twice as many centers. There can be little doubt that reducing Sweden's complement of cardiac centers to 2 had a major influence on the ability of this unit to produce these superlative outcomes.

This report documents how to clear a newly set bar. A consistently applied policy of early complete repair, with rare utilization of PAB, by a stable and experienced surgical staff with concentrated areas of expertise at a high volume regionalized cardiac center, produced heretofore unachieved clinical outcomes. We should all take heed.

See Article page 2145.

Commentary: Complete atrioventricular septal defect in young infants: The advantages of early repair

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The current approach of elective primary repair of complete atrioventricular septal defect (cAVSD) at 3 to 6 months of age appears to be a widely supported standard of care in the congenital surgical world. Sturdier valvular tissue, improved intracardiac visualization, and time for patients with a borderline left ventricle to show appropriate ventricular growth are just a few of the benefits associated with this approach. Controversy exists as to the best approach to the symptomatic neonate or young infant. Much is written supporting a staged tactic using a main pulmonary artery band (PAB) to control heart failure symptoms followed by complete repair with PAB removal at an older age.^{1,2} However, there exists

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CENTRAL MESSAGE

Primary repair of complete atrioventricular septal defect in symptomatic young infants appears to be a viable approach.

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literature advocating for early complete cAVSD repair in young infants, citing concerns for worsening common atrioventricular valve regurgitation and inter-stage demise.^{3,4}

In this issue of the *Journal*, Ramgren and colleagues⁵ present their 25-year experience with more than 300 patients with cAVSD undergoing primary repair. They note that their institutional management is primary repair and avoidance of PAB staging, even in the younger infants. They compared several outcomes for patients following repair of cAVSD at the elective standard age (3-6 months, n = 249) versus an early age (<3 months, n = 55) when there were indications for early intervention, such as severe atrioventricular (AV) valve regurgitation or congestive heart

failure. Overall surgical mortality was excellent, with risk factors for poor survival in the total cohort found to be the presence of an additional ventricular septal defect, previous coarctation repair, persistent left superior vena cava, and genetic syndromes other than trisomy 21. Despite the left AV valve zone not being completely closed in a greater number of patients in the early cohort, there was no statistically significant difference between the 2 groups of patients with regard to reoperation rate on the AV valves. The risk factors for left AV valve reoperation included low weight at initial surgery, associated cardiac malformations, persistent left superior vena cava, tetralogy of Fallot, and unbalanced valve/ventricles. The authors should be congratulated on an excellent large-volume single-institution report showing success in primary cAVSD repair in all infants, including the challenging, younger ones.

There are patients with cAVSD, specifically the neonates, who may benefit from a staged approach. St Louis and colleagues⁶ reviewed 2399 patients with cAVSD repair (median age at surgery 4.6 months) from the Society of Thoracic Surgeons Congenital Heart Surgery Database (2008-2011). They reported that risk factors for poor outcome (mortality, complications) included early repair (<2.5 months) and low weight (<3.5 kg) at the time of surgery. Others have demonstrated greater complications rates and reoperation rates in the early primary cAVSD group as well.³ Most recently, Devlin and colleagues¹ reported the use of PAB in the Congenital Heart Surgeons' Society cAVSD cohort (2008-2012). This multi-institutional study reported on 50 infants with cAVSD undergoing PAB at a median age of 1.1 months. After PAB, left AV valve regurgitation improved or worsened in some patients, but overall the distribution remained constant. Of the 24 patients

banded with the intent to have a staged biventricular repair, 23 had cAVSD repair and 1 died interstage. There was no difference in medium-term outcomes including residual septal defects, need for AV valve reoperation, subaortic stenosis, or need for pacemaker between those who were banded first and those who had primary cAVSD repair. Importantly, survival at 4 years after cAVSD was similar between the staged and primary repair groups (93% vs 91%).

In conclusion, the authors report an excellent single institutional study favoring early repair of cAVSD in younger infants. However, it is unlikely that this single strategy would be sufficient for all patients with cAVSD, particularly the neonates. Issues such as low weight, obstructed aortic arch, complex intracardiac anatomy, and other extracardiac issues support an individualized approach when deciding on staged versus primary repair of cAVSD.

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