMAHA
Fleming, William H.
Malette, William G.
Sellers, Robert D.

NEW HAMPSHIRE

HANOVER
Tyson, M. Dawson
JAFFREY CENTER
Woods, Francis M.

NEW JERSEY

BELLVILLE
Gerard, Franklyn P.
BROWNS MILL
Fernandez, Javier
CAMDEN
Camishion, Rudolph C.
EAST ORANGE
Auerbach, Oscar
MILLBURN
Parsonnet, Victor
MORRISTOWN
Morse, Dryden P.
N. CALDWELL
Wychulis, Adam R.
NEW BRUNSWICK
Kunderman, Philip J.
NEWARK
Amato, Joseph J.
Neville, William E.
PENNSAUKEN
Pierucci, Louis, Jr.
PISCATAWAY
MacKenzie, James W.
SHORT HILLS
Demos, Nicholas J.
Timmes, Joseph L.
SOUTH ORANGE
Abel, Ronald M.
TENAFLY
Gerst, Paul H.

NEW MEXICO

ALBUQUERQUE
Holder, Thomas M.
Killen, Duncan A.
Mayer, John H., Jr.
Padula, Richard T.
Reed, William A.
MT. VERNON
Campbell, Daniel, Jr.
ST. LOUIS
Earner, Hendrick B.
Bergmann, Martin
Clark, Richard E.
Codd, John E.
Connors, John P.
Ferguson, Thomas B.
Kaiser, George C.
Lewis, J. Eugene, Jr.
Lucido, Joseph L.
Roper, Charles L.
Tyras, Denis H.
Weldon, Clarence S.
Willman, V. L.

NEW YORK

ALBANY
Alley, Ralph D.
Kausel, Harvey W.
McKneally, Martin F.
BAY SHORE
Ryan, Bernard J.
BRONX
Bloomberg, Allan E.
Hirose, Teruo
Robinson, George
BRONXVILLE
Prater, Robert W. M.
BROOKLYN
Griepp, Randall B.
Levowitz, Bernard S.
Sawyer, Philip N.
BUFFALO
Adler, Richard H.
Andersen, Murray N.
Lajos, Thomas Z.
MacManus, Joseph E.
Subramanian, S.
COOPERSTOWN
Blumenstock, David A.
FAYETTEV1LLE
Bugden, Walter F.
FLORAL PARK
Crastnapol, Philip
IRVINGTON
Altai, Lari A.
MINEOLA
Mangiardi, Joseph L.
NEW HYDE PARK
Wisoff, B. George
NEW PALTZ
Johnson, Elgie K.
NEW YORK
Bailey, Charles P.
Beattie, Edward, Jr.
Bowman, Frederick, Jr.
Boyd, Arthur D.
Bregman, David
Cahan, William G.
Clauss, Roy H.
Conklin, Edward F.

Edwards, W. Sterling
LAS VEGAS
Thai, Alan P.
ROCIADA
Wilson, Hugh, E., III
SANTA FE
Wilson, Julius L.

Findlay, Charles, Jr.
Ford, Joseph M.
Friedlander, Ralph
Gay, William A., Jr.
Giannelli, Stanley, Jr.
Glenn, Frank
Green, George E.
Holman, Cranston W.
Holswade, George R.
Humphreys, G. H., II
Hutchinson, John, III
Isom, O. Wayne
Jaretzki, Alfred, III
King, Thomas C.
Kirschner, Paul A.
Lambert, Adrian
Litwak, Robert S.
Maier, Herbert C.
Malm, James R.
Martini, Nael
Nealon, Thomas F., Jr.
Okinaka, Arthur J.
Redo, S. Frank
Reemtsma, Keith
Rubin, Morris
Spencer, Frank C.
Steichen, Felicien M.
Subramanian, V. A.
Tice, David
Veith, Frank J.
Wichern, Walter, Jr.
Wolff, William I.
CLEAN
Douglas, Richmond
PATCHOGUE
Finnerty, James
PLATTSBURG
Potter, Robert T.
ROCHESTER
DeWeese, James A.
Schwartz, Seymour I.
Stewart, Scott
Zaroff, Lawrence I.
ROSLYN
Thomson, Norman, Jr.
SARANAC LAKE
Decker, Alfred M., Jr.
Merkel, Carl G.
SCOTTSVILLE
Emerson, George L.
SETAUKET
Dennis, Clarence
SOUTHAMPTON
Heroy, William W.

CLEVELAND
Ankeney, Jay L.
Cosgrove, Delos M.
Cournand, Andre
Cracovaner, Arthur J.
Cunningham, J., Jr.
Davidson, Louis R.
Edie, Richard N.

STATEN ISLAND
Garzon, Antonio A.
STONY BROOK
Soroff, Harry S.
SYRACUSE
Effler, Donald B.
VALHALLA
Reed, George E.
W. HAMPTON BEACH
Sarot, Irving A.

NORTH CAROLINA

ASHEVILLE
Belts, Reeve H.
Scott, Stewart M.
Sethi, Gulshan K.
Takaro, Timothy
CHAPEL HILL
Murray, Gordon F.
Starek, Peter J. K.
Wilcox, Benson R.
CHARLOTTE
Robicsek, Francis
Taylor, Frederick H.
DURHAM
Hart, Deryl
Jones, Robert H.
Oldham, H. N., Jr.
Sabiston, David C.
Sealy, Will C.
Smith, David T.
Wolfe, Walter G.
Young, W. Glenn, Jr.
GREENSBORO
Deaton, W. Ralph, Jr.
HILLSBOROUGH
Wechsler, Andrew S.
PINEHURST
Fischer, Walter W.
WINSTON-SALEM
Cordell, A. Robert
Hudspeth, Allen S.
Johnston, Frank R.
Meredith, Jesse H.

OHIO

AKRON
Falor, William H.
CHARDON
Mautz, F. R.
CINCINNATI
Carter, B. Noland
Gonzalez, Luis L.
Helmsworth, James A.
Rosenkrantz, Jens G.

HAVERTOWN
Chadoff, Richard J.
HERSHEY

Cross, Frederick S.
Groves, Laurence K.
Kay, Earle B.
Loop, Floyd
COLUMBUS
Clatworthy, W. H., Jr.
Kilman, James W.
McEnany, M. Terry
Meckstroth, Charles
Vasko, John S.
Williams, Thomas, Jr.
DAYTON
Dewall, Richard A.
PEPPER PIKE
Mendelsohn, Harvey J.
TOLEDO
Blakemore, William S.
Selman, Morris W.

OKLAHOMA

OKLAHOMA CITY
Elkins, Ronald C.
Felton, Warren L., II
Fisher, R. Darryl
Greer, Allen E.
Munnell, Edward R.
Wilder, Robert J.
Williams, G. Rainey
Zudhi, M. Nazih
TULSA
Guernsey, James M.

OREGON

DAYS CREEK
Miller, Arthur C.
PORTLAND
Lawrence, G. Hugh
Okies, Joseph E.
Poppe, J. Karl
Starr, Albert

PENNSYLVANIA

BETHLEHEM
Snyder, John M.
BUCK HILL FALLS
Thompson, Samuel A.
FAIRFIELD
McClenathan, James E.
GLADWYNE
Johnson, Julian
HAMBURG
Judd, Archibald R.
LANDRUM
Stayman, Joseph W.
STATE PARK
Ryan, Thomas

TENNESSEE

CHATTANOOGA
Adams, Jesse E., Jr.
Hall, David P.
JACKSON
Chandler, John H.
JOHNSON CITY
Bryant, Lester R.
Lefemine, Armand A.
KNOXVILLE
Demuth, William, Jr.
Pierce, William S.
Waldhausen, John A.
LANCASTER
Witmer, Robert H.
LUNBERVILLE
O'Neill, Thomas J. E.
PHILADELPHIA
Brockman, Stanley K.
Center, Sol
Edmunds, L. Henry, Jr.
Fineberg, Charles
Haupt, George J.
Lemmon, William M.
Lemole, Gerald M.
MacVaugh, Horace, III
Mendelssohn, Edwin
Mundth, Eldred D.
Rosemond, George P.
Templeton, John, III
Wallace, Herbert W.
Nemir, Paul, Jr.
PITTSBURGH
Bahnson, Henry T.
Ford, William B.
Magovern, George J.
Pontius, Robert G.
Rams, James J.
Ravitch, Mark M.
RYDAL
Frobese, Alfred S.
SAYRE
Sewell, William H.
WYNNEWOOD
Harken, Alden H.
YARDLEN
Sommer, George N., Jr.

RHODE ISLAND

PROVIDENCE
Karlson, Karl E.
Simeone, Fiorindo A.

SOUTH CAROLINA

CHARLESTON
Bradham, Randolph R.
Hairston, Peter
Parker, Edward F.
Sade, Robert M.
COLUMBIA
Almond, Carl H.
Mitchel, Ben F., Jr.
Paulson, Donald L.
Platt, Melvin R.
Razzuk, Maruf A.
Shaw, Robert R.
Sugg, Winfred L.
Urschel, Harold, Jr.
DILLEY
Hood, Richard H., Jr.
GALVESTON
Derrick, John R.
HOUSTON
Beall, Arthur C., Jr.
Burdette, Walter J.
Cooley, Denton A.

Blake, Hu Al
Domm, Sheldon E.
MEMPHIS
Cole, Francis H.
Eastridge, Charles E.
Garrett, H. Edward
Howard, Hector S., Jr.
Hughes, Felix A., Jr.
McBurney, Robert P.
Pate, James W.
Robbins, S. Gwin
Rosensweig, Jacob
Skinner, Edward F.
NASHVILLE
Alford, William, Jr.
Bender, Harvey W., Jr.
Dale, W. Andrew
Diveley, Walter L.
Foster, John H.
Gobbel, Walter G., Jr.
Johnson, Hollis E.
Sawyers, John L.
Scott, Henry W., Jr.
Stoney, William S.
Thomas, Clarence, Jr.
SEWANEE
Thrower, Wendell

TEXAS

AUSTIN
Hood, R. Maurice
Ross, Raleigh R.
BEAUMONT
Harrison, Albert
DALLAS
Adam, Maurice
Davis, Milton V.
Holland, Robert H.
Kee, John L., Jr.
Lambert, Cary J.
Crawford, E. Stanley
De Bakey, Michael E.
Hallman, Grady L., Jr.
Henly, Walter S.
Lawrie, Gerald M.
Mattox, Kenneth L.
Morris, George C., Jr.
Mountain, Clifton F.
Norman, John C.
Overstreet, John W.
Reul, George J., Jr.
Seybold, William D.
Wukasch, Don C.
LAPORTE
Barkley, Howard T.
LUBBOCK
Bricker, Donald L.
Dalton, Martin L., Jr.
SAN ANTONIO
Dooley, Byron N.
French, Sanford, III
Grover, Frederick L.
Heaney, John P.
Nixon, James W.
Proctor, Oscar S.
Trinkle, J. Kent
TEMPLE
Brindley, G. V., Jr.

UTAH

SALT LAKE CITY
Cutler, Preston R.
Johnson, Clive R.
Liddle, Harold V.
Mortensen, J. D.
Nelson, Russell M.
Wolcott, Mark W.

VERMONT

BRATTLEBORO
Gross, Robert E.
BURLINGTON
Coffin, Lawrence H.
Miller, Donald B.
CHESTER DEPOT
Adams, Herbert D.
WHITE RIVER JUNCTION
Crandell, Walter B.

VIRGINIA

ARLINGTON
Conrad, Peter W.
CHARLOTTESVILLE
Crosby, Ivan K.
Dammann, John F.
Minor, George R.
Muller, William, Jr.
Nolan, Stanton P.
Wellons, Harry A., Jr.
LYNCHBURG
Moore, Richmond L.
RICHMOND
Bosher, Lewis H.
Brooks, James W.
Cole, Dean B.

WEST VIRGINIA

E. CHARLESTON
Walker, James H.
HUNTINGTON
Littlefield, James B.
MORGANTOWN
Tarney, Thomas J.
Warden, Herbert E.

WISCONSIN

LA CROSSE
Gundersen, Erik A.
MADISON
Chopra, Paramjeet S.
Young, William P.
MARSHFIELD
Myers, William O.
Ray, Jefferson F., III
Sautter, Richard D.
MILWAUKEE
Bonchek, Lawrence I.
Flemma, Robert J.
Hausmann, Paul F.
Johnson, W. Dudley
Lepley, Derward, Jr.
Litwin, S. Bertrand
Mullen, Donald C.

Greenfield, Lazar J.
Gwathmey, Owen
Johns, Thomas N. P.
Lower, Richard R.
SOUTH ARLINGTON
Klepser, Roy G.

WASHINGTON

SEATTLE
Anderson, Richard P.
Cantrell, James R.
Dillard, David H.
Hill, Lucius D., III
Jarvis, Fred J.
Jones, Thomas W.
Manhas, Dev R.
Mansfield, Peter B.
Merendino, K. Alvin
Miller, Donald W.
Mills, Waldo O.
Pinkham, Roland D.
Sauvage, Lester
Thomas, George I.
SPOKANE
Berg, Ralph, Jr.
VICTORIA
Stenstrom, John D.
W. VANCOUVER
Robertson, Ross

MANITOBA

WINNIPEG
Barwinsky, Jaroslaw
Cohen, Morley

NEWFOUNDLAND

ST. ANTHONY
Thomas, Gordon W.
ST. JOHNS
Brownrigg, Garrett M.
Couves, Cecil M.

NOVA SCOTIA

HALIFAX
Murphy, David A.
KENTVILLE
Quinlan, John J.

ONTARIO

DORSET
Mustard, William T.
HAMILTON
Sullivan, Herbert J.
LONDON
Heimbecker, Raymond
NORTH OTTAWA
Key, James A.
OTTAWA
Keon, Wilbert J.
SUDBURY
Field, Paul
Walker, George R.
TORONTO
Baird, Ronald J.
Bigelow, Wilfred G.
Narodick, Benjamin
Tector, Alfred J.
Weisel, Wilson
WAUSAU
Davila, Julio C.
WEST BEND
Gardner, Robert J.

WYOMING

TETON VILLAGE
Kaunitz, Victor H.

CANADA

ALBERTA

CALGARY
Miller, George E.
EDMONTON
Callaghan, John C.
Meltzer, Herbert
Sterns, Laurence P.

BRITISH COLUMBIA

VANCOUVER
Allen, Peter
Ashmore, Philip G.
Harrison, Elliott
Tyers, G. Frank O.

QUEBEC

MONTREAL
Blundell, Peter E.
Bruneau, Jacques
Chiu, Chu-Jeng (Ray)
Dobell, Anthony R.
Grondin, Claude M.
MacLean, Lloyd D.
Mclmosh, Clarence A.
Morin, Jean E.
Mulder, David S.
Scott, Henry J.
OUTREMONT
Lepage, Gilles
QUEBEC CITY
Gravel, Joffre-Andre
WESTMOUNT
Vineberg, Arthur M.

Cooper, Joel D.
Ginsberg, Robert J.
Goldman, Bernard S.
Henderson, Robert D.
Joynt, George H. C.
Lockwood, A. L.
Pearson, F. Griffith
Scully, Hugh E.
Trimble, Alan S.
Trusler, George A.

WESTBROOK
Lynn, R. Beverly

WOODBRIDGE
Laird, Robert

OTHER COUNTRIES

ARGENTINA

BUENOS AIRES
Favaloro, Rene G.

AUSTRALIA

MELBOURNE
Sutherland, H. D'Arcy

BANGLADESH

DACCA DIST.
McCord, Colin W.

BRAZIL

SAO PAULO
Zerbini, E. J.

ENGLAND

BRISTOL
Belsey, Ronald

BUCKINGHAMSHIRE
Sellors, Thomas

CAMBRIDGE
Moore, Thomas C.

ESSEX
Kennedy, John H.

HEREFORD
Thompson, Vernon

LONDON
Brock, Lord
Ross, Donald

FRANCE

BORDEAUX
Fontan, Francis

PARIS
Dubost, Charles

GUATEMALA

GUATEMALA CITY
Herrera, Rodolfo

INDIA

RAIPUTANA
Van Allen, Chester M.

IRELAND

DUBLIN
O'Malley, Eoin

JAPAN

YAMAGUCHI
Mohri, Hitoshi

NETHERLANDS

LEIDEN
Brom, Gerald A.

NEW ZEALAND

AUCKLAND
Barratt-Boyes, Sir Brian

PORTUGAL

LISBON
Macedo, M. E. Machado

SCOTLAND

EDINBURGH
Logan, Andrew

SPAIN

SANTANDER
Duran, Carlos Gomez

SWEDEN

STOCKHOLM
Bjork, Viking O.

SWITZERLAND

ZURICH
Senning, Ake

GENOLIER
Hahn, Charles J.

WEST GERMANY

AACHEN
Messmer, Bruno J.

VENEZUELA

CARACAS
Tricerri, Fernando E.

BY-LAWS OF

THE AMERICAN ASSOCIATION FOR THORACIC SURGERY

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 Evarts 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.

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 Countil 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.

THE AMERICAN ASSOCIATION FOR THORACIC SURGERY
Charter Members
June 7, 1917

E. Wyllis Andrews
John Auer
Edward R. Baldwin
Walter M. Boothby
William Branower
Harlow Brooks
Lawrason Brown
Kenneth Bulkley
Alexis Carrel
Norman B. Carson
J. Frank Corbett
Armistead C. Crump
Charles N. Dowd
Kennon Dunham
Edmond Melchior Eberts
Max Einhorn
Herman Fischer
Albert H. Garvin
Nathan W. Green
John R. Hartwell
George J. Heuer
Chevalier Jackson
H. H. Janeway
James H. Kenyon
Adrian V. S. Lambert
Arthur A. Law
William Lerche
Howard Lilienthal
William H. Luckett
Morris Manges
Walton Martin
Rudolph Matas
E. S. McSweeney
Samuel J. Meltzer
Willy Meyer (Founder)
James Alexander Miller
Robert T. Miller
Fred J. Murphy
Leo S. Peterson
Eugene H. Pool
Walther I. Rathbun
Martin Rehling
B. Merrill Ricketts
Samuel Robinson
Charles I. Scudder
William H. Stewart
Franz Torek
Martin W. Ware
Abraham O.Wilensky
Sidney Yankauer

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..... Predident, Herbert Sloan

EVARTS A. GRAHAM MEMORIAL TRAVELING FELLOWS

1st	1951-52	L. L. Whytehead, M.D., F.R.C.S. 790 Sherbrooke St., Winnipeg 2, Manitoba, 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. Department of Surgery, Tokyo University School of Medicine 1 Motofuji-cho, Bunkyo-Ku, Tokyo, 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. Brompton Hospital, London, S.W. 3, 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. Chirugische University Klinik, Graz, AUSTRIA
16th	1965-66	Ary Blesovsky, M.D. London, ENGLAND
17th	1966-67	C. Peter Clarke, F.R.A.C.S Cardiac Surgeon, The Royal Childrens Hospital, Flemington Road, Parkville, Vic. 3052 AUSTRALIA
18th	1966-67	G. B. Parulkar, M.D. Thoracic and Cardiovascular Center, K.E.M. Hospital, Parel, Bombay 12, INDIA
19th	1967-68	Claus Jessen, M.D. Surg. Dept. D, Rigshospitalet, Blegdamsvej 9, Copenhagen, DENMARK
20th	1969-70	Peter E. Bruecke, M.D. A-1090 Vienna, Alserstrasse 4, 1st Surgical Clinic, Vienna, 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. 41 rue Louvrex, Liege B-4000, BELGIUM
25th	1974-75	J. J. DeWet Lubbe.M.D. Dept. of Cardio-Thoracic Surgery, University of Stellenbosch P. O. Box 53 Bellville. REPUBLIC OF SOUTH AFRICA
26th	1975-76	Mieczyslaw Trenkner, M.D. Institute of Surgery Debinski, POLAND
27th	1976-77	Bum KooCho, M.D. Yonsei University P.O. Box 71 Severance Hospital Seoul, KOREA
28th	1977-78	Alan William Gale, M.D., FRACP, FRACS. St. Vincents Medical Centre 376-382 Victoria St. Darlinghurst 2010 AUSTRALIA
29th	1978-79	Eduardo Otero Goto, M.D. Servicio de Cirugia Cardiovascular Ciudad Sanitaria "Le Fe" Valencia, SPAIN
30th	1981-82	Richard Firmin, M.D. 21, Florence Street Islington, London N.I
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