Atrial Myxoma:

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INTRODUCTION:

Intracardiac tumors continue to remain a mystifying and elusive diagnostic challenge for the Cardiologist. On the other hand, benign tumors of the heart offer the Cardiac Surgeon the opportunity to offer a patient a complete cure of a lesion rather than a palliative procedure, such as a valve replacement or coronary artery by-pass grafting. The Cardiovascular Technicians in our institution have the great fortune to share in both the challenge of a diagnostic work up and the satisfaction of aiding in the surgical correction of cardiac lesions.

The diagnosis of Atrial Myxoma is usually made after a patient has experienced some type of disastrous embolic episode. This paper deals with the now accepted use of echocardiographic diagnostic procedure, performed by technicians, and our technique for surgical removal of a large left atrial myxoma. We also hope to share with you some of our ideas and methods, both in the Catheterization Laboratory and in Open Heart Surgery, now practiced in our institution.

CASE REPORT:

H. G. was a 40 year old Engineer admitted with the diagnosis of myocardiopathy for the purpose of cardiac evaluation. He had a history of progressive dyspnea for four (4) months with constant aching in the chest. He had three (3) pillow orthopnea, with no significant edema. He was taking Digitalis, Pronestyl, Potassium, and diuretics. There was no history of rheumatic fever, arthritis, or hypertension. He was known to have a heart murmur for 1½ years; he had a normal ECG four (4) months prior to admission.

On physical exam there was a Grade II right ventricular lift. The PMI was in the fifth (5th) intercostal space at the mid-clavicular line and an apical thrill was present with a Grade III systolic murmur in the mitral area. The remainder of the physical exam was unremarkable.

Routine lab work was normal. ECG showed biatrial enlargement and right ventricular hypertrophy with S-1, S-2, S-3 syndrome. Chest X-Ray and cardiac fluroscopy showed moderate to severe cardiomegly with CT ratio of 20 to 35.7 cm with left atrium 2+ enlarged and without paradoxical pulsations. The left ventricle was 1 to 2+ enlarged with good contractions. No intracardiac calcifications were seen and the aorta was normal. Evidence of severe pulmonary venous hypertension and moderate pulmonary arterial hypertension were noted.

The next day the patient was brought to the Atraumatic Cardiovascular Diagnostic Laboratory where Vectorcardiography confirmed right ventricular hypertrophy. There was an apical systolic murmur of mitral incompetence in the supine position that disappeared in the recumbent position. There was a Grade II low frequency decrescendo and crescendo diastolic murmur at the mitral area and a high frequency diastolic murmur at the pulmonic area. The carotid pulse tracing was normal. Echocardiography showed mild left atrial enlargement with a size of 2.3 cm/m^2. Left ventricular size was mildly enlarged and echo volume study showed an ejection fraction of 0.48. Mitral valve amplitude was 35 mm and the E to F slope velocity was approximately 85 mm/sec. There was a large mobile mass identified that moved behind the anterior mitral valve leaflet echo and down in the left ventricle in diastole. The tricuspic valve echo revealed no mass but closing velocity was consistant with tricuspid incompetence. The diagnosis of left atrial tumor was made.

The Cardiovascular Technician's Role in Diagnosis and Treatment

The following day a right and left heart catheterization and coronary angiograms were done. The pressure findings were: right atrium $\underline{\overline{6}}$; right ventricle 88/0-12; pulmonary artery 91/34 $\overline{56}$; pulmonary artery oxygen saturation was 66%. Pulmonary capillary pressure was not obtained because the large right atrium would not allow the catheter to wedge; left ventricular pressure was 80/0-4; aortic pressure was 80/62 $\overline{70}$; aortic oxygen saturation was 98%. Coronary angiograms were normal. Cine' left ventriculogram showed enlarged left ventricle and Grade II or VI mitral incompetence. With contrast in both the left atrium and left ventricle a large mobile mass was shown to move from the left atrium across the mitral valve and protrude partly down into the left ventricle in diastole. The diagnosis of left atrial tumor was confirmed.

On February 2nd, under general Morphine anesthesia, a median sternotomy was performed on the patient. He was placed on cardiopulmonary by-pass with a Sarns Model 2000 Roller Pump and a Bentley Oxygenator with additional Swank filtration in the cardiotomy line. The patient was cooled to 30 degrees Centrigrade. A left ventricular vent was placed utilizing gravity drainage, and the heart was electrically fibrillated. The large right atrium was widely opened and the attachment of the stalk of the tumor was identified in the septum. The aorta was crossclamped. The septum was opened, suction on the left ventricular vent was started, and a portion of the septum at the attachment sight was resected. The incision in the septum was widened and the tumor was pulled through the septum intact. The atrial septum was then repaired with suturing. Air was aspirated as the heart was allowed to fill and the aortic crossclamp was released. Aortic crossclamp time was 13 minutes. The right atrium was closed. The patient was rewarmed, electrically defibrillated, the vent removed, and by-pass was discontinued.

The mass was reported by pathology as a myxoma measuring 7.5 x 4.8 x 4.2 cm and weighing 88.5 grams.

The patient made an uneventful recovery. Post operative Echocardiography showed a normal mitral valve and normal left atrial chamber size.

The patient was discharged February 11th (9 days post-op) on no medication. He is now back at work and leads a completely normal life.

DISCUSSION

Our institution is the only community hospital in the State of Alabama that does heart catheterizations and open-heart surgery. Not having the benefit of Residents or Fellows, the responsibility of developing new procedures and refining old ones becomes the duty of the Cardiovascular Technicians. The technicians developed the Echocardiography program in our institution, as well as refining the Phonocardiography and Vectorcardiography programs, and they have made many changes in the Catheterization Laboratory. This was all brought about by individual training and effort. The technicians perform the technical duties required for diagnosis and surgery; but, more importantly, they contribute to the thinking and decision-making required for an accurate diagnosis and successful operation.

In the Atraumatic Cardiac Diagnostic Laboratory, the Cardiovascular Technicians have more or less a free hand in deciding what procedures should be done to diagnose the patient. Initial interpretations of Vectorcardiograms, Phonocardiograms, and Echocardiograms are done by the technicians. By combining this information with the history, physical, ECG, Laboratory and

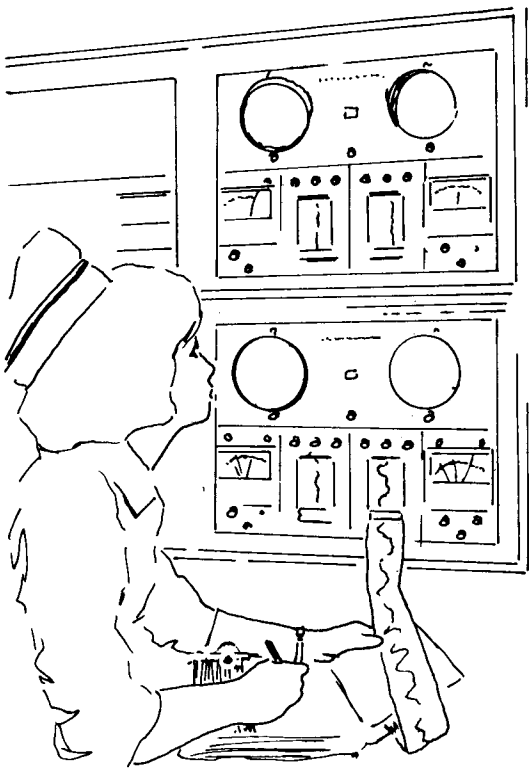
Radiological studies, a pre-catheterization diagnosis is made. This allows a quick and easy catheterization without doing unnecessary studies on patients.

In the Catheterization Laboratory, the technicians become half of a diagnostic team. The technicians, a Cardiologist and a Radiologist are the only ones present during heart catheterizations. In addition to the usual duties of the technician during catheterizations, such as operation of monitoring and pressure equipment, other duties are required of them. All cine' X-Ray film is exposed and developed by our technicians. They scrub to assist the physicians. We feel that the doctors in the Catheterization Laboratory need to spend their time concentrating on the procedure and what they are trying to prove or disprove. The patient's physical status and immediate interpretation of the data acquired should be the responsibility of the technicians, who then relay this information to the doctor in charge. This responsibility is extremely important, because no one wants to subject a patient to a traumatic procedure and not obtain the desired data.

In the operating room for open-heart surgery, the technicians again are required to do their own thinking and make their own decisions. A Sarns Model 2000 Roller Pump with five (5) pump heads is used for cardio-pulmonary by-pass. The Travenol mast was adapted to accept the Bentley Oxygenator by bolting a 1½" square aluminum bar in a vertical position on the movable portion of the mast. The Bentley Oxygenator hanger was reversed, a pin added for stability, and then mounted on the bar. The oxygenator is raised and lowered for gravity venous drainage. This allows a quick economical adaption to the Bentley Oxygenator and the ability to change back to the Travenol Oxygenator, should we decide to do so, while maintaining the 2 liter priming volume.

We routinely use a hemodilution prime consisting of 2 liters of 5% Dextrose and 0.45% Sodium Chloride that is buffered to a normal pH. All fluids that are added to the pump while on by-pass are buffered to a normal pH. With each unit of ACD blood that is added during by-pass 60 cc of 1.4% $NaHCO_3$ (Sodium Bicarbonate). 3000 units of Sodium Heparin, and 5cc of 10% CaCl (Calcium Chloride) are given. All fluids given to the patient before and after by-pass are buffered to a pH of 7.4. The average amount of blood given is 1.7 units for a two (2) hour perfusion. Perfusion pressure is maintained below 100 mm Hg. during by-pass.

We have always felt that there was no appreciable reason for maintaining high blood pO^2 values while on by-pass. Just because a patient is in shock while on by-pass is no reason to allow him to become acidotic or to change his metabolism in any way from the normal. On the other hand, perhaps a high pO_2 may increase the chance for air embolus or unnecessary blood trauma.



Blood O_2 and CO_2 tensions and pH are maintained at normal range, resulting in a normal or near normal base excess, and minimal change in the patient's metabolism. Total body flow of 2.2 liters/minute/m^2, or around 4 liters/minute on the normal size adult, is maintained. O_2 flow is around 12 liters/minute at 37 degrees centigrade and may decrease to 6 to 7 liters/minute at 30 degrees centigrade to maintain the normal pO_2 values. Routine hypothermia of 30 degrees centigrade is used with the aid of the Sarns heat exchanger. The reliability of the physiological pressures monitored during surgery and the post-op period is another responsibility of the technicians in our institution.

Post-op, most patients are again brought to the Atraumatic Laboratory for studies that will allow us to follow their now changed physical course in the years to come. Base line studies are made with Phonocardiograms and Echocardiograms that will prove very useful, if a patient has a change in his clinical course in the future.

SUMMARY

A patient with a Left Atrial Myxoma is presented. The diagnosis by Echocardiography, the catheterization data and the surgical correction are presented in order to show the many roles of the Cardiovascular Technician in our institution.

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