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Reply to the Editor:

We thank Dr Dodge-Khatami for his interest and insightful questions. Because the methods of inducing catch-up growth of the hypoplastic ventricles and valves in patients with unbalanced atrioventricular canal (UAVC) defects are not yet standard procedures, the technical details are of considerable importance.

There are also several important general points about these operations that should ease the concern about embarking on this approach.

The general principle is to increase flow across the hypoplastic atrioventricular (AV) valve, which generates the ventricular growth signal and induces catch-up growth of the hypoplastic ventricles and valves.¹ Even the smallest of these structures have enormous growth potential, and with the growth conditions met, the hypoplastic valves and ventricles will catch up surprisingly quickly.

While catch-up growth is occurring, septal defects are left behind to allow intracardiac shunting that will maintain adequate systemic and pulmonary blood flows. After the first stage, the patients predictably will be

stable because of the intracardiac shunting. There is no need to “bite the bullet” in an all-or-nothing operation and hope that a complete repair will be tolerated.

A restrictive atrial septal defect (ASD) is used to both allow shunting and increase flow across the hypoplastic AV valve to generate the growth signal. In right ventricle (RV)-dominant UAVC defects, a ventricular septal defect (VSD) is also left behind so that the RV can augment left ventricular (LV) flow and maintain an adequate cardiac output (CO).¹

The AV valve repair itself is helpful whether the end result is a 2-ventricle or single-ventricle repair. A UAVC lesion is a known risk factor for a Fontan procedure, at least in part because of AV valve problems, and valve repair should reduce this risk.

Finally, these growth-inducing operations do not irreversibly commit patients to a 2-ventricle repair, and a single-ventricle track remains available if necessary.

The following is in regard to your specific questions:

1. The partial VSD repair: A VSD is left behind only in RV-dominant UAVC defects where the CO must be augmented by the RV.¹ A complete VSD patch closure is done first in the usual fashion for a 2-patch AV canal defect repair, which stabilizes the valves. It also allows the upper edge of the patch to be placed away from the hypoplastic component when dividing the common AV valve leaflet, so it will enlarge the area of the hypoplastic valve.²
2. The residual VSD is created by cutting a hole in the center of the VSD patch. The hole must be big enough to allow augmentation of LV output, so it depends on the size of the patient. The size is not exact, but it should be at least 5 mm in diameter. The hole should not be so big, however, that it discourages transmitral flow. These patients will have pulmo-

nary artery bands, so the pulmonary vasculature will be protected.

When growth is adequate, the hole in the patch can be closed surgically. Because the septal rim of the VSD is patched, there will not be a risk of heart block during closure of the hole.

In an LV-dominant UAVC lesion, augmentation through a residual VSD is usually not necessary. Only approximately half a CO will provide sufficient pulmonary blood flow, and if more is needed, a shunt can be placed to allow time for the RV to grow. These patients do require a restrictive ASD to encourage tricuspid flow and contribute to the CO by right-to-left shunting.

3. Limits to the degree of hypoplasia in the growth of UAVC defects: No patients have been turned down, even with a ventricular z score of less than -7 or a rudimentary mitral valve. The hypoplastic valves and ventricles will reliably grow. We all grow 20- to 30-fold after birth, so a lot of potential growth is available. Our article illustrates a tiny mitral valve, which would have been highly obstructive after a complete repair. To provide adequate mitral flow, the large tricuspid valve was split in 2, which left the patient with 2 mitral valves. As shown, the tiny mitral valve grew well and reached normal size.²

Most of the hypoplastic AV valves in our series were only small, but a few were also deformed. Among the deformities repaired were a 2-layer mitral valve and several with significant regurgitation. Most are repairable, but if not, a replaced mitral valve in a 2-ventricle repair should still be better than a single ventricle repair, especially one with bad AV valves.

4. Snared ASD: The reason for keeping the ASD snare mechanism separate from the primum ASD patch is that the snare is adjusted off

bypass and will pull on the patch and perhaps on the AV valves, possibly making them leak. There is usually some atrial septum available, but if not, I would put the hole and snare as far lateral as possible, which should make the pull on the rest of the repair negligible.

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WILL LOCAL USE OF ANTIBIOTICS BE ESSENTIAL?

To the Editor:

We appreciate the study by Schimmer and colleagues¹ on gentamicin-collagen sponge use for heart surgery. They demonstrated a reduction of wound complication after surgery by gentamicin-collagen sponge use.

We agree with Schimmer and colleagues¹ and strongly recommend applying antibiotics directly to the surgical site. Our previous study was on the prevention of surgical site infection by antibiotic spraying.² We used not only gentamicin but also cefazolin. In our study, the incidence of deep surgical site infection was 0.50% in 2612 patients. We chose gentamicin and cefazolin because they cover the most likely contaminants, such as *Staphylococcus aureus* and *Pseudomonas aeruginosa*. In the study by Schimmer and colleagues,¹ *S aureus* cases were low despite the use of only gentamicin.

Local use of antibiotics is not accepted by guidelines for prevention of

surgical site infection³ because there is no strong evidence. The references of the guidelines did not report better results than Schimmer and colleagues.¹

In reality, many surgeons apply antibiotics by local spraying or subcutaneous injection. We think local use of antibiotics is an essential method for postoperative reduction of wound complications.

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Reply to the Editor:

We appreciate the kind comments¹ on our publication “Gentamicin-Collagen Sponge Reduces Sternal Wound Complications After Heart Surgery: A Controlled, Prospectively Randomized, Double-Blind Study”² regarding our results of the routine prophylactic retrosternal use of a gentamicin-collagen sponge in patients undergoing cardiac surgery. Our answers to the 3 points included in the letter to the Editor are as follows:

1. The most likely contaminants of deep sternal wound infections (mediastinitis) in our study were coagulase-negative staphylococci (68.4%), gram-negative bacteria (10.5%), *Propionibacterium acnes* (10.5%), and *Staphylococcus aureus* (5.3%).² This microbial

spectrum is similar to that in the Swedish study by Friberg and colleagues,³ in which coagulase-negative staphylococci formed the largest group of pathogens. The number of *S aureus* cases accounted for 2.4% (1 case) in the presented study, 21.7% in a Swedish study, and 37.3% in a US study.⁴ In our study and the Swedish study, there were no patients with methicillin-resistant *S aureus*. By contrast, methicillin-resistant *S aureus* infection was identified in 10.2% of the microbial isolates (27.3% of the *S aureus* cases) in the US study. The extent to which the dissimilar microbial spectra and possible antibiotic resistance influence the results cannot be clarified.

2. The guidelines for prevention of surgical site infections investigating intraoperative gentamicin implant before wound closure involve 2 randomized controlled trials.^{3,5,6} Figure 1 shows that the 2 studies were combined in a meta-analysis, and that a statistically significant difference was found favoring the gentamicin implant (odds ratio, 0.49; 95% confidence interval, 0.34-0.68; $I^2 = 0\%$).⁶

Engelmann and colleagues⁷ summarized these 2 studies in 2007 by observing that a slight reduction in infection was seen, but the population was too small to draw a definitive conclusion. Although the use of topical antibiotics is controversial, and they are not used by most cardiac surgeons, the existing studies demonstrate a reduction in the wound infection rate. More study is warranted before topical antibiotics can be recommended as a standard prophylaxis.⁷ Our study is a randomized controlled trial and therefore fulfils this demand and is a contribution toward more evidence in the prevention of surgical site infection.