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THE AMERICAN ASSOCIATION

For

THORACIC SURGERY

1954 -1955

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SUNDAY MORNING, APRIL 24, 1955

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Sunday Morning, April 24, 1955

8:30 A.M. Business Meeting.

9:00 A.M. Scientific Session: REGULAR PROGRAM.

1. Pleurobiliary and Bronchobiliary Fistulae.

HERBERT D. ADAMS, Boston, Mass.

Pleurobiliary fistulae are not rare among thoracic war casualties and usually respond well to prolonged suction drainage. Among civilian patients, however, pleurobiliary and bronchobiliary fistulae are very rare but when they occur a serious and complex surgical problem is presented.

Any obstruction of the biliary tract that causes the accumulation of bile beneath the right diaphragm plus secondary infection may erode through the diaphragm. If the pleura is free, a pleurobiliary fistula is established. The symptoms are those of a massive effusion. Bile is obtained on thoracentesis, with subsequent rapid re-accumulation. The treatment is closed pleural drainage and administration of the proper antibiotic. When the patient's condition permits, the pathologic condition in the biliary tract must be treated surgically.

If at the time of rupture through the diaphragm, the pleura is fused, there will be rapid perforation into a bronchus, producing a bronchobiliary fistula and profuse "biliaryptysis". The surgical management of bronchobiliary fistula requires first, the appropriate surgical procedure to relieve the biliary obstruction which is the basic cause of the fistula. When this is accomplished, the fistula will close spontaneously in some cases. In other cases in which the biliaryptysis persists, a lobectomy will be necessary to cure the patient. Two cases to illustrate each of these conditions are presented to show the etiology, clinical course and surgical management of these unusual conditions.

2. Staphylococcal Pneumonia in Infants: A Report of Ten Cases.

W. E. BLOOMER (*by invitation*), R. E. COOKE (*by invitation*), G. E. LINDSKOG, and S. GIAMMONA (*by invitation*), New Haven, Conn.

Staphylococcal pneumonia represents a special type of pneumonia in that (1) the majority of cases occur in infants, (2) it is associated with empyema in a high percentage of cases, (3) pneumatocele as a residual is not uncommon, (4) there is a high incidence of complicating bronchopleural fistula often with a rapidly developing tension pneumothorax, (5) mortality without proper treatment is very high. It, therefore, may represent a very serious emergency.

In general the causative organism can be recovered from nasopharyngeal cultures and always from the pleural fluid when an effusion develops. The staphylococcus recovered in these cases is generally found resistant to the more commonly used antibiotics, particularly penicillin and streptomycin.

After admission of a case with a presumptive diagnosis of Staphylococcal pneumonia, equipment for an emergency thoracentesis should be kept available in the patient's room so as to handle a tension pneumothorax without delay when this emergency arises. Three of the ten cases presented the emergency picture of a tension pneumothorax.

Experience with ten cases, all of whom were less than four months of age and seven of whom had empyema, suggests that routine use of antibiotics and

simple thoracentesis is not the ideal treatment. The early introduction of adequate polyethylene catheter suction and the use of appropriate antibiotics constitute the basis of management. There have been no deaths in this series.

3. Management of Massive Hemoptysis, Not Due to Pulmonary Tuberculosis or Neoplasm.

J. L. EHRENHAFT and RODMAN E. TABER (*by invitation*), Iowa City, Iowa

Rarely patients are seen with massive life-threatening hemoptysis, the reason for which is obviously neither tuberculosis nor neoplastic disease. We have seen eight patients in the last five years who fall into this category. Occasionally these patients had episodes of previous bleeding of less severe degree. The history and routine roentgenologic studies have usually not indicated the site or cause of bleeding. The handling of these patients prior to emergency thoracotomy will be discussed. It has usually been possible to perform segmental resection or lobectomy to eradicate the bleeding sites. The most important diagnostic procedure in our opinion is bronchoscopy during or immediately following bleeding episodes.

The pathologic examination of the resected specimens has been rather disappointing even though attempts to demonstrate the bleeding points have been made by injecting plastic material into the bronchial and pulmonary arterial tree. Early resection of the bleeding area as soon as the site is located is indicated in our opinion. Delay of surgery or procrastination of definitive treatment may result in exsanguination or fatal asphyxia due to aspiration of blood. Illustrated case reports will be presented.

4. The Significance of the Anterior Segment in Bronchiectasis.

RICHARD H. OVERHOLT and WILFORD B. NEPTUNE (*by invitation*), Boston, Mass.

The surgical spotlight is not often focused upon the anterior segment. In tuberculosis, this area is the least frequent of the upper-lobe segments to become involved. In bronchiectasis, segments in the basal or mid-position have attracted most attention because they are the chief offenders. With the finding of obvious disease below, many surgeons have been content with incomplete bronchographic patterns insofar as upper lobes are concerned. In our experience, however, at least 8 per cent of bronchiectatics have anterior segmental diseases. In a few ill patients, this is the only segment involved.

Escape from detection contributes to surgical failure or half cures. Clockwise rotation of the anterior segment brings it into a dependent position after basal-segmental and middle-lobe resection. Minimal, pre-existing abnormality is then likely to become a process of pathologic significance.

Technically, the right or left anterior segment can be removed individually or in combination with adjoining segments about as easily as any of the other 16 segments. When an anterior segment or a subsegment of it and the middle lobe are involved (the most common combination), the minor fissure, if present, is usually

fused by the inflammatory reaction. Both lobe and segment can be enucleated together with greater facility and safety than with resection of the middle lobe alone.

Cases will be presented to illustrate the significance of anterior segmental disease; in particular, the consequences of oversight during the initial surgical procedure.

5. "Spontaneous" Rupture of the Esophagus.

GEORGE W. B. STARKEY (*by invitation*), Boston,
Mass.

This paper reports four cases of so-called "spontaneous" rupture of the lower esophagus. All were treated surgically, with three recoveries and one late death. This paper emphasizes once again the relative ease of diagnosis and the necessity for early treatment. In each of the four cases, the initial diagnoses were incorrect; therefore, there was some delay in initiating treatment.

Two of the patients were treated by surgical closure of the rent in the lower third of the esophagus and drainage of the left pleural space. The third patient was treated by thoracotomy drainage only and recovered. The fourth patient, a 69-year-old man, was discovered about seven days after the initial rupture. At this time a left empyema was drained after demonstration of the perforation in the esophagus by routine barium swallow. This patient was recovering but died in his third week after thoracotomy drainage, of a perforated duodenal ulcer associated with hemorrhage from a vessel in the floor of the ulcer.

Emphasis will be laid on the early signs and symptoms, as well as the diagnostic procedures used when ruptured esophagus is suspected. A brief discussion of the literature will precede the presentation of the four cases.

6. One-Stage Pharyngo-Esophageal Diverticulectomy.

J. D. MORTENSEN (*by invitation*), O. THERON
CLAGETT,
HERBERT W. SCHMIDT and HOWARD K. GRAY,
Rochester Minn.

For more than 40 years surgeons have debated the relative merits and disadvantages of the one-stage versus the two-stage operation for excision of a pharyngo-esophageal diverticulum, and still there is no unanimity of opinion as to the procedure of choice. The most recent and authoritative report is that of Lahey, who strongly defended the two-stage operation and challenged advocates of the one-stage procedure to demonstrate comparable results.

We have reviewed all our cases in which one-stage pharyngo-esophageal diverticulectomy was performed during the 10-year period January 1, 1944, through December 31, 1953; there were no cases in which two-stage diverticulectomy was done during this period. The series consists of 339 such cases. Three patients died during hospitalization, giving a hospital mortality rate of 0.9 per cent.

There is no reason to believe that the end results following the one-stage operation should be appreciably superior to those following the two-stage operation, or that the reverse should obtain. From our study of a large

group of cases in which one-stage pharyngo-esophageal diverticulectomy was performed we are able to report operative mortality and morbidity rates that are as good as, and in some instances better than, the rates reported for the two-stage operation. Furthermore, the period of hospitalization and the period of observation after leaving the hospital were significantly less following the one-stage procedure. When these economic features are considered together with the emotional benefit to be derived by imposing only one operation, we believe that the one-stage operation for excision of a pharyngo-esophageal diverticulum is preferable to the two-stage procedure.

SUNDAY AFTERNOON, APRIL 24, 1955

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Sunday Afternoon, April 24, 1955

2:00 P.M. Scientific Session: REGULAR PROGRAM.

7. The Diagnosis of Acquired Valvular Disease by Left Heart Pressure Recordings.

DON L. FISHER (*by invitation*), Pittsburgh, Pa.

Pressure recordings of the left heart circuit can be safely obtained at left heart catheterization, using transthoracic left atrium puncture by the method of Bjork. A six inch, 18 gauge, thin-walled needle is inserted by a right paravertebral approach in the un-anesthetized patient. The prone position is used with fluoroscopy to check the placement of the needle. A polyethylene catheter is passed through the needle and advanced successively into the left atrium, left ventricle and aorta. Fifty-six patients have been studied by this technique without serious complications. Pressure records demonstrate characteristic changes for each of the acquired left valve lesions as well as evidence of left heart failure. The severity of mitral stenotic obstruction is indicated by the amount of pressure drop across the valve, during ventricular diastole. Mitral insufficiency is measured by the amplitude of the re-gurgitant pulse into the left atrium during ventricular systole. The severity of obstruction in aortic stenosis is indicated by the amount of pressure drop across the aortic valve during the ventricular systolic pulse. Aortic insufficiency widens the aortic pulse pressure and eventually produces increased left ventricular pressure. Left ventricular failure from any cause results in an increased diastolic (filling) pressure. Correlation with findings at heart surgery and at autopsy were used to test the validity of these criteria.

8. A Laboratory and Clinical Evaluation of Operations for Coronary Artery Disease.

DAVID S. LEIGHNINGER (*by invitation*), Cleveland, Ohio

During the past twenty-three years Beck and his associates have established the principles of improving the blood supply to the heart. These are (1) the even distribution of blood by intercoronary arterial communications, (2) elevation of the coronary sinus pressure, and (3) the addition of new blood from outside sources by (a) extracoronary communications and (b) arterialization of the coronary sinus. The intercoronary arterial communications are probably the most important mechanism of benefit. Mautz and Gregg developed a method of study which quantitatively evaluates the functional intercoronary communications by determining the backflow from a major coronary artery. The effect of epicardial abrasion, sinus ligation, arterialization of the coronary sinus, and various irritants such as asbestos, asbestos-like substances, talcum powder, phenol, silver nitrate and urea have been studied by this method. Backflow values in operated dogs were compared to values for a large number of control dogs and the results correlated with other methods

of testing. The significance of a small quantity of blood, 3 to 5 cubic centimeters per minute, to an ischemic area of myocardium has been established and the mechanism by which this quantity of blood is beneficial has been determined.

Two operative procedures, the Beck I and II operations, which utilize these mechanisms of benefit, have been applied to over 200 patients with excellent or good results in about 80 per cent. The results in patients can be correlated to the experimental background.

9. Technical Factors Which Favor Mammary-Coronary Anastomosis With Reports of Forty Cases of Human Coronary Artery Disease Thus Treated.

ARTHUR VINEBERG and WILLIAM BULLER (*by invitation*), Montreal, Que.

At the last meeting of this Association the frequency of mammary-coronary anastomosis and internal mammary artery patency was questioned. This question has been studied for ten years by us. Many hundreds of animals have been operated upon, testing one factor at a time. Many of the factors responsible for thrombosis of the implanted internal mammary artery are now known as well as some of the factors responsible for mammary-coronary anastomosis. These will be discussed under two headings, namely: (1) Preparation of the Artery for Implantation, and (2) Technique of Implantation.

Evidence will be presented to show that with the proper technique of preparation and implantation the artery remains open in 92 per cent of the implants. The incidence of mammary coronary anastomosis seems to be dependent upon pressure differentials and ischaemia. Arteries implanted into normal hearts form mammary-coronary anastomoses in 46 per cent of animals as compared with 71 per cent in ischaemic hearts. Empyema, haemothorax and abdominal distention are complications which tend to cause thrombosis of the internal mammary artery in both animal and man.

Evidence will be shown which indicates that a systemic artery placed within the myocardium of the left ventricle remains open because it bleeds directly into myocardial sinusoidal spaces lying between myocardial fibre bundles. These spaces are opened during the making of the myocardial tunnel.

A short report of results obtained by internal mammary artery implantation in the treatment of 40 human cases of coronary artery insufficiency will be given.

10. Analysis of 50 Patients Treated by Mitral Commissurotomy Five or More Years Ago.

ROBERT P. GLOVER, THOMAS J. E. O'NEILL and O. HENRY JANTON

(*by invitation*), Philadelphia, Pa.

The authors performed 50 commissurotomies for mitral stenosis in 1949 and 1950. Each of these patients has been followed to the present time. The purpose of this communication is to present their present status with all pertinent data to include both the present functional and objective findings. Thirty-eight of the 50 patients are living five years or more after surgery. Each has maintained to the present time the degree of subjective improvement noted within the first postoperative year. Twenty-eight of the 38 living patients are considered to be in an excellent functional state and are living relatively normal lives. Nine are considerably improved over their preoperative state and one remains unimproved. Of the 12 nonliving patients six represent an operative mortality during the initial phase of this surgical program. The remaining six died from six months to four years after surgery. Three of these were desperate Stage V cases at the time of surgery; three were in Stage III but presented completely immobile, heavily calcified valves in which an ideal commissurotomy could not be accomplished.

In the opinion of the authors commissurotomy performed properly in cases of pure or greatly predominant mitral stenosis has been of inestimable value to the vast majority of patients so treated. The presented data support the view that initial improvement has been maintained for a five year period; there have been no indications to suggest that this improved state will not continue indefinitely in the future.

11. Evaluation of Techniques for the Repair of Auricular and Ventricular Septal Defects.

EARLE B. KAY, FREDERICK S. CROSS (*by invitation*) and

HENRY A. ZIMMERMAN (*by invitation*), Cleveland, Ohio

The final chapter in the repair of various types of septal defects in the heart is far from complete yet the increasing number of successful closures by various groups attests to the progress that is being made. Concomitant with the development of new surgical techniques is the development of a better understanding by the internist and the surgeon as to the correct timing of operations, and proper operative indications and contra-indications.

Atrial septal defects present a simpler problem in closure than ventricular septal defects due to easier accessibility, lower atrial chamber pressure, and the thinner atrial wall adaptable to utilization in the closed techniques.

It is the purpose of this study to review our experience in the closure of septal defects, both atrial and ventricular, by closed and open methods. Fifteen patients of a wide age range with atrial septal defects of either the septum primum or secundum type have been repaired. All of these defects have been repaired by the closed method utilizing several different techniques. There has been one death in the fifteen cases in this series.

One ventricular septal defect has been repaired by a closed technique, and a beginning experience is being obtained in the use of controlled cross-circulation in the open closure of pure ventricular septal defects, as well as those associated with Tetralogy of Fallot.

Technical aspects of the various methods used will be described, pre and postoperative cardiac catheterization studies as well as clinical evaluations will be presented, and impressions gained to date concerning the indications and contra-indications to surgery will be discussed.

12. Experiences with Surgical Repair of Atrial Septal Defects.

ELTON WATKINS, JR. and ROBERT E. GROSS, Boston, Mass.

The surgical closure of defects in the atrial septum has proved to be a useful procedure which improves the functional status of invalided patients. We have operated upon 35 individuals. These patients presented either incapacitating symptoms or findings suggesting impending difficulty—a large heart, poor body development, serious pulmonary congestion, or catheterization data indicating that right ventricular output was more than twice left ventricular output.

Over ninety per cent of the defects have been located dorsally in the septum, well away from the atrio-ventricular valves. Such malformations have been closed by the external suture methods we have described. Defects near the inferior caval orifice have been closed most easily by placing the inferior sutures through the left atrial wall, which lies close to the anterior lip of the septal orifice. The rare *ostium primum* defects have been associated with serious deformities of the mitral and tricuspid valve leaflets. We have had no survivals following closure of such defects. An additional hazard is the proximity of the atrio-ventricular node and bundle to the inferior margin of the low-lying defect. The conduction system may be located by landmarks palpable at the time of operation.

Post-operative management has been complicated occasionally by left ventricular failure controlled by digitalization and limitation of fluid and sodium intake. Evidence suggests that the syndrome is related to poor development of the left ventricle over the years when the septal defect prevented adequate filling of the growing ventricle.

MONDAY MORNING, APRIL 25, 1955

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Monday Morning, April 25, 1955

8:30 A.M. Scientific Session: THORACIC SURGICAL FORUM.

13. Anastomosis of Right Auricle to Pulmonary Artery in the Treatment of Tricuspid Atresia.

ELLIOTT S. HURWITT, DENNISON YOUNG (*by invitation*) and

DORIS J. W. ESCHER (*by invitation*), New York, N. Y.

On November 15, 1954, in the Forum on Fundamental Surgical Problems of the American College of Surgeons, a new approach to the correction of tricuspid atresia was described by Warden, DeWall, and Varco. By anastomosing the tip of the right auricular appendage to the main pulmonary artery in dogs with suture-obliteration of the tricuspid valve, they utilized the pumping potential of the right auricle to convey the systemic venous blood to the pulmonary circulation. An infant desperately ill with an atresia of the pulmonary conus and a common ventricle (cor triloculare) as components of complicated congenital heart disease was subjected to this new operation under hypothermia on December 8, 1954. Although the outcome of this initial attempt was unsuccessful, an analysis of the anatomical and physiological data obtained during operation emphasizes the crucial importance of thorough study in evaluating the rationale of this procedure. The pressure gradient and comparative degree of oxygen saturation of the blood in the right auricle and pulmonary artery are the critical readings. On the basis of a study of these data, the technical aspects of the operation, and the autopsy findings, recommendations are made concerning the use of this operation in the surgical management of tri-cuspid atresia.

14. Autogenous Thoracic Aorta Grafts of Pericardium and Nylon Net Using a Thrombin-Fibrinogen Coagulum.

RICHARD H. ADLER (*by invitation*), Denver, Colo.

In an effort to eliminate certain undesirable features associated with aortic homografts and the maintenance of an aortic vessel bank, a method has been developed for making thoracic aortografts from autogenous pericardium, nylon net and a thrombin-fibrinogen coagulum at the time of thoracotomy. First, a simple, practical procedure was evolved for quickly preparing a sticky coagulum from thrombin and fibrinogen. Thereafter, sterile grafts could be made at the operating table by the following method. A sheet of pericardium is removed and trimmed free of excess fat. A rectangular piece of nylon net, fashioned to desired size, is then stuck to the external surface of the pericardium by means of freshly interposed thrombin-fibrinogen coagulum. Within several minutes the coagulum has set and the two layers become adherent; the pericardium serves as an intima and the nylon net as an external elastic support. This tissue is then placed around a cylinder and sutured into a tube of appropriate length and diameter while the thoracic aorta is being prepared for resection.

Such grafts, varying in length from 2.5 to 7.0 cm., have been used to replace excised segments of thoracic aorta in approximately thirty dogs. To avoid occasional spinal cord damage and heart failure during the period of aortic occlusion required for anastomosis, a siliconized polythene tube shunt was used to bridge the arch and descending aorta. The grafts have been studied at varying postoperative periods grossly, histologically, and by direct transventricular aortography. Most grafts so studied appear to function satisfactorily.

15. The Lymphatic Drainage of Silver-Coated Radioactive Gold Colloids Following Intra-Thoracic Administration to Pneumonec-tomized Dogs.

P. F. HAHN (*by invitation*), ROBERT A. MATUSKA (*by invitation*),

ROBERT I. CARLSON, STEWART H. AUERBACH (*by invitation*) and

GEORGE R. MENEELY (*by invitation*), Nashville, Tenn.

At various intervals following left pneumonectomy, therapeutic quantities of silver-coated radioactive colloid material were injected into the empty hemithorax. There were no deaths in the animals injected with the radioactive substance. The animals were sacrificed in two to five days and the radioactive content of the antero-superior mediastinal, right superior mediastinal, left superior mediastinal, and bronchial and carinal

nodes was determined. In general, good radiation was obtained in all of the superior mediastinal nodes. The radioactive content of the bronchial and carinal nodes was unpredictable.

Several animals were allowed to live several weeks after injection and histological examination showed nearly complete destruction of the irradiated mediastinal nodes. Histological examination of the liver and spleen in these animals showed no architectural abnormalities. Studies of the parietal pleura and of the pericardium showed no histological changes. Bronchial stump healing was unimpaired. Liver, spleen, and striated muscle were studied for radioactivity; and histologically radiation to the liver and spleen was well within tolerated limits.

Implications for use of such colloids as adjuvants to surgery in bronchogenic malignancy will be discussed. The advantages over the intrabronchial route previously reported rest in simplicity of administration and the ability to administer the drug repeatedly if necessary.

16. Circumferential Suture of the Mitral Ring -A Possible Method for the Surgical Correction of Mitral Insufficiency.

JULIO C. DAVILA, ROBERT G. TROUT, BART S. IAIA and FRANK MANSURE

(all by invitation). Sponsored by ROBERT P. GLOVER, Philadelphia, Pa.

The purpose of this communication is to present the experience gained in the experimental laboratory in the development of a technique for circumferential suturing of the mitral valve.

A brief comment is made regarding the rationale of this approach to the treatment of mitral insufficiency.

Over one hundred dogs have been used to study various aspects of the problem. A description of the technique which has been developed is given. The early effects of this procedure, using several different suture materials, in the hearts of normal dogs, are discussed. The effectiveness of the method in correcting artificially produced mitral regurgitation is presented.

Conclusions are based upon electrocardiographic, hemodynamic and anatomic-pathologic observations.

17. Studies Upon the Physiological Function of the Human Vagus Nerve in Various Pathological Pulmonary States.

OSLER A. ABBOTT, W. E. VAN FLEIT *(by invitation)*, E. R. DUSCHESNE *(by invitation)*

and A. E. ROBERTO *(by invitation)*, Emory University, Ga.

An analysis is presented of data obtained upon the effect of paralysis of the vagus nerve upon the pulmonary artery pressure in numerous different types of bronchopulmonary disease. Defunctionalization of the vagus nerve has been obtained by these methods: namely (a) the effect of large doses of intravenous probanthine upon preoperative cardiac catheter studies, (b) the effect of novocaine block of the isolated left or right vagus nerve upon pulmonary artery blood pressure during thoracotomy, and (c) cardiac catheterization studies in patients who have undergone unilateral or bilateral high vagus nerve transection. Comparative effects of novocaine block of the dorsal sympathetic chain are also reported. The studies obtained at the operating table were performed under standard conditions of anesthesia with mechanically regulated and recorded ventilatory pressure. The effect of different levels of ventilatory pressure upon the pulmonary artery pressure with and without vagus nerve control are reported. The variation in response obtained in different pathological states suggests the degree of vagotonia involved in various conditions. An attempt is made to parallel the pulmonary artery pressure response to the variation in tidal air and oxygen consumption values produced by the loss of vagus nerve control of the pulmonary bed.

18. Temporary Unilateral Occlusion of the Pulmonary Artery in the Preoperative Evaluation of Thoracic Patients. A Preliminary Report.

HERBERT SLOAN and JOE D. MORRIS *(by invitation)*, Ann Arbor, Mich.

Prediction of the effect of pulmonary resection, particularly pneumonectomy, on the cardiovascular system of patients is not possible in the same objective manner in which the effect on pulmonary function can be assessed. An attempt has been made to produce changes in the pulmonary circulation before operation which would simulate those resulting from pneumonectomy.

The pulmonary artery on the side of the proposed resection has been catheterized and the artery occluded completely with a balloon. Changes in pulmonary artery pressure, cardiac output, systemic arterial oxygen saturation and respiratory exchange have been recorded. The experiment has been repeated with the balloon inflated during a period of exercise.

Information has been obtained which may allow the determination before operation of the possible later development of pulmonary hypertension and cor pulmonale. Observations of the ability of patients to increase cardiac output sufficiently to withstand a thoracic operation and to maintain normal arterial oxygen saturations with one pulmonary artery occluded have been carried out. These studies have been correlated with similar studies made during operation.

19. Coronary Perfusion for Longer Periods of Cardiac Occlusion Under Hypothermia.

NORMAN E. SHUMWAY (*by invitation*) and MARVIN L. GLIEDMAN

(*by invitation*)

Sponsored by F. JOHN LEWIS, Minneapolis, Minn.

A limiting factor in the use of general hypothermia for intracardiac surgery is the relatively short time available for cardiac occlusion. The purpose of our experiments has been to extend this period by means of coronary perfusion. Fifteen minutes has been the maximum duration of cardiac occlusion tolerated by dogs at 25° C. Through the agency of coronary perfusion this time interval was prolonged up to thirty minutes.

After an initial series of experiments confirmed the observation that citrated blood produced ventricular fibrillation, heparinated blood was used for the perfusions. The ascending aorta was cannulated via the subclavian or brachiocephalic artery. Before the perfusion was begun, the aorta was obstructed by an inflatable cuff on the catheter tip. Non-crushing clamps applied distal to the catheter gave additional security that all perfusate would flow into the coronary arteries. The blood was taken from a reservoir, passed through a simple bubble type oxygenator, and then pumped through the coronary vessels at a rate of approximately 2 cc. per lb. of body weight per minute. Blood entering the heart through the coronary sinus was allowed to leave the system through a right atriotomy or ventriculotomy.

The time permitted by hypothermia for intracardiac surgery has been a function of the resuscitative power of the heart. With cardiac perfusion resistance of the nervous system to anoxia becomes the determining factor. In the dog with coronary perfusion 30 minutes of cardiac occlusion at 25° C. has been tolerated without evident neurological deficit.

20. Blood Volume Studies in Thoracic Surgical Procedures Using Radioactive Iodinated Human Serum Albumin (RIHSA).

CLIFFORD F. STOREY, CHARLES G. FOSTER (*by invitation*) and

THOMAS G. MITCHELL (*by invitation*), St. Albans, N. Y.

Despite the fact that thoracic surgical procedures are commonly performed today, there are only a few reports in the literature concerning the blood volume changes which occur in patients undergoing chest surgery.

Since the replacement of blood during and following surgery is based upon the estimated blood loss, the surgeon needs a practical and accurate means of measuring blood loss. The authors feel that blood volume determinations with RIHSA pre and postoperatively meet this need.

The blood volume changes observed in patients subjected to major thoracic surgical procedures as measured by RIHSA are presented. A comparison of blood loss during surgery as measured by the dry weighed sponge technique and RIHSA is also made.

21. Induced Cardiac Arrest for Intracardiac Surgical Procedures.

CONRAD R. LAM, THOMAS GEOGHEGAN (*by invitation*) and ALFRED LEPORE

(*by invitation*), Detroit, Mich.

There would be a great advantage in the performance of intracardiac operations if the organ were brought temporarily to standstill. The ideal of a dry heart would be nearly or perfectly attained, since there would be no coronary sinus flow. Furthermore, we have demonstrated that complete cardiac resuscitation is more easily attained if the heart is stopped during caval occlusion rather than being allowed to beat with an inadequate blood supply.

With the dog's brain protected by hypothermia, we have occluded the two cavas and azygos vein, and have stopped the heart with the intraventricular injection of potassium chloride. Various complicated intracardiac procedures have been carried out with facility under these conditions. The heart is easily resuscitated from the condition of standstill by massage and defibrillation.

22. Open Left Heart Surgery in Dogs During Cardiac Arrest Below 10° C. Temperature with and without Extracorporeal Circulation.

FRANK GOLLAN, REGINALD PHILLIPS, JR., JAMES T. GRACE and

RAYMOND M. JONES (*all by invitation*), Nashville, Tenn.

The body temperature of dogs can be lowered to the freezing point of water within one hour if the venous return is circulated, oxygenated and refrigerated in a small, plastic pump-oxygenator. At 13° C. the heart goes into asystole and the left heart can be opened for prolonged intracardiac surgery. Ventricular fibrillation, coronary flow or air embolism do not interfere with this procedure. On rewarming the blood in the extracorporeal circulation the heart resumes its regular beat and at 30° C. the pump-oxygenator can be turned off.

In a similar way rapid hypothermic asystole without ventricular fibrillation can be achieved by combining immersion in ice water with cooling of the pulmonary circulation by hyperventilation with refrigerated oxygen. After closure of the left cardiectomy, inhalation of warm oxygen, cardiac massage, clamping of the thoracic aorta and rapid body rewarming restore normal heart activity. Cooling of the extracorporeal or of the pulmonary circulation provides a bloodless field during cardiac arrest. While the former procedure lends itself advantageously for complex and prolonged intracardiac surgery the latter is applicable to simpler and shorter operations.

23. Physiological Observations in Experimental Pulmonary Insufficiency.

ROBERT G. ELLISON, WALTER J. BROWN, JR. (*by invitation*),

ELMER E. HAGUE, JR. (*by invitation*) and WILLIAM F. HAMILTON

(*by invitation*), Augusta, Ga.

The surgical attack upon congenital stenosis of the pulmonary valve has been quite successful in relieving symptoms due to this disease. Right ventricular pressures frequently fail to return to normal after the Brock technique and for this reason there has been an enthusiasm on the part of some surgeons to attack the valve under direct vision and in some cases to excise portion of it. This necessarily creates insufficiency of the valve. Swan minimizes the dangers of pulmonary insufficiency and feels that it may be desirable to accept some degree of insufficiency in order to relieve stenosis completely. On the other hand, some observers have felt that pulmonary insufficiency is tolerated poorly. This report deals with the presentation of physiological data gathered on a small group of dogs in whom the pulmonary valves had been completely excised.

The first five dogs were operated upon under hypothermia, but the others under normothermic conditions. Eight dogs have been followed for from one to 14 months. The data obtained indicates that complete pulmonary valvectomy has not yet produced any noticeable physiological handicap. As a result of an increase in stroke volume, the right ventricular systolic pressure was elevated, but in no case was the right ventricular end-diastolic pressure significantly above normal. Pulmonary diastolic pressure was uniformly low. Physiological data will be presented in detail.

24. Experimental Transposition of the Great Vessels.

SANFORD E. LEEDS, MORRIS M. CULLINER (*by invitation*) and

SHERMAN H. STRAUSS (*by invitation*), San Francisco, Calif.

Complete transposition of the great vessels is a common congenital malformation for which there is no satisfactory treatment. It cannot be created in laboratory animals for experimental study at the present time. Two types of operative procedures were performed in dogs, usually in stages, in order partially to transpose the normal circulation. Type I consisted of connecting the distal right superior pulmonary artery to the right atrium, creating an interatrial septal defect, and end-to-end anastomosis between the brachiocephalic and right pulmonary arteries. Excision of a part of the left lung was included in most of these animals. The Type II preparation, with and without an interatrial septal defect, included connection of the right superior pulmonary vein to the right atrium and the superior vena cava to the left atrium. By these means, an attempt was made to *produce* cyanosis and a balanced circulation, thus testing the efficiency of transposing pulmonary and systemic veins to *correct* cyanosis in patients with complete transposition of the great vessels.

Seventy-four operations were performed in forty-two dogs. Of the surviving animals, which became cyanotic, some were studied for more than two years. Observations were made on the flow through the interatrial septal defect during temporary occlusion of the left pulmonary artery, the right pulmonary artery having been divided for anastomosis with a systemic artery.

The application of these experiments to the clinical problem of complete transposition of the great vessels will be discussed.

25. Controlled Total Body Arterial Perfusion for Open Intracardiac Surgery.

HERBERT E. WARDEN (*by invitation*), RICHARD A. DEWALL (*by invitation*),

J. BRADLEY AUST (*by invitation*), NEWELL ZIEGLER (*by invitation*),

RAYMOND C. READ (*by invitation*), RICHARD L. VARCO and

C. WALTON LILLEHEI, Minneapolis, Minn.

Over the past several months controlled cross circulation has been used successfully at the University of Minnesota Hospitals as a means of performing open intracardiac surgery for prolonged periods of time. It is felt that an obvious improvement in the technique would be the elimination of the living donor from the operative set-up. Variation in the procedure that accomplishes this end has been developed and will be presented.

A simple method of oxygenation of blood without damage and without the need for special equipment has been utilized to replace the donor in the cross circulation circuit. By use of this method in conjunction with the concept of reduced flow and the mechanical principles of controlled cross circulation (which insure a quantitative balance between the arterial perfusion to and the venous withdrawal from the recipient) it is now possible to occlude the cardiac inflow and provide ample opportunity to operate within the chambers of a dry heart.

Several animals have been subjected to and have survived prolonged periods of cardiac by-pass using this technique. In addition, a physiologic evaluation of the method has been carried out in some detail with particular attention being paid to changes in the normal acid base relationships as indicated by pre and post

perfusion pH, O₂, and CO₂ determinations. Similarly changes in hemoglobin, hematocrit, platelet counts, and red cell fragility have been determined and will be presented.

26. The Arterialization of Blood as It Applies to the Mechanical Heart-Lung Apparatus.

F. D. DODRILL and ALFRED Lui (*by invitation*), Detroit, Mich.

The mechanical heart reported by one of us has been previously described. We are describing the addition of an oxygenator used in combination with the mechanical heart. A porous plate is used, on the under side of which oxygen is present under slight pressure, while on the top side the venous blood is delivered. Oxygen is absorbed by the venous blood as it rises in the chamber. The plate is so constructed that the tiny holes are not more than 10 microns in diameter. Any size plate can be made to accommodate any quantity of venous blood. Excess oxygen is allowed to escape in large bubbles. The excess oxygen in the form of bubbles is passed through an absorption chamber in which the large bubbles coalesce and break due to the change in surface tension. This change in surface tension is brought about by the presence of a small amount of an organo-polysiloxane. The free oxygen as well as the carbon dioxide is allowed to pass into the atmosphere.

Using such an apparatus, the venous blood is oxygenated to 100 per cent saturation and the carbon dioxide is removed in amounts which keep the carbon dioxide content of the arterial blood essentially normal. Studies of the pH also indicate figures within a normal range. Such an apparatus is connected between the two sides of the mechanical heart which are, in effect, two ventricles. The right side of the pump delivers blood through the oxygenator while the left side delivers it into the arterial system. Using this apparatus, we have been able to maintain the open heart in dogs for over 30 minutes with chemical and physiological standards approaching normal.

27. The Alveolar Carbon Dioxide Tension During Intrathoracic Operations.

THOMAS F. NEALON (*by invitation*), GEORGE J. HAUPT (*by invitation*)

and JOHN H. GIBBON, JR., Philadelphia, Pa.

A recent report from this laboratory demonstrated that adequate pulmonary ventilation can be achieved by intermittent positive and negative pressure during prolonged intrathoracic operations. The present report is a comparison between manual intermittent positive pressure and mechanical positive and negative pressure pulmonary ventilation. These techniques were alternated during operation and the following studies carried out. Total ventilation was measured by a dry test volume displacement gas meter. The per cent of carbon dioxide in the endexpiratory gas (alveolar air) was continuously measured and recorded with a Liston-Becker infrared gas analyzer. Intermittent arterial blood samples were analyzed for pH, CO₂ content, O₂ content, O₂ capacity, and sodium and potassium concentrations. The pCO₂ and O₂ saturation of arterial blood were calculated from these determinations. The pCO₂ of the arterial blood was correlated with the alveolar carbon dioxide tension determined by the infra-red gas analyzer. In addition, the sodium and potassium concentrations of the arterial blood are compared with the pCO₂ and pH.

The results of this study indicated that adequate pulmonary ventilation, evidenced by a normal or low alveolar pCO₂ and normal arterial oxygen saturation, can be achieved by either technique in patients with unimpaired pulmonary function. In patients with decreased pulmonary function, especially those with severe degrees of emphysema, intermittent positive and negative pressure provided adequate ventilation. On the other hand, intermittent positive pressure did not provide adequate ventilation in such patients or could not be employed because of its deleterious effect on the circulation, i.e., diminished cardiac output with resultant hypotension.

MONDAY AFTERNOON, APRIL 25, 1955

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Monday Afternoon, April 25, 1955

2:00 P.M. Executive Session. (Limited to Active and Senior Members).

3:00 P.M. Scientific Session: REGULAR PROGRAM.

Remarks by the President, Edward S. Welles, Saranac Lake, N. Y.

28. Lower Esophageal Web.

WALTER F. BUGDEN and J. ERNEST DELMONICO (*by invitation*),

Syracuse, N. Y.

Intermittent dysphagia caused by a smooth web or diaphragm in the lower esophagus at or near the esophago-gastric junction is described. Two adult male cases with surgical correction are presented. This entity is generally unrecognized by the roentgenologist and endoscopist for reasons that will be described. Both cases were "missed" at previous examinations. Schatzki described 5 cases in 1953 which he called "lower esophageal ring", only one of which was treated surgically by esoph-agoplasty. Ingelfinger and Kramer described 6 cases in 1953 which they call "contractile lower esophageal ring". One was treated surgically by esophageal resection.

The etiological considerations will be discussed. Radiologically the findings are typical when proper maneuvers are made, but the diagnosis can be easily missed. The sparse number of reports in the literature indicates that the diagnosis is probably being overlooked by both roentgenologists and endoscopists. The esophagus must be distended with heavy barium above and below the defect to bring out the "web" on the roentgenograms.

The two cases we are reporting were explored and a lower esophageal web found. The lesion was not palpable externally but was clearly demonstrated with the esophagus opened longitudinally. Several diagrams demonstrate the method used for local esophagoplasty. Both cases are greatly improved and very grateful for the return to normal swallowing after many years of dysphagia and subternal distress.

29. Lymphoma of the Lung and Pleura.

WILLARD VAN HAZEL and ROBERT J. JENSIK (*by invitation*), Chicago, Ill.

The occurrence of lymphoma in the chest has usually been thought of as media-stinal in anatomic location with typical roentgen appearance and characteristic symptomatology and bronchoscopic features. In recent years isolated case reports of pulmonary lymphomas have appeared in the literature. Our present study consists of a group of twelve cases, which have for a common denominator a diagnosis of lymphoma but which was primarily pulmonary or pleural in location and varied considerably as to roentgen appearance and symptomatology.

The lesions were either asymptomatic, or varied from occasional cough, episodes of hemoptysis, to dyspnea or toxemia. The clinical histories appear in the complete report. Seven of the cases had X-ray evidence of pulmonary pathology, either as a solitary mass (four), a large dense mass in two (one of which had cavitation) and a bilateral diffuse nodulation in one. Four of the remaining five had recurrent pleural fluid and one had a large mass in each pleural space.

Bronchoscopy failed to give tissue diagnosis in the majority of the cases but interestingly in one, biopsy of the mucosa revealed the identical histologic report as was obtained by paraffin section studies of the centrifugal pleural fluid. Histologically the diagnoses were small cell lymphosarcoma, reticulum cell lymphosarcoma, Hodgkin's disease and Hodgkin's sarcoma. The exact tabulation is incorporated in the report although the majority were small cell lymphosarcoma.

The treatment consisted of surgical resection, X-ray therapy and nitrogen mustard. Complete resection consisted of lobectomy in three patients and pneumonectomy in two. In two cases incomplete resection was done. All five patients survived resection: One is now five years since pneumonectomy without evidence of recurrence (lymphoblastoma); one died three years postoperatively of an acute illness; two have been lost to follow-up after three years; one is alive one year after surgery. Of the two partially resected cases, one survived eight years and the other is still alive six years later, having had in the interim, one year ago, an abdominal perineal resection for colon carcinoma.

30. Chest Wall Prosthesis.

BERT H. COTTON, GEORGE A. PAULSEN (*by invitation*) and

JACK DYKES (*by invitation*), Los Angeles, Calif.

Twenty cases of chest wall tumors are reported, divided into primary and secondary neoplasms. The treatment of these tumors was surgical excision with replacement of the chest wall by a prosthesis. Following large block resections of the thoracic wall an attempt has been made to maintain rigidity by replacement with a suitable material to aid in the mechanics of respiratory physiology. The developmental phases of providing functioning chest wall prosthesis are discussed in this paper. Various prosthetic materials and methods with their adaptation to various sized defects are presented. Advantages, disadvantages and complications met in this series are summarized.

A short movie showing the use of stainless steel mesh as chest wall replacement accompanies the paper.

31. Thymic Neoplasms.

DONALD B. EFFLER and LAWRENCE J. MCCORMACK

(*by invitation*), Cleveland, Ohio

Thymic tumors are frequently observed in myasthenia gravis; otherwise they are considered to be rare neoplasms and of little clinical interest. Malignant tumors of the thymus are also reported, but the intimate relationship between thymic tumor and malignancy deserves added emphasis.

This report concerns 17 patients with thymic tumor; all have been studied at the Cleveland Clinic within the past five years. Diagnosis by direct biopsy or excision was established in each case. Nomenclature based on histopathologic features is discussed and a simplified classification of thymic tumors has been used.

The nebulous relationship between myasthenia gravis and thymic tumor has been discussed in the literature; the authors believe that this emphasis has been out of proportion to more important features of the tumor. Thymic neoplasms occur more frequently than generally recognized; misdiagnosis as lymphoblastoma, lymphoma or mediastinal carcinoma is common, as the thymus contains mixed tissue elements. It becomes increasingly apparent that thymic tumors occur in all age groups and carry a high incidence of malignancy. Unless there is obvious tumor extension or gross metastases are apparent, both gross and histopathologic distinctions between benign and malignant tumor of the thymus are impossible.

The authors believe that all thymic tumors should be considered malignant. A program of combined surgical and radiologic therapy is suggested. This combined therapy even in those cases with obvious malignancy demonstrated by intrapleural and intrapericardial metastases may greatly improve an otherwise hopeless prognosis. Excision alone in the apparently benign thymic tumor is inadequate; late metastases or recurrence occur too frequently. The concept of high malignant potential in thymic neoplasm deserves particular emphasis.

6:30-8:30 P.M. COCKTAIL PARTY, Informal.

Chalfonte-Haddon Hall.

TUESDAY MORNING, APRIL 26, 1955

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Tuesday Morning, April 26, 1955
9:00 A.M. Scientific Session: REGULAR
PROGRAM.

32. Pulmonary Resection in Active Cavitory (Open-Positive) Tuberculosis.

ROBERT H. HOLLAND (*by invitation*), JOHN W. BELL (*by invitation*) and

EDWARD S. WELLES, Sunmount, N. Y.

Current attempts to control cavitory tuberculosis with prolonged chemotherapy result in a predictable incidence of medical failures. When a resistant strain of tubercle bacilli develops, definitive surgical treatment is followed by a high incidence of major complications.

This study deals with over eighty resections in patients who had positive sputa or gastric washings, and cavities visible on planigrams immediately prior to surgery. Studies of bacterial sensitivity to Streptomycin, Para-Amino-Salicylic Acid and Isoniazid are available on admission, preoperatively and postoperatively. Accordingly, we have divided these cases into Original Chemotherapy (Susceptible and Resistant) and Retreatment Chemotherapy (Susceptible and Resistant). A number of patients in the Retreatment-Resistant group were given short term pre and postoperative courses of viomycin and terramycin in combination. These four groups have been studied from admission, through surgery, and on follow-up examinations.

It is felt that medical failure can be anticipated in the early months of chemotherapy when certain indications exist. These indications are presented, together with recommendations for earlier surgical treatment.

33. Simultaneous Bilateral Resection for Pulmonary Tuberculosis in Mental Patients.

F. JOHN LEWIS, M. TAUFIC (*by invitation*), B. ZIMMERMAN (*by invitation*),

MORLEY COHEN (*by invitation*) and J. F. PERRY (*by invitation*),

Minneapolis, Minn.

In 14 patients with bilateral pulmonary tuberculosis we have resected parts of both lungs at one operation. The operation has been done through an anterior incision with transverse division of the sternum and entry into both pleural cavities through the third interspaces. Diseased segments in both lungs were then removed sequentially by one operating team, or at the same time with two. The former method is preferred. A lobectomy on one side plus a segmental resection on the opposite side was necessary in one patient while the others all had bilateral segmental resections. There were no deaths. The patients were all inmates of a State Mental Hospital and they were in relatively good health except for their tuberculosis.

For these particular patients, and perhaps for others as well, this method has several advantages over the staged bilateral resection. The total time of treatment can be shortened by 9 to 12 months and we have been able to attend more expeditiously to the long list of mental patients with tuberculosis who are awaiting surgery. For most of the patients the operation has been no harder to bear than the second operation of a staged bilateral resection. Perhaps this is because a simultaneous bilateral operation forces a more uniform distribution of the respiratory load postoperatively. Then, too, with a bilateral anterior incision there is less muscle trauma and disability than with either side of a staged procedure. We plan to continue using the simultaneous operation for good risk patients with limited bilateral disease.

34. Blood Volume Studies in Pulmonary Tuberculosis.

JOHN H. KEHNE (*by invitation*) and FELIX A. HUGHES, Memphis, Tenn.

Previously published reports indicate the importance of blood volume deficiencies in the chronically ill patient but limited work has been done specifically in the field of tuberculosis. Significant replaceable deficiencies in blood volume, plasma volume and hemoglobin mass have been found in 62% of an unselected survey series of 100 cases of pulmonary tuberculosis presented as candidates for thoracic surgery. Average deficiencies found were 12% in blood volume, 19%

in hemoglobin mass and 9% in plasma volume. The deficiency in the hemoglobin mass was found to exceed 500 cc. of whole blood in 62% of the total series, 1000 cc. of blood in 46% of the series, and 1.500 cc. of blood in 23% of the entire group.

Blood volume determinations represent the only method to evaluate these deficiencies and should be employed more frequently in chronic pulmonary tuberculosis in order to provide better supportive therapy in both the medical and surgical phases of treatment. Considering the fact that these patients had been under treatment in different hospitals for prolonged periods and assumed to be normal, the problem of blood deficiencies should be presented and re-evaluated.

35. Surgical Treatment in Tuberculosis Complicated with Pulmonary Emphysema.

ROBERT W. NEWMAN, PERRY M. HUGGIN,
CHARLES L. BUTLER and

MEDFORD C. BOWMAN (*all by
invitation*), Knoxville, Tenn.

The authors have been impressed that surgical treatment in patients with tuberculosis complicated by pulmonary emphysema is much more hazardous both as to the operative and to the postoperative course. Since the majority of surgery in tuberculosis is now excisional in nature, a study of results comparing emphysematous tuberculous patients with non-emphysematous patients would be helpful.

The presentation is an analysis of 30 surgical patients with pulmonary tuberculosis complicated by moderate to severe generalized emphysema. A concept of the pathology involved and the rationale of surgical approach is presented. The complications, morbidity and mortality in these 30 patients are compared to a group of 259 surgical patients treated during the same period who had pulmonary tuberculosis without complicating emphysema. A discussion of the postoperative problem of the "emphysema syndrome" is

presented and recommendations as to the prevention of its development are made.

Physiological data is presented relative to the preoperative diagnosis and evaluation of this group of patients with complicated tuberculosis. A discussion of the decisions as to the best surgical approach to treatment in the light of our experiences with the problem is presented.

36. Surgery for Cavitory Tuberculosis in Patients with a Single Lung.

FRANCIS M. WOODS and NORMAN J. WILSON, Boston, Mass.

Control of cavitory tuberculosis in the single remaining lung has been nearly insuperable when rest and anti-microbial agents fail. Pneumothorax, both intra and extrapleural, modified thoracoplasty, pneumoperitoneum, cavity drainage have all been tried. Resection remains the surest method when applicable. We have removed segments or single lobes in the lung remaining after pneumonectomy in seven instances since 1951. Only one operative mortality occurred. The problems of case selection, anesthesia, technical difficulties at operation, the postoperative management and the favorable end results will be reported. Some physiologically similar situations will also be discussed where the active disease is in the lung opposite a totally destroyed lung.

37. Surgical Treatment of Pulmonary Histoplasmosis with MRD-112 as an Adjunct.

JOHN W. POLK (*by invitation*), CHAS. A. BRASHER (*by invitation*),

JOAO DE CASTRO (*by invitation*) and W. W. BUCKINGHAM, Kansas City, Mo.

A brief history of histoplasmosis is described. Detailed pathological findings in resected and autopsy specimens are considered. The methods of treating pulmonary histoplasmosis are discussed with emphasis on surgical resection and the use of MRD-112. Experiences with surgical resection in four patients having chronic, progressive, pulmonary histoplasmosis are discussed. The organism, *Histoplasma Capsulatum*, was cultured in each case. One case resected without drug therapy is reviewed in detail; a second case treated with MRD-112 prior to thoracotomy is also outlined. In contrast, cases of four patients treated medically with MRD-112 are outlined.

All cases have been followed thoroughly to determine the benefits of each form of therapy. The role of complement fixation determination, in both surgical and medical treatment, is discussed fully. These experiences with chronic, progressive, pulmonary histoplasmosis led us to believe that it is a generalized disease, similar in many ways to tuberculosis. It is believed that for localized, chronic disease, surgical resection offers the best prognosis. Treatment with MRD-112 has been utilized in cases with extensive pulmonary disease. Follow-up studies will be needed before the final evaluation of this drug can be ascertained. Surgical resection may be used for destroyed areas of lung following MRD-112 treatment. We propose that careful complement fixation data offers the best method of following post-treatment cases.

TUESDAY AFTERNOON, APRIL 26, 1955

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Tuesday Afternoon, April 26, 1955
2:00 P.M. Scientific Session: REGULAR
PROGRAM.

38. The Development of the Pleural Partition to Prevent Over expansion of the Lung Following Partial Lung Resection.

LYMAN A. BREWER, III, ANGEL F. BAI (*by invitation*) and W. M. JONES

(*by invitation*), Los Angeles, Calif.

The management of a large pleural dead space created by partial pulmonary resection usually presents a difficult clinical problem. The ill effects of overexpansion and emphysema of the remaining lung tissue, leading to lung rupture in some instances, are well known. The organization of the fluid which accumulates to fill the pleural space results in a marked decrease of the functions of the unresected portions of the lung. The usual methods employed to decrease this space are (1) thoracoplasty, (2) phrenemphraxis, (3) pneumoperitoneum, and (4) the insertion of various foreign body prostheses, lucite spheres,

zirconium, ivalon sponges, etc. Each of these methods have certain inherent disadvantages.

The authors present an original concept of developing an intrapleural partition which effectively limits the expansion of the lung without certain of the drawbacks of the commonly used methods. The technique of fashioning this partition is described along with general results of this procedure in a series of experimental studies in dogs. A critical appraisal of the various materials used in forming the partition is made. The effect on the remaining pulmonary tissue, the fate of the space above the partition, and the clinical application of this procedure are presented.

39. Operative Thoracic Ductography: Report of Three Cases Illustrating Its Value.

ALLAN STRANAHAN,
RALPH D. ALLEY and HARVEY W. KAUSEL

(by invitation), Albany, N. Y.

The experience of others in the surgical management of persistent chylothorax of spontaneous or traumatic origin is briefly reviewed. Previously reported anatomical studies of the thoracic duct system which disclose a significant incidence of anatomical variation are also discussed and supplemented with our own observations obtained by contrast radiographic examination of the thoracic duct system in fresh autopsy material. Such anatomical considerations suggested the desirability of obtaining visualization of the thoracic duct system by radiographic means at the time of surgical exploration in cases requiring interruption of the system. A method for thoracic ductography which demonstrates the variations of the system which may be present was therefore developed. The technique for exploring the thoracic duct system through either hemithorax, as well as the advantages and disadvantages of each is described.

One case of postoperative chylothorax and two cases of chylous effusion resulting from malignant lymphoma in which surgical interruption of the thoracic duct system was undertaken are presented. In each instance thoracic ductography yielded important anatomical data. In one case there was

reduplication of the duct in its midportion, another had two major ducts which united within a centimeter of the left subclavian vein, and in the third the system had a plexiform pattern. It is concluded that the anatomical variations of the thoracic duct system demand preliminary contrast visualization where complete surgical interruption of the system is contemplated. A practical method for thoracic ductography is reported.

40. Complications of Mitral Valve Surgery with Particular Reference to the Post Commissurotomy Syndrome.

CHARLES B. RIPSTEIN, New York, N. Y.

Direct surgical attack on the diseased mitral valve has become a well accepted procedure and many patients are now being subjected to operation. The results in general have been good but certain complications and sequelae have been observed which are peculiar to this type of surgery and which greatly increase the mortality and morbidity.

This paper deals with the immediate and late complications seen in a series of 250 patients undergoing surgery for mitral stenosis or insufficiency. The methods evolved for preventing and treating these complications are discussed. The following classification has been used:

- I. Technical Complications at Operation: (1) laceration of the auricle; (2) injury to the circumflex branch of the left coronary artery; (3) arterial emboli; (4) production of mitral insufficiency.
- II. Immediate Postoperative Complications: (1) cardiac arrhythmias; (2) shock syndrome; (3) cardiac failure; (4) bacterial endocarditis.
- III. Later Postoperative Complications: The post commissurotomy syndrome.

Of these, arterial emboli constitute the cause of the greatest mortality and the post commissurotomy syndrome the cause of the greatest morbidity. With increasing experience the prophylaxis against emboli has become so effective that they have occurred in only 1% of operations and no fatalities have resulted from them. The post commissurotomy syndrome has been effectively prevented by the routine

postoperative use of cortisone so that it no longer impairs the result of surgery.

41. The Surgical Treatment of Aortic Stenosis.

CHARLES P. BAILEY, H. E. BOLTON (*by invitation*), W. L. JAMISON (*by invitation*)

and H. T. NICHOLS (*by invitation*), Philadelphia, Pa.

Aortic stenosis may be of congenital, arteriosclerotic, or rheumatic origin. In the latter type of case commissural fusion of the valve leaflets is a constant and prominent feature. This pathological feature suggests, and provides, the feasibility of accomplishing improvement in function by anatomical separation of the valve elements. While a variable degree of valve calcification is present in over 90% of these cases, it usually does not preclude, although it may limit, the effectiveness of surgery.

Two reasonable approaches to the stenotic aortic valve have been devised - the transventricular, and transaortic. The latter implies the preliminary attachment of a plastic or tissue pouch to the wall of the ascending aorta. This method permits actual digital palpation of this valve, and in favorable cases (over 50%) simple separation of the commissures by blunt pressure. When an instrument is required it may be inserted along the finger through the pouch.

Our entire experience with the surgical treatment of this disease beginning on March 9, 1950, will be presented. By the time of presentation the total number in our series should be in excess of 300 operated cases. Suggestions for exact pre-operative diagnosis, selection of cases, and method of management will be made. A follow-up on the operated cases with pre and postoperative physiological examinations will be included.

42. The Use of Shunts in the Resection of the Thoracic Aorta.

J. MAXWELLCHAMBERLAIN, ROBERT KLOPSTOCK, PETER PARNASSA (*by invitation*),

A. GRANT (*by invitation*) and J. J. CINCOTTI,

New York, N. Y.

The resection of aortic aneurysms does not always require an artificial shunt, but occasionally a shunt is paramount to success. A shunt is usually necessary when the surgeon anticipates encroachment upon the cerebral circulation. Hypothermia may remove the tension of working against "time" or cerebral anoxia, but in the older patient the hazard of ventricular fibrillation must be considered. Furthermore, cerebral *hypertension*, and left ventricular strain accompany cross-clamping of the aorta. Experimental work will be presented to demonstrate this influence on the heart and cerebral circulation when the aorta is clamped under normal and hypothermic states.

Temporary shunts of plastic materials and heterologous blood vessels have been used experimentally and clinically. Blood pressure proximal and distal to the different shunts have been electronically recorded. The advantages of each will be discussed.

A short movie will be presented to demonstrate the use of a shunt made from a sterilized 225 lb. pig aorta during a 10-hour resection of an aorta in a 62-year-old male containing four aneurysms; the first in the arch opposite the innominate artery and the fourth at the level of the crux of the left diaphragm.

43. Patent Ductus Arteriosus with Hypertension: Analysis of Cases in Which Operation Was Performed.

F. HENRY ELLIS (*by invitation*), JOHN W. KIRKLIN and

EARL H. WOOD (*by invitation*), Rochester, Minn.

Clinical and physiologic data have been accumulated in recent years to help clarify those atypical cases of patent ductus arteriosus in which there is an associated pulmonary hypertension. There is, however, considerable disagreement as to the correct surgical management of these patients. The indications for operation are ill-defined and there is no clear concept of the postoperative results.

An analysis has therefore been made of approximately 25 cases of patent ductus arteriosus with pulmonary hypertension in which an operation was performed. Pre-

operative physiologic data have been obtained by cardiac catheterization in all cases. The analysis will be presented in some detail to emphasize certain hemodynamic features such as the bidirectional nature of some of the shunts and the variability of peripheral cyanosis in patients with right-to-left shunts. Physiologic data gathered at the time of operation and during the postoperative period in many cases will also be presented.

On the basis of these findings, cases of patent ductus arteriosus with pulmonary hypertension have been classified as follows:

1. Cases in which pressure in the pulmonary artery is elevated but is less than systemic arterial pressure.

2. Cases in which pressure in the pulmonary artery is equivalent to systemic arterial pressure.

a. With predominantly a left-to-right shunt.

b. With predominantly a right-to-left shunt.

The analysis of cases has led to certain conclusions concerning the surgical management of these patients particularly with reference to: (1) Criteria for the selection of patients for operation; (2) technical factors of importance during the operation and the postoperative period; (3) prognosis following operation.

ALPHABETICAL ROSTER

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The American Association for Thoracic Surgery 1954-1955

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Block, Robert G..... Montefiore Hospital, 210th and 72nd Sts., New York, N.Y.
Bradshaw, Howard..... Bowman Gray School of Medicine, Winston-Salem, N.C.
Brantigan, Otto C..... 104 W. Madison St., Baltimore, Md.
S Brewer, Lyman A., III..... 2010 Wilshire Blvd., Los Angeles 57, Calif.
Brown, A. Lincoln..... 490 Post St., San Francisco, Calif.
Brown, Robert K..... 1624 Gilpin St., Denver 6, Colo.
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Clagett, O. Theron..... Mayo Clinic, Rochester, Minn.
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Conklin, William S..... 1016 Standard Ins. Bldg., Portland 5, Ore.
Cotton, Bert Hollis..... 1321 N. Vermont Ave., Los Angeles 27, Calif.
Cournand, Andre..... Bellevue Hospital, 28th St. and 1st Ave., New York, N.Y.
Crandell, Walter B..... Veterans Adm. Hospital, White River Junction, Vt.
Crimm, Paul D..... Ohio Bldg., Sidney, Ohio
Curreri, Anthony R..... 1300 University Ave., Madison, Wis.
Curtis, George M..... Ohio State University, College of Medicine,
Columbus, Ohio
Dailey, James E..... 4109 Montrose Blvd., Houston 6, Texas
Daniel, Rollin A..... Vanderbilt University Medical School, Nashville, Tenn.
Davidson, Louis R..... 30 East 60th St., New York 22, N.Y.
Davis, Edgar W..... 1150 Connecticut Ave., Washington, D.C.
Day, J. Claude..... 307 David Whitney Bldg., Detroit 26, Mich.
DeBakey, Michael E..... Baylor University School of Medicine, Dept. of Surgery,
Houston, Texas

DeCamp, Major Paul Trumbull..... 1415 Marguerite St., Anniston, Ala.
 Decker, Harry R..... 730 The Park Bldg., 355 - 5th Ave., Pittsburgh 22, Pa.
 Dennis, Clarence E..... 989 Edgewood Ave., Pelham Manor, N.Y.
 Deterling, Ralph A..... 180 Ft. Washington Ave., New York, N.Y.
 Dodrill, Forest D..... 621 David Whitney Bldg., Detroit, Mich.
 Dorner, Ralph A..... 710 Equitable Bldg., Des Moines 9, Iowa
 Dorsey, John M..... 636 Church St., Evanston, Ill.
 Douglass, Richmond..... Biggs Memorial Hospital, Ithaca, N.Y.
 Drash, Everett C..... University of Virginia Hospital, Charlottesville, Va.
 Dugan, David J..... 459 - 30th St., Oakland 9, Calif.
 Effler, Donald B..... Euclid and East 93rd Sts., Cleveland, Ohio
 Cj Ehrenhaft, Johann L..... University of Iowa, Iowa City, Iowa
 Ellison, Robert G..... University Hospital, Augusta, Ga.
 Evans, Byron Henry..... 2940 Fresno St., Fresno, Calif.
 Fischer, Walter W..... 170 East 78th St., New York, N.Y.
 Forsee, James H., Col., M.C., U.S.A..... Medical Section, HQ AFFE, APO 343,
 c/o Postmaster, San Francisco, Calif.
 Freedlander, Samuel O..... 10515 Carnegie Ave., Cleveland, Ohio
 Gagnon, Edouard Donat..... 902 Est., Rue Sherbrooke, Montreal, Ont.
 Gale, Joseph W..... Wisconsin General Hospital, Madison 6, Wis.
 Garlock, John H..... 50 East 77th St., New York, N.Y.
 Gebauer, Paul..... Leahi Hospital, 649 Polole St., Honolulu, T.H.
 Gerbode, Frank L..... Stanford Univ. Hospital, San Francisco, Calif.
 Gibbon, John H., Jr..... 1025 Walnut St., Philadelphia, Pa.
 Glover, Robert P..... 269 S. 19th St., Philadelphia, Pa.
 Gordon, Joseph..... 106 Girard Blvd., S.E., Albuquerque, N.M.
 Grace, Archibald J..... 530 Wellington St., London, Ont.
 Gray, Howard K..... Mayo Clinic, Rochester, Minn.
 Gross, Robert E..... 300 Longwood Ave., Brookline, Mass.
 Grow, John B..... 3705 E. Colfax, Denver, Colo.
 Haight, Cameron..... University Hospital, Ann Arbor, Mich.
 Hanlon, Rollins..... 1401 S. Grand Blvd., St. Louis, Mo.
 Harken, Dwight E..... 67 Bay State Road, Boston 15, Mass.
 Harper, Frederick R..... 1104 Republic Bldg., Denver, Colo.
 Harrison, Albert W..... Medical Branch, University of Texas, Galveston, Texas
 Harrison, Harlon W..... Veterans Adm. Center, Whipple, Ariz.
 Harter, John S..... 212 Brown Bldg., Louisville 2, Ky.
 Head, Jerome R..... 55 E. Washington St., Chicago, Ill.
 Helmsworth, James A..... Cincinnati General Hospital, Cincinnati, Ohio
 Himmelstein, Aaron..... 70 East 96th St., New York 28, N.Y.
 Holinger, Paul H..... 700 N. Michigan Ave., Chicago, Ill.
 Holman, Cranston William..... 862 Fifth Ave., New York 21, N.Y.
 Holman, Emile..... 722 Funston Ave., San Francisco, Calif.
 Hudson, W. A..... 602 David Whitney Bldg., Detroit, Mich.
 Hughes, Felix A., Jr..... Kennedy Hospital, Memphis, Tenn.
 Humphreys, George H..... 180 Ft. Washington Ave., New York, N.Y.
 Jackson, Chevalier L..... 1901 Walnut St., Philadelphia, Pa.
 Janes, Ernest C..... 250 Main St., Hamilton, Ont.
 Janes, Robert M..... Medical Arts Bldg., Toronto, Ont.
 Johnson, Julian..... 3400 Spruce St., Philadelphia, Pa.
 Jones, John C..... 1136 West 6th St., Los Angeles, Calif.
 Joynt, G. H. C..... 399 Bathurst St., Toronto, Ont.
 Kay, Earle B..... 10465 Carnegie Ave., Cleveland, Ohio
 Kent, Edward M..... 1406 Clark Bldg., Pittsburgh 22, Pa.
 Kergin, Frederick G..... Medical Arts Bldg., Toronto 5, Ont.
 Kessler, Charles R..... 1027 Woodward Bldg., Birmingham 3, Ala.

Kinsella, Thomas J..... 1251 Medical Arts Bldg., Minneapolis, Minn.
 Kirby, Charles K..... 3400 Spruce St., Philadelphia, Pa.
 Klassen, Karl Peter..... Ohio State University, Columbus, Ohio
 Knoepp, Louis F..... Veterans Administration Hospital, Alexandria, La.
 Laird, Robert..... 399 Bathurst St., Toronto, Ont.
 Lam, Conrad R..... Henry Ford Hospital, Detroit, Mich.
 Lambert, Adrian, Jr..... 122 East 76th St., New York, N.Y.
 Langston, Hiram Thomas..... 133 Gage Road, Riverside, Ill.
 Leahy, Leon J..... 105 Medical Arts Bldg., Buffalo, N.Y.
 Lees, William Morris..... 185 N. Wabash Ave., Chicago 1, Ill.
 Lester, Charles W..... 70 East 80th St., New York, N.Y.
 Leven, N. Logan..... 1464 Lowry Medical Arts Bldg., St. Paul, Minn.
 Lindskog, Gustaf E..... 50 Marvel Road, New Haven, Conn.
 Lynch, Joseph P..... 1180 Beacon St., Brookline, Mass.
 McDonald, John R..... Mayo Clinic, Rochester, Minn.
 McGrath, Edward J..... Cincinnati General Hospital, Cincinnati, Ohio
 McIntosh, Clarence A..... 1390 Sherbrooke St., W., Montreal, Que.
 MacManus, Joseph..... 491 Delaware, Buffalo, N.Y.
 Maier, Herbert C..... 3 East 71st St., New York, N.Y.
 Major, Robert Carlisle..... University Hospital, Augusta, Ga.
 Maurer, Elmer P. R..... 827 Union Central Bldg., Cincinnati, Ohio
 Mautz, F. R..... University Hospital, Cleveland, Ohio
 Mayer, John Henry, Jr..... 829 West 55th St., Kansas City, Mo.
 Meade, Richard H..... Blodgett Medical Bldg., Grand Rapids, Mich.
 Meltzer, Herbert..... 224 Birks Bldg., Edmonton, Alberta
 Merendino, K. Alvin..... University of Washington, Seattle, Wash.
 Merkel, Carl G..... 8 Church St., Saranac Lake, N.Y.
 Meyer, Herbert Willy..... 170 East 78th St., New York, N.Y.
 Minor, George R..... University of Virginia Hospital, Charlottesville, Va.
 Miscall, Laurence..... 11 East 68th St., New York, N.Y.
 Moersch, Herman..... 725 Tenth Ave., Rochester, Minn.
 Moore, Julian A..... 404 Flatiron Bldg., Asheville, N.C.
 Moore, Richmond L..... 180 Ft. Washington Ave., New York, N.Y.
 Mudd, James L..... 634 N. Grand Blvd., St. Louis, Mo.
 Muller, Wm. H., Jr..... University of Virginia Hospital, Charlottesville, Va.
 Mulvihill, Daniel A..... 15 East 77th St., New York, N.Y.
 Murphy, James D..... Veterans Administration Hospital, Oteen, N.C.
 Newton, Harlan F..... 319 Longwood Ave., Boston, Mass.
 Nixon, J. W..... 1121 Nix Professional Bldg., San Antonio, Texas
 Oatway, William H., Jr..... La Vina Sanatorium, Altadena, Calif.
 Ochsner, Alton..... Tulane University School of Medicine, New Orleans, La.
 O'Neill, Thomas J..... 269 South 19th St., Philadelphia 3, Pa.
 O'Rourke, Paul V..... 307 David Whitney Bldg., Detroit, Mich.
 Overholt, Richard H..... 1101 Beacon St., Brookline, Mass.
 Paine, John Randolph..... The Buffalo General Hospital, 100 High St.,
 Buffalo, N.Y.
 Parker, Edward F..... 86 Hasell St., Charleston, S.C.
 Paulson, Donald L..... 3810 Swiss Ave., Dallas, Texas
 Pool, John L..... 755 Park Ave., New York 21, N.Y.
 Potts, Willis J..... 707 Fullerton Ave., Chicago 14, Ill.
 Proctor, Oscar S..... Box 126, University P.O., Seattle, Wash.
 Raine, Forrester..... 425 E. Wisconsin Ave., Milwaukee, Wis.
 Rasmussen, Richard A..... Blodgett Medical Bldg., Grand Rapids, Mich.
 Ravitch, Mark M..... Fifth Ave. and 100th St., New York 29, N.Y.
 Richards, Victor..... Stanford-Lane Hospital, San Francisco 15, Calif.
 Rienhoff, William F., Jr..... 1201 N. Calvert St., Baltimore, Md.

Riggins, H. McLeod..... 140 East 54th St., New York, N.Y.
 Robertson, Ross..... 3830 West 37th Ave., Vancouver, B.C.
 Rogers, W. L..... 490 Post St., San Francisco, Calif.
 Rosemond George Parrott..... 3401 Broad St., N., Philadelphia, Pa.
 Ross, Dudley E..... 974 Dunsmuir Road, Mount Royal, Que.
 Rumel, William R..... 807 Medical Arts Bldg., Salt Lake City, Utah
 Samson, Paul C..... 3959 Happy Valley Road, Lafayette, Calif.
 Sanger, Paul W..... Doctors Bldg., Kings Drive, Charlotte, N.C.
 Scannell, J. Gordon..... Massachusetts General Hospital, Boston, Mass.
 Schaffner, Vernon D..... Kentville, Nova Scotia
 Schmidt, Herbert Wm..... Mayo Clinic, Rochester, Minn.
 Scott, Henry W., Jr..... Vanderbilt University Hospital, Nashville, Tenn.
 Sealy, Will C..... Duke University Hospital, Durham, N.C.
 Shaw, Robert R..... 3810 Swiss Ave., Dallas, Texas
 Shefts, Laurence M..... 503 Moore Bldg., San Antonio, Texas
 Shumacker, Harris B., Jr..... Indiana University Medical Center, Indianapolis, Ind.
 Skinner, Edward F..... 899 Madison Ave., Memphis, Tenn.
 Skinner, George F..... 36 Coburg St., St. Johns, N.B.
 Sloan, Herbert..... University Hospital, Ann Arbor, Mich.
 Sommer, George N. J., Jr..... 120 W. State St., Trenton, N.J.
 Soutter, Lamar..... 203 Commonwealth Ave., Boston, Mass.
 Steele, J. D..... 1324 West Wisconsin Ave., Milwaukee 3, Wis.
 Stephens, H. Brodie..... 384 Post St., San Francisco, Calif.
 Strieder, John W..... 1180 Beacon St., Brookline, Mass.
 Swan, Henry, II..... 4200 E. 9th Ave., Denver 20, Colo.
 Sweet, Richard Harwood..... 205 Beacon St., Boston, Mass.
 Thompson, Samuel A..... 850 Park Ave., New York, N.Y.
 Touroff, Arthur S. W..... 994 Fifth Ave., New York 28, N.Y.
 Tuttle, William M..... 307 David Whitney Bldg., Detroit 26, Mich.
 Tyson, M. Dawson..... Hitchcock Clinic, Hanover, N.H.
 Van Hazel, Willard..... 224 S. Michigan Blvd., Chicago, Ill.
 Varco, Richard L..... University Hospital, Minneapolis, Minn.
 Vineberg, Arthur M..... 1390 Sherbrooke St., West, Montreal, Que.
 Waterman, David H..... 607 Medical Arts Bldg., Knoxville, Tenn.
 Watson, William Law..... 1088 Park Ave., New York, N.Y.
 Weinberg, Joseph A..... Veterans Administration Hospital, Long Beach, Calif.
 Welles, Edward S..... 110 Park Ave., Saranac Lake, N.Y.
 White, Marion Lawrence, Jr..... Huntington Bank Bldg., Huntington, W. Va.
 Williams, Mark H..... 63 Front St., Binghamton, N.Y.
 Wilson, Norman J..... 1101 Beacon St., Brookline, Mass.
 Woodruff, Warriner..... 8 Church St., Saranac Lake, N.Y.
 Woods, Francis M..... 1101 Beacon St., Brookline, Mass.
 Wright, George Wilbur..... 11311 Shaker Blvd., Cleveland 4, Ohio
 Wylie, Robert H..... 535 Park Ave., New York, N.Y.

ASSOCIATE MEMBERS

Ackman, F. Douglas..... 1374 Sherbrooke St., W., Montreal, Que.
 Adelman, Arthur..... Tokyo Army Hospital, A.P.O. 1052, San Francisco, Calif.
 Aitchison, David Bancroft..... Mount Sanatorium, Hamilton, Ont.
 Ashburn, Frank S..... 1835 Eye St., N.W., Washington, D.C.
 Auerbach, Oscar..... Veterans Adm. Hospital, East Orange, N.J.
 Badger, Theodore..... 264 Beacon St., Boston, Mass.
 Bahnson, Henry T..... 201 Cedarcroft Road, Baltimore 12, Md.
 Baronofsky, Ivan D..... 1216 Powderhorn Terrace, Minneapolis, Minn.
 Beecher, Henry K..... Massachusetts General Hospital, Boston 14, Mass.
 Benedict, Edward Benson..... Massachusetts General Hospital, Boston 14, Mass.
 Benoit, Hector W., Jr..... 618 Professional Bldg., Kansas City 6, Mo.

Berg, Ralph, Jr..... 231 Medical Center Bldg., Spokane 4, Wash.
 Black, Harrison..... 67 Bay State Road, Boston 15, Mass.
 Bloomberg, Allan E..... 4 East 88th St., New York 28, N.Y.
 Bortone, Frank..... 2765 Hudson Blvd., Jersey City, N.J.
 Bosher, Louis H..... 1200 E. Broad St., Richmond, Va.
 Bosquet, Ernest O..... 5689 Boulevard Rosemont, Montreal, Que.
 Boyd, David P..... 605 Commonwealth Ave., Boston, Mass.
 Brindley, George Valter, Jr..... Scott and White Clinic, Temple, Texas
 Brownrigg, Garrett M..... 47 Queens Rd., St. Johns, Newfoundland
 Bruneau, Jacques..... 847 Cherrier, Montreal 24, Que.
 Bryant, Joseph Ray..... 321 West Broadway, Louisville 2, Ky.
 Burbank, Benjamin..... 244 Henry St., Brooklyn 2, N.Y.
 Carlson, Robert I..... Veterans Administration Hospital, Nashville, Tenn.
 Carter, Max G..... 614 Orange St., New Haven, Conn.
 Chambers, John S., Jr..... 233 "A" St., Room 1205, San Diego 1, Calif.
 Chandler, John Hughes..... 420 E. Main St., Jackson, Tenn.
 Chesney, John G..... 2300 Biscayne Blvd., Miami, Fla.
 Chodoff, Richard Joseph..... 255 S. 17th St., Philadelphia, Pa.
 Chunn, Charles Francis..... 442 W. Lafayette St., Tampa 6, Fla.
 Cincotti, John J..... Veterans Administration Hospital, Brooklyn 9, N.Y.
 Cooley, Denton A..... Baylor University College of Medicine,
 Houston 25, Texas
 Cooper, David A..... 1520 Spruce St., Philadelphia, Pa.
 Cox, William V..... 133 Court St., Auburn, Maine
 Cracovaner, Arthur J..... 114 East 72nd St., New York, N.Y.
 Crecca, Anthony Daniel..... 376 Roseville Ave., Newark 7, N.J.
 Cutler, Preston R..... 807 Medical Arts Bldg., Salt Lake City 1, Utah
 Dafoe, Colin S..... 11037 - 80th Ave., Edmonton, Alberta
 Dasch, Frederick W..... 5908 Greene St., Philadelphia 44, Pa.
 Daughtry, DeWitt C..... 4201 Lake Road, Bay Point, Miami, Fla.
 Davison, Richard..... 5300 N. Christian Ave., Chicago 13, Ill.
 Deaton, W. Ralph, Jr..... 153 Bishop St., Greensboro, N.C.
 Delarue, Norman C..... 25 Donlea Drive, Toronto 7, Ont.
 De Matteis, Albert..... 1216- 13th Ave., Altoona, Pa.
 Deshaies, Georges..... 37 Bellingham Road, Montreal, Que.
 Diveley, Walter L..... 2122 West End Ave., Nashville 5, Tenn.
 Dodds, G. Alfred..... 807 Broadway, Fargo, N.D.
 Domm, Sheldon E..... 605 W. Main Ave., Knoxville, Tenn.
 Drake, Emerson H..... 29 Deering St., Portland, Maine
 Eglee, Edward P..... 105 East 53rd St., New York, N.Y.
 Emerson, George L..... 26 Strathallan Park, Rochester 7, N.Y.
 Falor, William H..... 623 Second National Bldg., Akron 8, Ohio
 Fell, Egbert H..... 122 So. Michigan Ave., Chicago 3, Ill.
 Finnerty, James..... 862 Park Ave., New York 21, N.Y.
 Fishback, Frederick C..... 1835 Eye St., N.W., Washington, D.C.
 Ford, William B..... 1107 Clark Bldg., Pittsburgh 22, Pa.
 Fox, Robert..... 636 Church St., Evanston, Ill.
 Frank, Howard A..... 330 Brookline Ave., Boston 15, Mass.
 Friedlander, Ralph..... 1215 - 5th Ave., New York 29, N.Y.
 Friesen, Stanley R..... 39th and Rainbow, Kansas City 3, Kansas
 Gaensler, Edward A., Capt. (MC) USAF..... Box 469, Sampson AFB,
 Geneva, N.Y.
 Geary, Paul..... 909 Park Ave., Plainfield, N.J.
 Goldman, Alfred..... 416 N. Bedford Drive, Beverly Hills, Calif.
 Grace, Edwin J..... 121 Fort Green Place, Brooklyn, N.Y.
 Grimes, Orville F..... University of California Hosp., San Francisco 22, Calif.

Hampton, Foster, Jr..... Suite 101, Interstate Bldg., Chattanooga, Tenn.
 Hardy, James D..... Tennessee School of Medicine, Memphis, Tenn.
 Harrison, Elliott..... 1862 West Broadway, Vancouver, B.C.
 Herben, George F..... House of Rest at Sprain Ridge, Yonkers, N.Y.
 Heroy, William W..... 22 Oakwood Road, Huntington, N.Y.
 Herrera-Llerandi, Rodolfo E..... 7-A Avenida Sur 18, Guatemala City, Guatemala
 Hertzler, Jack H..... 4377 West Maple Road, Birmingham, Mich.
 Higginson, John F..... 2455 N.W. Marshall St., Portland, Ore.
 Hochberg, Lew A..... 135 Eastern Parkway, Brooklyn 17, N.Y.
 Hopkins, William A..... 710 Peachtree Street, Atlanta, Ga.
 Hudson, Theodore R..... 55 E. Washington St., Chicago, Ill.
 Hun, Henry..... 149 Washington Ave., Albany, N.Y.
 Hurley, G. A. Patrick..... 1538 Sherbrooke St., W., Montreal, Que.
 Hurwitt, Elliott S..... 33 Pinecrest Parkway, Hastings-on-Hudson, N.Y.
 Hurwitz, Alfred..... Veterans Administration Hospital, West Haven 16, Conn.
 Ingram, Ivan N..... 350 Post St., San Francisco 8, Calif.
 Iovine, Vincent M..... 1150 Connecticut Ave., N.W., Washington, D.C.
 Jarvis, Fred J..... 819 Boylston Ave., Seattle 4, Wash.
 Johnson, Clive R..... 1216 Pennsylvania Ave., Fort Worth 4, Texas
 Johnson, Elgie K..... 909 President St., Brooklyn, N.Y.
 Johnson, Hollis E..... 2122 West End Ave., Nashville, Tenn.
 Johnston, James H., Jr..... 727 Carlisle St., Jackson, Miss.
 Judd, Archibald R..... 304 N. Fourth St., Hamburg, Pa.
 Kelley, Winfield O..... Uncas on Thames, Norwich, Conn.
 Kemler, R. Leonard..... 576 Farmington Ave., Hartford 5, Conn.
 Kenney, Leo J..... Henry Ford Hospital, Detroit 2, Mich.
 King, Richard..... 814 Doctors Bldg., Atlanta, Ga.
 Kipp, Harold A..... Mercy Hospital, Pittsburgh, Pa.
 Kirklin, John W..... Mayo Clinic, Rochester, Minn.
 Kirschner, Paul A..... 3 East 73rd St., New York 21, N.Y.
 Klepser, Roy George..... 1835 Eye St., N.W., Washington, D.C.
 Klopstock, Robert..... Veterans Administration Hospital, Brooklyn 9, N.Y.
 Kraeft, Nelson H..... 1501 Magnolia Drive, Tallahassee, Fla.
 Kunderman, Phillip J..... 165 Livingston Ave., New Brunswick, N.J.
 Kunstler, Walter E..... 5238 Queen Mary Road, Montreal, Que.
 Lampson, Rutledge Starr..... 85 Jefferson St., Hartford, Conn.
 Laurey, James R..... 1318 Girard St., N.W., Washington, D.C.
 Lawrence, Edwin A..... Indiana University Medical Center, Indianapolis, Ind.
 Leeds, Sanford E..... 2211 Post St., San Francisco 15, Calif.
 Leetch, Henry W..... 108 Main St., Saranac Lake, N.Y.
 Leibovitz, Martin..... 812 Medical Arts Bldg., Tulsa, Okla.
 Lewis, Floyd J..... University Hospitals, Minneapolis 14, Minn.
 Lewis, Rubin M..... 2380 Ellsworth, Berkeley, Calif.
 Lillehei, Clarence W..... University Hospitals, Minneapolis 14, Minn.
 Longacre, Jacob James..... 1503 Carew Tower, Cincinnati, Ohio
 Lucido, Joseph L..... 634 North Grand, St. Louis 3, Mo.
 Lyon, Clayton..... 384 Post St., San Francisco, Calif.
 MacDonald, Neil..... Medical Arts Bldg., Windsor, Ont.
 Saul Allen..... 104 S. Michigan Ave., Chicago 3, Ill.
 Macpherson, Lachlan..... St. John Tuberculosis Hospital, East St. John, N.B.
 Mader, Victor O..... 149 S. Park St., Halifax, Nova Scotia
 Mannix, Edgar P..... 7539 Kessel St., Forest Hills, N.Y.
 Mason, James Monroe, III..... 1023 South 20th St., Birmingham, Ala.
 Melick, Dermont W..... 1005 Professional Bldg., Phoenix, Ariz.
 Mendelssohn, Edwin..... 255 South 17th St., Philadelphia 3, Pa.
 Mendelssohn, Harvey J..... 2065 Adelbert Road, Cleveland, Ohio

Michelson, Elliott..... 1801 Eutaw Place, Baltimore, Md.
 Miller, Carrol C..... 304 Humphrey St., Swampscott, Mass.
 Miller, Felix P..... 109 N. Oregon St., El Paso, Texas
 Mills, Waldo O..... 1445 Medical and Dental Bldg., Seattle 1, Wash.
 Mousel, Lloyd H..... Dept. of Anesthesiology, The Swedish Hospital,
 Seattle, Wash.
 Olsen, Arthur M..... 102 - 2nd Ave., S.W., Rochester, Minn.
 O'Neill, James F..... 32 Roslyn Ave., Glenside, Pa.
 Papper, Emmanuel M..... 622 West 168th St., New York 32, N.Y.
 Peters, Richard M..... Dept. of Surgery, Chapel Hill, N.C.
 Phillips, Francis J..... Seward Sanatorium, Seward, Alaska
 Pinkham, Roland D..... Suite 1445, Medico-Dental Bldg., Seattle, Wash.
 Pollock, William C., Col. (MC), U.S.A..... 1336 Cherry St., Denver 8, Colo.
 Karl..... 1130 S.W. Morrison St., Portland, Ore.
 Potter, Benjamin P..... 821 Bergen Ave., Jersey City, N.J.
 Pratt, Lawrence A..... 3919 John R. Street, Detroit, Mich.
 Quinlan, John J..... Nova Scotia Sanatorium, Kentville, Nova Scotia
 Ramsay, Beatty H..... 12300 Wilshire Blvd., Los Angeles 25, Calif.
 Read, Charles T..... 550 West Thomas Road, Phoenix, Ariz.
 Ripstein, Charles B..... 54 Rose Ave., Great Neck, L.I., N.Y.
 Roe, Benson B..... 384 Post St., San Francisco 8, Calif.
 Ryan, Bernard J..... 375 East Main St., Bay Shore, N.Y.
 Ryan, Thomas C..... 90 Shenango St., Greenville, Pa.
 Sanes, Gilmore M..... 3500 Fifth Ave., Pittsburgh 13, Pa.
 Sarot, Irving A..... Ill East 69th St., New York 21, N.Y.
 Schafer, Paul W..... c/o Message Center, Walter Reed Army Hospital,
 Washington, D.C.
 Seley, Gabriel..... 540 Park Ave., New York 21, N.Y.
 Seybold, William D..... Hermann Professional Bldg., Houston, Texas
 Shipman, Sidney..... 490 Post St., San Francisco, Calif.
 Simpson, H. Murray..... 292 Queen's Ave., London, Ont.
 Skinner, A. M..... Homer Folks Tuberculosis Hospital, Oneonta, N.Y.
 Snyder, Howard E..... 103V2 E. Ninth Ave., Winfield, Kansas
 Snyder, John M..... 1236 Moffitt Ave., Bethlehem, Pa.
 Stayman, Joseph..... Germantown Hospital, Philadelphia 44, Pa.
 Stenstrom, John D..... 2390 Bowker Ave., Victoria, B.C.
 Storey, Clifford F., Capt. (MC)..... U.S. Naval Hospital, Portsmouth, Va.
 Stranahan, Allan..... Albany Hospital, Albany, N.Y.
 Strode, Joseph E..... 1021 Kapiolani, Honolulu 14, T.H.
 Sullivan, Herbert J..... 58 Wellington St., South Hamilton, Ont.
 Swenson, Orvar..... 300 Longwood Ave., Boston, Mass.
 Templeton, John Y., III..... 1025 Walnut St., Philadelphia 7, Pa.
 Terrill, Frank I..... Montana State Tuberculosis Sanatorium, Deer Lodge, Mont.
 Test, Frederick C., II..... 91 Cass Ave., Mount Clemens, Mich.
 Tillou, Donald J..... 311 W. Church St., Elmira, N.Y.
 Tricerri, Fernando E..... Callao 1924, 6 Piso, Buenos Aires, Argentina
 Valle, A. R..... U.S.P.H.S. Hospital, Detroit, Mich.
 Veal, J. Ross..... 3560 Appleton St., N.W., Washington, D.C.
 Vorwald, Arthur J..... College of Medicine, Wayne University, Detroit, Mich.
 Waddell, William R..... 69 Woodland Road, Chestnut Hill, Mass.
 Walker, James H..... 1112 Virginia St., East, Charleston, W. Va.
 Ware, Paul F., Capt. (MC)..... Fitzsimons Army Hospital, Denver 8, Colo.
 Watkins, Elton, Jr..... 300 Longwood Ave., Boston 15, Mass.
 Webb, Watts R..... Sanatorium, Miss.
 Weisel, Wilson..... 324 E. Wisconsin Ave., Milwaukee 2, Wis.
 Whiteside, William C..... 342 Birks Bldg., Edmonton, Alberta

Willauer, George..... 1930 Chestnut St., Philadelphia, Pa.
 Wilson, Julius L..... Henry Phipps Institute, Philadelphia, Pa.
 Wiper, Thomas B..... 536 Mason St., San Francisco, Calif.
 Witmer, Robert H..... 126 East Chestnut St., Lancaster, Pa.
 Wolff, William..... 502 Park Ave., New York 22, N.Y.

SENIOR MEMBERS

Allen, Duff S..... (Mail Returned), Washington Univ. Med. School, St. Louis, Mo.
 Amberson, J. B..... Bellevue Hospital, New York, N.Y.
 Ballou, David..... 1538 Sherbrooke St., N., Montreal 25, Que.
 Bazin, A. T..... 1414 Drummond St., Montreal, Que.
 Beck, Claude S..... 2065 Adelbert Road, Cleveland, Ohio
 Berry, Frank B..... 4301 Massachusetts Ave., Washington 16, D.C.
 Bettman, Ralph B..... 104 S. Michigan Ave., Chicago, Ill.
 Bigger, Isaac A..... Medical College of Virginia, Richmond, Va.
 BJalock, Alfred..... Johns Hopkins Hospital, Baltimore, Md.
 Butler, Ethan Flagg..... 956 West Water Street, Elmira, N.Y.
 Byers, H. Roddick..... Ganonoque, Ont.
 Carlson, Herbert A..... 4241 East 14th St., Long Beach, Calif.
 Carter, B. Noland..... Cincinnati General Hospital, Cincinnati, Ohio
 Churchill, Edward D..... Massachusetts General Hospital, Boston, Mass.
 Clerf, Louis H..... 1530 Locust St., Philadelphia, Pa.
 Cole, Dean B..... Professional Bldg., Richmond, Va.
 Crowe, Samuel J..... Johns Hopkins Hospital, Baltimore, Md.
 Dieffenbach, Richard H..... 570 Mt. Prospect Ave., Newark 4, N.J.
 Dolley, Frank S..... 2010 Wilshire Blvd., Los Angeles 57, Calif.
 Dovell, Chauncey D., Col. (MC), U.S.A..... Regional Hospital, Fort Sheridan, Ill.
 E'ggers, Carl..... 850 Park Ave., New York, N.Y.
 Elkin, Daniel C..... Elkin Place, Lancaster, Ky.
 Eloesser, Leo..... 490 Post St., San Francisco, Calif.
 Faulkner, William B., Jr..... 1802 Fillmore St., San Francisco, Calif.
 Ferguson, R. G..... Ft. San, Sask.
 Flick, John B..... The Pennsylvania Hospital, 8th and Spruce St., Philadelphia, Pa.
 Frank, Louis W..... 614 Heyburn Bldg., Louisville, Ky.
 Graham, Evarts A..... Barnes Hospital, St. Louis 10, Mo.
 Harrington, Stuart W..... Mayo Clinic, Rochester, Minn.
 Hart, Deryl..... Duke University, Durham, N.C.
 Hayes, John N..... 24 Church St., Saranac Lake, N.Y.
 T Heinbecker, Peter..... Washington University Medical School, St. Louis, Mo.
 Johns, Frank S..... Johnston-Willis Hospital, Richmond, Va.
 Kernan, John D..... 103 East 78th St., New York, N.Y.
 King, Donald S..... Massachusetts General Hospital, Boston, Mass.
 Lemon, Willis S..... 1100 Kensington Ave., Clifton Forge, Va.
 Lewald, Leon T..... 1200 Fifth Ave., New York, N.Y.
 Lockwood, A. L..... 300 Bloor St., E. Toronto, Ont.
 Miller, Robert T., Jr..... Mountain Lake, Lake Wales, Fla.
 Myers, J. Arthur..... 730 LaSalle Bldg., Minneapolis, Minn.
 Neuhoof, Harold..... Box 198, Huntington Road, Stafford, Conn.
 O'Brien, Edward J..... 307 David Whitney Bldg., Detroit 26, Mich.
 Ornstein, George..... 965 Fifth Ave., New York, N.Y.
 Packard, Edward N..... 142 Park Ave., Saranac Lake, N.Y.
 Pickhardt, Otto C..... 66 East 79th St., New York, N.Y.
 Rigler, Leo G..... University Hospital, Minneapolis, Minn.
 Shipley, Arthur M..... University Hospital, Baltimore, Md.
 Smith, David T..... Duke University, Durham, N.C.
 Stewart, George A..... 3301 N. Charles St., Baltimore, Md.
 Thorburn, Grant..... 1602 West Genessee St., Flint, Mich.

Tucker, Gabriel..... 250 South 19th St., Philadelphia, Pa.
 Van Allen, Chester M..... State Hospital, Bikaner, Rajputana, India
 Wangenstein, Owen H..... University Hospital, Minneapolis, Minn.
 Whittemore, Wyman..... Boyce, Va.
MEMBERS DECEASED
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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