Calcific Aortic Valvular Disease Associated with Complete Heart Block
Case Reports of Successful Correction*

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Three patients with calcific aortic valvular disease associated with complete heart block underwent total aortic valvular replacement at Deborah Hospital. One patient had concomitant epicardial implantation of a "synchronous" (atrial triggered) pacemaker, and two patients had pacemakers implanted prior to aortic valve surgery.

Although these patients had practically identical lesions, their surgical management differed. The purpose of this communication is to describe aortic valve replacement in the presence of complete heart block, in one instance, and in the presence of functioning pacemakers in two.

CASE REPORTS

Case 1: This case was reported elsewhere in greater detail.1 A 50-year-old white man was admitted to Deborah Hospital on May 1, 1964 complaining of shortness of breath. He denied a history of rheumatic fever. In 1942, he was rejected for military service because of a murmur. Two years before hospital admission, he began to suffer from dizziness on exertion. At that time, complete heart block was found. In January, 1963, epicardial implantation of electrodes and a fixed-rate pacemaker was carried out at another institution. He improved following this procedure, but four months before admission to Deborah Hospital, dizziness and dyspnea reappeared. He had been hospitalized elsewhere for recurrent episodes of pulmonary edema.

Physical examination revealed a well-healed thoracotomy scar. A systolic thrill was felt over the aortic area. A grade 4/6 mid-systolic ejection murmur heard over this region radiated to the neck and the entire precordium. A grade 2/6 early blowing diastolic murmur was heard along the left sternal border. The electrocardiogram showed complete A-V block with a ventricular rate of 58 per minute. Some ventricular complexes were captured by the pacemaker stimulus. Chest roentgenograms revealed cardiomegaly with poststenotic dilatation of the ascending aorta and left ventricular enlargement. Two electrical leads were seen extending from the cardiac shadow to the abdomen.

On May 8, 1964, combined heart catheterization revealed left ventricle-brachial artery systolic ejection pressure gradient of 80 mm Hg peak-to-peak and 70 mm Hg by planimetry. At operation on June 26, 1964, complete adhesive obliteration of the pericardial sac was found. Only the right atrium, right ventricle and part of the left ventricle were mobilized. Care was taken not to disturb the area of pacemaker electrode implantation. Total cardiopulmonary bypass was effected by a single venous drainage catheter in the right atrium and an arterial tapered catheter in the left common femoral artery.

The aortic valve was found to be calcified and rigid. The commissures were fused reducing the central opening to a slit. After the valve was excised, calcium deposits were seen extending to the upper interventricular septum. A No. 9 Starr-Edwards aortic valve prosthesis was sutured in place. At the end of the procedure, the heart was defibrillated with a single direct current shock. It resumed regular vigorous contractions following the pacemaker impulse.

The patient had an uneventful postoperative course and has remained asymptomatic.

Case 2: A 41-year-old white man was admitted to Deborah Hospital on December 7, 1964. He gave a history of rheumatic fever at the age of 13 years. He was rejected for military service when a heart murmur was heard on physical examination. In August, 1963, he fainted twice while taking a shower. There were no further attacks until July, 1964, when he again had recurrent black-out spells. These were accompanied by precordial pain radiating to the left arm. In August, 1964, he was found unconscious in his home. He was taken to another hospital where a diagnosis of aortic stenosis and Adams-Stokes syndrome was made. He was treated medically and was referred to Deborah Hospital for surgical evaluation.

On admission, the blood pressure was 170/50 mm Hg and the pulse rate 58 per minute. There was a systolic thrill over the aortic area. A grade 3/6 systolic ejection murmur heard in this area radiated to the neck and left sternal border. A grade 3-4/6 diastolic decrescendo murmur was heard along the left sternal border and at the apex. The aortic second sound was markedly diminished. The peripheral pulses were "collapsing."

The electrocardiogram showed complete A-V block with a ventricular rate of 60 per minute (Fig 1). Chest roent-
Ficura 2. Chest roentgenograms of Case 2. Left, showing cardiac enlargement and right, showing the implanted pacemaker leads and the Starr-Edwards aortic valve prosthesis. Note decrease in the heart size.

Ficura 1. Electrocardiograms of Case 2. Left, preoperative tracings showing complete heart block and right, postoperative tracings showing fixed rate pacing at 83 per minute.

Roentgenograms showed cardiomegaly with moderate left ventricular enlargement and slight dilatation of the ascending aorta. Calcification could be seen in the region of the aortic valve (Fig 2).

On March 17, 1965, a temporary transvenous pacemaker catheter electrode was inserted. During the procedure, the patient developed acute pulmonary edema which responded well to administration of digitalis and an intravenous drip of thiomerin and aminophylline. At surgery on March 22, 1965, the aortic valve was found to be severely calcified. In addition, there was a fenestration of the non-coronary cusp. Extensive calcification was also seen in the upper interventricular septum. The aortic valve was excised and replaced with a No. 11 Starr-Edwards aortic valve prosthesis. Following this, epicardial electrodes and a synchronous pacemaker* were implanted. The patient was rewarmed and the electrodes were connected to the pulse generator after temporary catheter pacing was discontinued. The heart resumed paced beating at once.

The patient made an uneventful recovery and was dis-

* Atricor, Cordis Corp., Miami, Florida.
He was well until October, 1966, when he began to tire easily, experience dyspnea and tightness and pain in the chest. He was admitted to another hospital where a diagnosis of aortic stenosis with congestive heart failure and complete heart block was made. A week later, a permanent transvenous artificial pacemaker was implanted. Since then all symptoms except easy fatigue have disappeared.

On admission, examination showed a well-developed, well-nourished white man with a blood pressure of 118/78 mm Hg and a regular pulse rate of 72 per minute. The pacemaker pulse generator could be palpated in the infraclavicular area. There was a grade 4-5/6 long ejection systolic murmur best heard in the aortic area and transmitted to the apex and the neck. There was a grade 1-2/6 early blowing diastolic murmur most intense over the left sternal border. The aortic component of the second heart sound was diminished. The electrocardiogram showed complete A-V block with a fixed pacing rate of 68 per minute (Fig 3).

Chest roentgenograms showed cardiomegaly, left ventricular enlargement, poststenotic dilatation of the ascending aorta and a suggestion of calcification of the aortic valve (Fig 4). The transvenous electrode was seen wedged in the right ventricular chamber. Cardiac catheterization was not performed because of fear that the electrode might be displaced or entangled with the cardiac catheter.

At surgery on June 2, 1967, the aortic valve was found to be severely deformed and calcified. The calcification extended to the interventricular septum and upper part of the septal leaflet of the mitral valve.

In the region of the right coronary cusp, the calcium deposits extended to the level of the coronary ostia. The valve was excised and all accessible calcium was removed with a rongeur. A calf aortic valve heterograft was then sutured in the subcoronary position.2 The heart was defibrillated once. It resumed paced beating immediately. The patient recovered uneventfully.

On November 29, 1967, he was readmitted to the hos-

![Figure 3. Electrocardiogram of Case 3 showing complete A-V block with a fixed rate pacing of 68 per minute.](image)

![Figure 4. Chest roentgenograms of Case 3. Left, showing cardiac enlargement and the transvenous catheter electrode in the right ventricle. Right, postoperative film showing decrease in heart size.](image)
pital for postoperative cardiac catheterization. His heart size had decreased and he was completely asymptomatic.

COMMENT

These three patients had calcific aortic stenosis and complete heart block resulting from extension of calcification to the conduction bundle of the heart. All three underwent correction of both abnormalities by implantation of artificial pacemakers and total replacement of the damaged valves.

The first patient had an epicardial pacemaker implanted 17 months before aortic valve replacement. As a result, adhesive pericarditis and obliteration of the pericardial sac had developed. Mobilization of the heart, preparatory to cardiopulmonary bypass, was left to a minimum and extreme caution was required in order to avoid displacement of the pericardial electrodes. The customary way of venting the left ventricle, through a catheter placed in its apex, was not used. Instead, gradual filling of the left heart was accomplished by careful pulmonary ventilation and controlled reduction of the venous drainage. These maneuvers drove the air ahead of the blood and allowed it to escape through the aortotomy. Any remaining gas was evacuated by inserting a large bore needle vent through the right ventricle and interventricular septum and into the left ventricular cavity.

The second patient had an epicardial pacemaker implanted at the time of aortic valvular replacement. It was deemed necessary to insert a temporary transvenous catheter pacer four days before surgery in the hope of improving myocardial tone by pacing at normal rates. This patient went into congestive heart failure while the temporary catheter was being inserted. It was obvious that myocardial tone was poor and any type of surgery would have been hazardous in the absence of temporary pacing.

The third patient had a permanent transvenous pacemaker implanted eight months before valve replacement. The pericardial sac was free of adhesions and cardiac mobilization was not a problem. However, the heart had to be handled with great care to avoid dislodging the intracardiac electrode.

A single catheter was inserted into the right atrium for venous drainage. Individual cannulation of the cavae for this purpose might have dislodged the right ventricular catheter electrode which passed through the superior vena cava.

All patients were cooled to about 85°F during bypass. At this temperature, the hearts fibrillated with a temporary loss of response to the pacemaker impulse. Soon after rewarming, defibrillation was effected without difficulty and the hearts resumed paced beats immediately. The postoperative courses were smooth and particularly free of any complicating arrhythmias. All patients left the hospital improved.

SUMMARY

Three patients with calcific aortic valvular disease associated with complete heart block underwent total aortic valve replacement. Special cannulations and post-perfusion venting of the left heart, limited mobilization of the heart during surgery and postoperative pacing with a transvenous electrode were used to advantage. These surgical maneuvers were adapted to the individual situation and varied according to the timing and type of pacemaker implantation.

REFERENCES


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