Editorial Comment

Appropriate Palliative Intervention for Infants With Double Inlet Ventricle and Tricuspid Atresia With Discordant Ventriculoarterial Connection: Role of Pulmonary Artery Banding*

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Subaortic stenosis after pulmonary artery banding. Pulmonary artery banding for reduction of pulmonary artery blood flow and pressure in infants with double inlet left ventricle and those with tricuspid atresia and transposition of the great vessels can be deleterious by inducing or exacerbating subaortic stenosis (1-4). Such stenosis is the result of progressive hypertrophy of the subaortic "chamber" and inevitably results in diffuse ventricular hypertrophy. As the goal in the definitive treatment of these patients is the Fontan operation, the ventricular hypertrophy associated with subaortic stenosis is an undesirable consequence of simple pulmonary artery banding and adds to the risk of the modified Fontan procedure (5,6).

Subaortic stenosis can occur naturally in these patients, particularly in those with associated anomalies of the aortic arch (interruption or coarctation). In this setting, pulmonary artery banding is usually ineffective in reducing pulmonary artery blood flow because the patient does not tolerate the degree of pulmonary artery constriction necessary to achieve significant reductions in blood flow and pressure.

The present study. Although these observations have been known for some time, Franklin et al. (7) have confirmed and systematized them. In their elegant study in this issue of the Journal (7), they analyze 102 consecutive infants with the cardiac morphologic features under study. Their conclusions, amply supported by their data, indicate that alternative palliative therapies must be found for these infants.

Thus, the objectives of palliative surgery in infants with these cardiac anomalies include 1) reduction of pulmonary artery blood flow and pressure, and 2) elimination of any pressure gradient between the ventricle and aorta. These goals must be accomplished without pulmonary artery distortion and with preservation of aortic to ventricular valve competence. A number of surgical alternatives are available for the proper palliative treatment of these infants.

1. Reduction of pulmonary artery blood flow. Pulmonary artery blood flow and pressure can be reduced in these infants by conventional pulmonary artery banding, by insertion of an endoluminal fenestrated patch separating the main from the pulmonary artery branches ("endoluminal band") and by separating the pulmonary artery branches from the main pulmonary artery and establishing a controlled systemic to pulmonary artery shunt. In our experience, the best method appears to be the insertion of an endoluminal band, as it is the most effective means of preserving the distal and proximal architecture of the pulmonary artery system. External banding has a significant potential for distorting the pulmonary artery confluence when placed too distal or for distorting the underlying pulmonary valve when placed too proximal. A systemic to pulmonary shunt into a surgically isolated pulmonary artery confluence is also capable of inducing severe pulmonary distortion and scarring, as shown by experience with the Norwood operation for hypoplastic left heart syndrome (5,3).

2. Relief of subaortic stenosis. Two techniques are appropriate for the relief of subaortic stenosis in these infants: A) creation of a large communication between the ascending aorta and main pulmonary artery (the so-called Damus-Kaye maneuver), which results in a double outlet ventricle (2.5.9-12). When this technique is used, reduction of distal pulmonary artery blood flow is best accomplished by an endoluminal band. Although this technique is quite effective in abolishing the pressure gradient between the left ventricle and aorta, the long-term competence of the often dilated pulmonary valve, now functioning under systemic pressures, is a source of concern. B) Relief of subaortic stenosis can also be accomplished by appropriate resection of the subaortic area and surgical enlargement of the ventricular septal defect. Resection in areas known not to contain the conduction bundle can result in excellent relief of obstruction and in preservation of atrioventricular conduction. In small infants, this resection cannot be accomplished satisfactorily with use of the transaortic approach because of the small size of the aortic annulus. In such infants we have found it best to incise the subaortic chamber, thus avoiding damage to the aortic valve, and to complete the procedure by patching the incision so as to further enlarge the subaortic area.

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Conclusions. The study by Franklin et al. (7) reemphasizes the inadequacy of pulmonary artery banding as the sole palliative therapy in this group of infants. Even though the palliative maneuvers I have outlined are more aggressive and may carry a higher surgical risk, it behooves all of us to understand their rationale, to perfect their execution and to define their application.

References