administration of enoxaparin late until surgical intervention (8.7 ± 0.75 hours preoperatively), and nonwithdrawal of aspirin.

In conclusion, we agree with the authors that the use of enoxaparin before routine cardiac operations appears safe as far as major bleeding complications are concerned. Probably this consideration also applies to the early postoperative period; in this respect administration of high-dose enoxaparin (1 mg/kg twice daily) has recently been reported after mechanical valve implantation as a bridge to satisfactory oral anticoagulation.⁵ Finally, higher doses might be justified in some subsets of critically ill patients undergoing coronary operations, although a clear cutoff indication between subcutaneous enoxaparin versus heparin infusion remains to be elucidated. In our opinion caution is advised because the benefits of high-dose enoxaparin might be outweighed by the risks related to a less aggressive attitude toward unstable patients awaiting coronary bypass surgery.

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Reconstruction of double-outlet right ventricular outflow tract comprising a pulmonary artery flap in a child with an anomalous coronary artery To the Editor:

van Son¹ provided a useful operative solution for repairing tetralogy of Fallot of anomalous origin in the left anterior descending coronary artery and small pulmonary annulus. The technique, using a pulmonary artery flap as the posterior wall of the constructed pathway, has the potential

advantage of preserving growth and avoiding coronary damage for this subset. However, no interim or long-term results have been reported.

A 3-year-old boy who had been cyanotic since birth because of a double-outlet right ventricle with a subaortic ventricular defect and infundibular-valvular pulmonary stenosis (z value² of -3.6) underwent a definitive operation according to the instructions of the proposed technique at our institute. The right coronary artery originated from the aorta, transversing the right ventricular outflow tract (RVOT) very near the main pulmonary trunk because of l-transpositioned great arteries. Seven years postoperatively, the pressure gradient across the RVOT had increased to 80 mm Hg from 20 mm Hg, even though the native pulmonary valve annulus and a patchy reconstructed tract orifice had grown by 11 mm ($z = -2.8$) and 15.5 mm ($z = +1.2$), respectively (Figure 1). Meanwhile, the right coronary artery beneath the constructed pathway showed no distortion.

The growth of the RVOT without harmful influence on the coronary artery was proved in this case, and the problem involved in leaving the native outflow tract open was elucidated. The anatomic stenosis advanced concomitant with development of the native pathway. The bloodstreams from both pathways probably created turbulence at the merging point, making the outflow tract bulge centrifugally. The dilated native posterior wall rose up and protruded into the pathway as a transverse fold. Although we still support the early definitive repair of Fallot-type cyanotic disease, we conclude that com-

Figure 1. A, Angiogram 4 years postoperatively: the right ventricular angiogram demonstrates the development of reconstructed and native pathways. B, Angiogram 7 years postoperatively: the native outflow tract bulged centrifugally, and the posterior wall protruded into the pulmonary outflow tract as a transverse fold (black arrows) with a pressure gradient of 80 mm Hg.

plete repair should be deferred until the child is 6 to 7 years old to confirm whether the pulmonary valve annulus has sufficiently developed. Various techniques^{3,4} for repair must be chosen individually for this subset of anomalies.

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Tricuspid valve in hypoplastic left heart syndrome

To the Editor:

With great interest, we read the article by Ohye and colleagues,¹ describing their institutional experience with surgery for tricuspid valve regurgitation (TR) in patients with hypoplastic left heart syndrome (HLHS). The detailed analysis and clear presentation are praiseworthy. The authors focus on right ventricular (RV) volume overload and annular dilation of the tricuspid valve as the most common mechanism leading to significant TR, whereas structural abnormalities of the tricuspid valve in HLHS are mentioned only briefly as leaflet prolapse and leaflet tethering. We believe, however, that some morphologic features unique to the tricuspid valve in HLHS deserve closer attention.

Some years ago, we specifically studied the tricuspid valve morphology in a series of 82 anatomic specimens of HLHS.² One finding was that structural abnormalities of

the tricuspid valve were markedly more frequent in hearts with a patent mitral valve. Overall, we found some dysplasia of tricuspid valve leaflets in 35% of the HLHS specimens and in up to 50% of those with mitral stenosis. It would be interesting to know whether the authors' clinical experience also reflects this notion; that is, whether the majority of the patients with HLHS requiring tricuspid valve repair had mitral stenosis rather than atresia. If this were the case, one might infer that patients with HLHS and mitral stenosis are indeed predisposed to clinically relevant TR and might necessitate closer follow-up examinations and perhaps earlier intervention.

Regarding repair of a regurgitant tricuspid valve, the authors favor a partial annuloplasty that effectively eliminates the posterior leaflet and results in a functionally bifoliate valve. Because the coronary artery in the atrioventricular groove can be put at risk with annuloplasty procedures, it is worth noting that a previous study³ described a significant prevalence of left coronary dominance (56%) in hearts with aortic and mitral atresia compared with regular right coronary dominance in hearts with aortic atresia and mitral stenosis.

The final point we would like to raise is the use of a partial ring for reinforcement of an annuloplasty. In HLHS the septal leaflet of the tricuspid valve differs markedly from that in a normal heart. We found that in hearts with mitral atresia, when the RV aspect of the interventricular septum is concave (ie, bulging toward the left ventricle), the usual direct chordal attachments of the septal leaflet are replaced by additional papillary muscles.² The interventricular septum in HLHS becomes essentially part of the RV free wall, and the architecture of the septal leaflet resembles that of the anterosuperior leaflet. Therefore it would be interesting to know how the authors orientate the partial ring, with the opening facing the anterosuperior leaflet or the septal leaflet. With the right atrioventricular valve in HLHS being supported to a greater extent by RV free wall musculature, one wonders whether a closed ring might not be more effective in preventing redilation.

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Reply to the Editor:

I appreciate the comments of Ho and Stamm in their letter to the editor. I am well aware of their excellent article describing the findings of tricuspid valve (TV) abnormalities in 35% to 50% of 82 pathologic specimens of hypoplastic left heart syndrome (HLHS).¹ Because our article was a retrospective, observational review, it did not have the scientific rigor of their study, nor did we have many pathologic specimens available for review. Therefore we concentrated on clinical, rather than morphologic, issues. The only method for evaluation of the anatomy of the TV available to us was echocardiography, which did not always correlate with the intraoperative findings. Because neither of these methods of assessment is particularly robust for describing the exact morphology of the TV, they were not stressed in the article. We also did not attempt to correlate the anatomic subtype of HLHS to the development of tricuspid regurgitation.

We continue to prefer the partial annuloplasty for the repair of the TV in the setting of HLHS, as well as in other lesions. We have not experienced any coronary events or deaths that we thought might be coronary related in patients with HLHS or other anomalies. The few rings we have placed were positioned in the traditional orientation for concerns of the conduction system. Although these patients all universally had excellent results, we have only used them in rare cases in which we thought the relatively fixed annulus would be of sufficient size to carry the child into adulthood.

Thank you again to Drs Ho and Stamm for taking the interest to submit a letter to the editor regarding our article. Such interaction and airing of other viewpoints