Mitral valve replacement in the first three months of life

JAMES C POLLOCK, SAID SHAWKAT, ALAN HOUSTON

From the Departments of Cardiology and Cardiac Surgery, Royal Hospital for Sick Children, Yorkhill, Glasgow

SUMMARY Two infants, aged 2 and 3 months, underwent mitral valve replacement with Björk-Shiley mechanical valves for severe congenital mitral regurgitation not amenable to valve repair. Both infants survived the operation and left hospital taking a low dose aspirin anticoagulant regimen. One child survived for three years without incident, but the other died at 11 months of pneumonia after valve replacement for tissue ingrowth and subsequent thrombosis.

Every effort is made in children to conserve the native valve by reconstructive techniques since replacement in this group carries appreciable short and long term mortality and morbidity.1-4 Occasionally, conservation is impossible owing to severe valvar dysplasia. We report our experience with mitral valve replacement in two such infants with severe dysplastic mitral valves in the first three months of life.

Patients and methods

CASE 1

A 6 week old, full term male infant presented with failure to thrive, progressive tachycardia, and tachypnoea such that he required ventilation shortly after admission. Initial examination showed congestive heart failure and cardiomegaly on a chest radiograph (Fig. a). An apical systolic murmur was present. The initial diagnosis was of pneumonia and a small ventricular septal defect. Nevertheless, the infant could not be weaned from ventilatory support over a two week period, and his haemodynamic status gradually deteriorated despite digitalisation, fluid restriction, and vigorous diuretic treatment. The infant then underwent cardiac catheterisation, which showed gross mitral regurgitation with a mean left atrial pressure of 22 mm Hg and "a" and "v" wave pressures of 22 and 31 mm Hg respectively.

The child underwent surgery, and the mitral valve was found to have rudimentary cusp tissue and very short attenuated chordae attached to two normally located papillary muscles. Under deep hypothermic

Requests for reprints to Mr J C Pollock, FRCS, Department of Cardiac Surgery, Royal Hospital for Sick Children, Yorkhill, Glasgow G3 8SJ.

Accepted for publication 17 July 1984
circulatory arrest for 20 minutes, the largest valve that
the annulus would take, a 19 mm Björk-Shiley pro-
thesis was implanted.

Spontaneous systemic circulation was restored and
a low dose infusion of isoprenaline given. The infu-
sion was discontinued within 12 hours, and the child
was extubated on the third postoperative day. Conges-
tive heart failure rapidly resolved with diuretic treat-
ment and the child was discharged on the twentieth
postoperative day in sinus rhythm taking 30 mg of
aspirin daily and frusemide. A chest radiograph on
discharge showed pronounced resolution of his car-
diomegaly (Fig. b). Three years later the child had
grown normally and was taking only low doses of
aspirin.

CASE 2

A full term male infant was admitted seven weeks
after birth in severe congestive heart failure. Shortly
after admission he required intubation and ventila-
tion. Initial investigation suggested coarctation of
the aorta, and this was confirmed at cardiac catheteri-
sation, which also showed severe mitral regurgitation
with "a" and "v" wave pressures of 23 and 34 mm Hg
respectively. The child underwent immediate surger-
y, and a subclavian flap repair of a preductal coarc-
tation was carried out. The procedure was tolerated
well, but despite excellent femoral pulses and
maximum medical treatment the child could not be
weaned from his ventilator. Two weeks after his first
operation he returned to theatre and the mitral valve
was replaced with a 17 mm Björk prosthesis under
depth hypothermic arrest. The anterior leaflet was an
opaque immobile membrane, and the posterior cusp
was represented by fibrous nodules into which were
inserted chordae from two normally located papillary
muscles. Spontaneous systemic circulation in sinus
rhythm was restored and isoprenaline given. His con-
dition rapidly improved, and he was extubated on the
fourth postoperative day. He was discharged home on
the nineteenth postoperative day taking 30 m of aspi-
rin daily, digoxin, and diuretics.

Seven months later he again presented with a sud-
don onset of congestive heart failure after a three day
history of a respiratory infection. Examination
showed the valve click to be absent. He underwent
emergency re-exploration of his prosthesis, which
showed partial obstruction of the valve by tissue
ingrowth on the ventricular surface and a superim-
posed blood clot. The valve was replaced with another
17 mm Björk prosthesis; and spontaneous systemic
circulation was restored and isoprenaline given.
Repeated attempts to reduce his ventilatory support
were defeated by poor gas exchange, and despite mas-
septic antibiotic treatment he died three weeks post-
operatively of bilateral bronchopneumonia. Necropsy
showed that the replacement prosthesis was function-
ing satisfactorily.

Discussion

Mitral valve replacement was undertaken as a life sav-
ing measure in two seriously ill infants. Both survived
operation and left hospital, although one died within
the first year of a prosthetic valve complication. Ini-
ially, both valves functioned well haemodynamically.
Congestive heart failure rapidly resolved, and both
children thrived despite the disproportionately large
size of the new valves in these small hearts and the fact
that both valves were of the old flat disc type.

The use of tissue valves in the left side of the heart
has proved to be disappointing in children, especially
those < 10 years of age, owing to early degeneration
and calcification. Hence in older children, mainly
teenagers, we have routinely implanted mechanical
valves in the left side and provided anticoagulation
with warfarin. This policy has worked well; only one
14 year old child had to be given aspirin because of
poor patient compliance with warfarin. Because of the
difficulty in achieving anticoagulation control in the
two infants in the present study, and since both were
in sinus rhythm postoperatively, we gave low doses of
aspirin in these cases. This regimen has been effective
in a recent series of children with mechanical valves
and seemed to be satisfactory in our two patients since
neither had any embolic incidents.

Our second case illustrates how rapidly tissue
ingrowth can occur in young children. Pannus forma-
tion producing valve dysfunction in the Björk pro-
thesis has been reported as early as one month after
implantation. Whether warfarin anticoagulation
would have affected the clinical course of this case is
doubtful. A recent report of 1400 mechanical valve
replacements in adults comparing two types of valve
suggests that the incidence of thromboembolism is
significantly higher with the Björk than with the St
Jude hinged prosthesis, but this series included a
large number of the older flat disc Björk prostheses. The
incidence of thrombosis with the Björk prosthesis
may be reduced, firstly, by using the new Monostrut
valve, which gives improved flow in the lesser orifice,
and, secondly, by using carbonised sewing rings,
which reduce the incidence of valve failure due to
inhibition of tissue ingrowth.

These two infants show that mitral valve replace-
ment is technically feasible as a life saving measure
in the first months of life but that the very young patient
appears especially prone to the complications of
mechanical valves.
Mitral valve replacement in the first three months of life

References