able as evidenced from our in vitro study* simulating altered Ca/P ratio. The macroaggregates were trapped in the lungs in the first pass. In contrast, heterionic exchange is a slow process. The possibility of preformed strontium macroaggregates was ruled out because 

\[ ^{87}\text{Sr} \]

from the same lot was not taken up by the lungs of other patients who had bone scans done on the same day. The problem needs further study. We are presently studying strontium kinetics in multiple myeloma cases, as well as in patients with altered calcium and phosphorus level of other etiology, such as renal failure. Animal experiments are also underway with a hypocalcemic drug, mithramycin, which was received by our patient.

McLachlan et al reported radiologically evident metastatic pulmonary calcification in patients with renal failure on dialysis. The mechanism underlying their finding could possibly be explained on the basis of our observation. 

\[ ^{87}\text{Sr} \] study would probably provide a means to detect radiologically undemonstrable early metastatic calcification process in hypercalcemia of diverse etiologies.

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Successful Total Correction of Common Ventricle

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A patient who had total correction of common ventricle is reported. Surgical techniques are discussed in detail and the importance of avoiding injury to the conduction system is stressed.

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Total correction of common ventricle seems to be a contraindication because of its complicated malformation and few operated cases have been reported. This is a case successfully operated by creating the ventricular septum with Dacron patch without damaging the conduction system.

Radical corrective measures in patients with common ventricle still present challenging problems because of the complex anatomic features involved, although there have been scattered reports of limited successes on this subject.1-3

CASE REPORT

The patient was a ten-year-old girl. Her symptoms consisted of failure to thrive, repeated episodes of upper respiratory infection, and limited exercise tolerance.

On auscultation of the heart, we found a grade 4/6 systolic murmur at the base, best heard in the 3rd to 4th intercostal space on the left sternal border, and a grade 2/6 systolic murmur at the apex with transmission to the left axilla. The pulmonary component of the second sound was markedly accentuated, single and palpable. Marked precordial heave was present. Chest x-ray examination showed moderate cardiomegaly with a CTR of 57 percent, prominence of the pulmonary conus, and engorged pulmonary vascular markings. Electrocardiogram showed regular sinus rhythm, as indeterminate axis, and biventricular hypertrophy. Right heart catheterization revealed a left-to-right shunt with a ratio of 81 percent at the ventricular level, a pulmonary to systemic pressure ratio of 100 percent and a resistance ratio of 38 percent. Arterial oxygen saturation was 94 percent and pulmonary arterial pressure was 110/60.

Angiocardiogram (Fig 1), taken with a catheter through

Figure 1. Preoperative selective left ventricular angiogram shows a huge pulmonary artery and small aorta, both of which are opacified simultaneously. The diameter of the former is three times that of the latter. Opacification of the large ventricular cavity alone was demonstrated, and visualization of the right ventricle was unobtainable. There is a grade 1/4 mitral insufficiency.
SUCCESSFUL TOTAL CORRECTION OF COMMON VENTRICLE

It was decided to create a ventricular septum with a Dacron sheet. The Dacron patch, oval in shape and measuring 6 x 4 cm, was inserted in between the mitral and the tricuspid papillary muscles so as to separate both tensor components and was fixed first superiorly by placing pledgeted mattress sutures on the medial leaflet of the tricuspid valve to anchor the patch on the posterior surface of the leaflet a few millimeters distal and parallel to the valve ring. When the commissure between the medial and the posterior leaflets was reached, a running suture was employed to anchor the patch to the posterolateral free wall of the ventricle toward the posterior papillary muscle, after placing a few mattress sutures on the posterior leaflet. Then the line of fixation of the patch went up towards the anterior proximity of the inferior margin of the outflow tract and continued along the margin to join the first mattress suture on the medial leaflet (Fig 3).

Immediately after termination of the bypass, systemic pressure was measured at 120 mm Hg systolic, while pressure in the right ventricle was 90 mm Hg, and this proved the effectiveness of the newly created septum.

The patient made an uneventful recovery and is now doing well at home. The postoperative ECG showed regular sinus rhythm.

A selective right ventricular angiogram taken after the operation revealed some residual shunting at the ventricular level, but of insignificant degree (Fig 2). The postoperative roentgenogram shows decreased pulmonary vascularity.

DISCUSSION

Hazards accompanying this procedure are the induction of iatrogenic heart block and dehiscence of the patch because of its relatively long suture line.

We successfully avoided injury to the very structure necessary for A-V conduction. Particular emphasis is placed on the method of patch fixation near the commisural zone between the tricuspid and the mitral tensor apparatuses and this would afford, to some extent, an additional support to keep the patch in place. As far as fixation of the patch to the myocardial wall is concerned, a snug bite would allow a water-tight and secure fixation.

In order to facilitate the intraventricular maneuver, it is essential to make the ventriculotomy on the right delimiting coronary artery and its branches. A key to our success was that we avoided injury to the A-V conduction system by placing the artificial septum in a slightly different position from where the natural septum would be.

In consequence, the newly created right ventricular cavity was somewhat smaller in size than the left. This inequality in size, however, can be tolerated by the patient, since no overloading of pulmonary circulation takes place. Ideally, both ventricular stroke volumes should be equal. However, considering the course of the conduction system in the case of common ventricle, it is hazardous to place stitches near the midline of the ventricle. Therefore, the artificial septum has to be shifted either to the left or the right of the midline.

This shift should be toward the right so that the right ventricular cavity is smaller than the left and flooding of the pulmonary circulation is avoided.

With this type of total correction, it is essential to have intact atrioventricular valves, each of which functions
palpated. There were distant heart sounds with no murmur. The abdomen was distended and ascites was present. The liver was very tender and was enlarged 12 cm below the right midcostal margin. There was 2+- pitting edema of the legs. A pericardial knock was thought to be heard after admission.

Laboratory studies which did not give normal findings were: prothrombin time 20 seconds (control 15); BSP 18 percent retention in 45 minutes; serum bilirubin 6 mg percent total and 4 mg percent indirect; and alkaline phosphatase of 20 Bessy-Brock units. The tuberculin test was negative. A Casoni test done after operation was negative. The electrocardiogram showed low QRS voltage with diffuse ST-T wave abnormalities and absence of a Q wave in lead V4. Fluoroscopy of the chest showed little pulsation of the heart shadow and elevation of the right diaphragm.

The patient was given digitalis and diuretics resulting in a slower pulse rate, but the edema, ascites, and hepatomegaly persisted. After four weeks’ hospitalization, the patient was still in heart failure and not much improved. On October 23, 1969 pericardial biopsy was performed which demonstrated a thick (6-8mm) pericardium without evidence of tuberculosis. On October 25, 1969 definitive pericardiectomy for constrictive pericarditis was performed. A collapsed hydatid cyst was found near the apex of the left ventricle which was irrigated with 30 percent saline solution. Postoperatively, the patient did well and by the eighth day most of the edema, hepatomegaly, and abdominal pain was gone. Six months after surgery the patient was well and taking only digitalis.

**DISCUSSION**

Echinococcal disease is quite common in certain areas of the world, but echinococcus cyst of the heart is not common. Only a few of the embryos reach the heart via the coronary arteries. It is felt that the process of infestation probably occurs in childhood and takes several years for the cysts to grow and later cause symptoms.

It has been shown that about 40 percent of all cases of cardiac cysts will rupture and most of these are fatal. Rupture into the pericardium will usually cause either acute hydatid pericarditis or several loculated daughter cysts which may or may not be symptomatic. Occasionally, rupture into the pericardium will later produce constrictive pericarditis.

Diagnosis is made by a high index of suspicion of echinococcus when an abnormal x-ray finding or electrocardiogram is seen in an area endemic with hydatid disease. X-ray examination may show an abnormal heart enlargement and the electrocardiogram frequently indicates ischemia of the left ventricle. Casoni intradermal test, complement fixation, or hemagglutination tests may be confirmatory of hydatid disease, but are only positive in about 60 percent of cases.

Because of the incidence of rupture of the cyst and subsequent high mortality, treatment is generally surgical removal of the cyst or evacuation of the contents and sterilization of it. The first successful operation for hydatid cyst of the heart was by Long in 1932. Since that time several reported cases of cysts of the heart have been successfully treated surgically. For the complication of constrictive pericarditis, as in our case, the classic pericardiectomy, as described by Holman, is adequate if