Henry Ford Hospital Medical Journal

Volume 18 | Number 3 Article 11

9-1970

A Decade of Heart Surgery and a Look Into the Future

Conrad R. Lam

Henry Ford Hosp. Med. Journal
Vol. 18, No. 3, 1970

NOTES AND COMMENTS

A Decade of Heart Surgery and a Look Into the Future

Conrad R. Lam, M.D.*

In May, 1970, the doctors of Michigan were invited to attend the scientific sessions of the Michigan Heart Association at Cobo Hall in Detroit. The program committee, of which I was a member, hoped that the program would display the very latest advances in the treatment of heart disease with emphasis on the potential contributions of the cardiac surgeon. A number of prominent cardiologists and cardiac surgeons from over this nation and Canada accepted invitations to come to Detroit for this meeting, the theme of which was "Cardiology and Surgery—More Hope for the Seventies."

When the topics for discussion had been chosen, and the speakers selected, it suddenly dawned on me that we had answers, partial or complete, to all of the unsolved problems in heart disease which I had listed nine years before in a speech entitled "Surgery's Last Frontier, the Heart." This was the presidential address at the annual dinner of the Michigan Academy of Science, Arts and Letters. In this talk, I traced the origins and progress of heart surgery, starting with the first suturing of a wound of the heart in 1896. In 1961, the mechanical heart-lung apparatus had been available for five years, and heart surgeons had been able to accomplish much in the repair of hearts with congenital and acquired defects. However, I suggested that there was still much opportunity for progress, and concluded the address with the following paragraph:

> "Many problems in heart surgery remain to be solved. Only a few of them can even be defined at this time. One of the most obvious is the problem of coronary artery disease. It is very likely that when anatomic localization of the arterial block is more precise and operative technique more refined, the surgeon will be able to do a great amount of good before the hardworking investigators are able to tell us how to prevent atherosclerosis. Durable plastic parts for the heart are practically with us. Transplantation of the heart may become physiologically possible when the secrets of antibody formation are known, but by that time we shall probably have an implantable plastic pump with built-in atomic power. The artificial electrical excitation of the heart with 'block' is already possible in a crude way, but small pacemaker units that can be recharged by induction are almost ready for placing in human cases. Much remains to be learned, however, about the electrical control of the heart. Several congenital anomalies have defied our efforts at correction. Some of these are transposition of the great vessels, tricuspid atresia and truncus arteriosus."

Today, we can now go over the problems mentioned and pair them up, item by item, with presentations on the program of that scientific session.

First: coronary artery disease. In our program, Dr. Harvey Kemp, formerly of Boston and now of New York, reminded us how "anatomic localization of the arterial block" has in fact become precise, by the coronary angiography method of Dr. Mason Sones of the Cleveland Clinic (he got his start in heart catheterization technics at the Henry Ford Hospital).

*Division of Thoracic Surgery, Department of Surgery

After the block has been localized, the heart surgeon can immediately provide additional blood to the heart muscle by a vein graft from the aorta to the artery beyond the point of obstruction. At the Michigan Heart meeting, this technic was explained by Dr. W. Dudley Johnson of Milwaukee, a surgeon who has had great success with the operation.

Second: "Durable plastic parts of the heart are practically with us." As we know, it is now common for heart surgeons to replace damaged heart valves with "durable" artificial valves. the first practical one being that of Dr. Albert Starr of Portland, Oregon. At the scientific sessions, the present status of heart valves was presented by Dr. Rodman E. Taber of the Henry Ford Hospital, and Dr. Joe Morris of the University of Michigan. They reported that athough some problems remain, the modern prosthetic heart valve is a very useful device.

Third: "Transplantation of the heart may become physiologically possible when the secrets of antibody formations are known . . ." The heart transplantation story is well-known by doctors and the laity, but the doctors at the Scientific Sessions were brought up to date by one of the more successful of the surgeons who have transplanted hearts—Dr. Donald Kahn of the University of Michigan.

Fourth: "The artificial electrical excitation of the heart with 'block' is already possible in a crude way, but small pacemaker units . . . are almost ready for placing in human cases." Now, implantable pacemakers have been available for several years, and the companies which make them are busy supplying the demand. Dr. William Chardack of Buffalo and his engineer cohort, Mr. Wilson Greatbatch, deserve great credit for their pioneer work in this field. Recent refinements in pacemakers include the "demand" pacemaker, which sends an impulse only when it is needed, ie, when the heart slows down. At the Michigan Heart Association meeting, advances in pacemaker technology were presented by Dr. Richard Judge of the University of Michigan.

Fifth: "Several congenital anomalies have defied our efforts at correction. Some of these are transposition of the great vessels, tricuspid atresia, and truncus arteriosus." On the program at Cobo Hall was Dr. William Mustard of Toronto, who described his ingenious operation to correct transposition of the great vessels. In this operation, the inner anatomy of the auricles is changed by a partition made of pericardium, so that blood from the right auricle goes into the left ventricle, and vice versa. But, this operation is practical only on children who have survived infancy. Most children with transposition of the great vessels do not survive, unless something is done in the first few days of life to permit mixing of the blood in the auricles. A large hole in the atrial septum will suffice, and this can be made by a "closed" procedure—the Blalock-Hanlon operation, or by a "non-operative" procedure, balloon septostomy, in which a catheter with a balloon on the tip is passed from a leg vein into the heart and through the foramen ovale. The balloon is then inflated and the catheter is pulled *hard,* producing a tear in the septum. Dr. Milton Paul, cardiologist of the Children's Memorial Hospital in Chicago, told of this and other

methods of saving the lives of desperately ill newborn babies.

Great palliation for the cyanotic child with *tricuspid atresia* is now possible with the use of the operation devised by Dr. William Glenn of New Haven, in which the right side of the heart is by-passed completely by the blood from the upper part of the body, with the superior vena cava being anastomosed to the right main pulmonary artery. Dr. Eduardo Arciniegas of the Henry Ford Hospital reported on five operations of this type for tricuspid atresia, all successful.

The most dramatic operation of all, the correction of *truncus arteriosus,* was reported by Dr. Dwight Magoon of the Mayo Clinic. With the congenital deformity called "truncus arteriosus," only one large vessel comes off the heart, instead of two—the pulmonary artery and the aorta. Dr. Magoon told how the anomaly had been corrected by the use of an aortic homograft with its valve, which connected the right ventricle with the two pulmonary arteries. Dr. Magoon was speaking in the place of Dr. Gian Rastelli, the young surgeon who came from Italy to the Mayo Clinic to do surgical research, and who had worked out the details of the operation on experimental animals. Dr. Rastelli was originally on the program, but could not fulfill his commitment—he had died a few weeks before the meeting date of Hodgkin's disease.

Now, for that look into the future. One's first impulse is to think that most everything has been done, and that the challenges and opportunities of a decade ago are not so plentiful now. We know this is not true. In Edison's laboratory at Menlo Park, New Jersey, there was a sign with the obvious purpose of dispelling complacency from his staff and perhaps himself. It read: "There's a better way to do it—find it." We must admit that there is a better way to do most or all of the things we do now.

The most frequent question asked of those who make predictions about heart surgery is that regarding replacement of the heart by transplantation or a completely artificial device. The inherent shortage of human donors for hearts makes homotransplantation of exceedingly limited value, even if great progress were made in conquering the rejection phenomenon. Xenografts from animals with hearts of comparable size could be practical, and since we have seen (via television) a man walk on the moon, I would not say this is an impossible dream. With regard to the artificial implantable heart, Dr. DeBakey's prediction ("We will have an artificial heart in five years"—Parade Magazine, May 16, 1965) has been as disappointing as that of another prominent Texan with regard to the time of the termination of the Viet Nam war. It is likely that the problem of power (atomic) will be solved in due time. But there is slow progress on making even a lining for an artificial heart so that thrombosis will not occur. It seems that blood has a remarkable tendency to clot when it touches anything other than endothelium.

It is difficult to hazard a guess regarding the next break-through in surgery for coronary artery disease. Undoubtedly, there will be much greater application of the three recently devised methods of direct operations on occluded coronary arteries, the bypass of the obstruction by a saphenous vein

graft from the aorta to the coronary artery, and "gas endarterectomy," and direct suture of the internal mammary artery to the end or side of a cornary artery.

There is room for considerable improvement in artificial heart valves. Although they are better than the deformed diseased valves which they replace, they are really pitiful substitutions for nature's valves, which have thin, pliable leaflets which move aside efficiently to allow the escape of blood, rather than presenting the obstruction inherent in a ball or disc poppet. And the danger of thrombosis on the artificial structure is so great that most patients face a lifetime of the "blood-thinner" regime.

The opportunities for brilliant advances in the surgery of congenital heart disease really seem more limited now than 10 years ago. Heart transplantation seems the only answer to some anomalies, such as endocardial fibroelastosis and certain cases of anomalous origin of the left coronary artery from the pulmonary artery.

Undoubtedly, there will be innovations in the armamentarium of the cardiac surgeon, and important among these will be improvements in pump-oxygenators. As the membrane "lung" becomes more sophisticated, and the pumps become less traumatic, artificial oxygenation of the blood for days or weeks may be expected. Probably we will be supporting the patient with massive myocardial infarctions for a considerable period of time after which the heart will be ready to carry the load, or the infarct or early ventricular aneursym will be excised.

Ten years ago, it seemed easier to define the problems which lay immediately ahead at the frontier of heart surgery. The fact that there seem to be fewer problems at hand is probably more of an indication of the maturity (let's don't say "age") of the writer than of a true paucity of opportunities. I would suspect that Sir James Paget was near the end of his productive career in 1896 when he wrote in his book "Surgery of the Chest": "Surgery of the heart has probably reached the limits set by nature to all surgery: no new method and no new discovery can overcome the natural difficulties which attend a wound of the heart." In contradistinction to this quotation, we have this from "Boss" Kettering, the inventor of the self-starter, and a great personal friend of Dr. Roy D. McClure (who was the first Chief of Surgery at Henry Ford Hospital): "In my opinion, we have to date chipped away only a few fragments from the Mountain of Knowledge—fragments that have changed our entire way of life. But looming ahead of us, practically intact, lies a huge mass of fundamental facts, any one of which, if uncovered, could change our civilization."* Mr. Kettering said this in 1955. If he were alive today, he would undoubtedly rejoice with us at the progress which has been made in heart surgery. But, he would probably urge us to keep chipping away at that Mountain of Knowledge which is still almost intact.

---

*Quoted by permission from Boyd, T. A.: *Prophet of Progress: Selections from the speeches of Charles F. Kettering*, 1961, New York, E. P. Dutton and Co. Dr. Boyd informs me that these remarks were made during Mr. Kettering's talk to a group of high school students at the Engineering Society of Detroit in June, 1955, three years before he died at the age of 82.