majority of cardiac surgeons, and consequently our findings reflect a 'real-world' situation."

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CONTEGRA AND EXTRACARDIAC FONTAN

To the Editor:

We read with the greatest interest the article entitled "Feasibility of the Extracardiac Conduit Fontan Procedure in Patients Weighing Less than 10 Kilograms."¹ After congratulating the authors for their excellent work, we have a few comments.

As a Fontan Conduit, they used polytetrafluoroethylene (Gore-Tex; WL Gore & Associates Inc, Flagstaff, Ariz) (14–20 mm in diameter) King Faisal Specialist Hospital and Research Center in Jeddah, used Contegra valved conduits in 4 patients for inferior vena cava–right pulmonary artery connection (Fontan). They speculated that an additional benefit of using the Contegra xenograft could be that it provides a competent valve in the Fontan circulation, which might help by reducing the reversal of flow and maintaining better forward flow into the pulmonary circulation. The concern was whether the valve, in a nonpulsatile, passive Fontan circulation, would facilitate smooth antegrade flow into the pulmonary circula-

tion or act as a source of resistance to the flow. The findings that none of their patients had hepatomegaly or ascites on physical examination and that the post-operative echocardiograms showed excellent antegrade flow in the inferior vena cava, which also was not dilated, and minimal flow reversal in the hepatic veins support the facilitation of smooth forward flow. They presented a new option for constructing an extracardiac Fontan connection with the Contegra xenograft that has not been previously published. Their early echocardiographic results supported the idea of minimizing the reversal of infradiaphragmatic venous flow, decreasing hepatic congestion, and possibly reducing the development of ascites.² They do have a way of assessing the conduit size by using Rowlatt and colleagues' chart.³

The authors routinely administered 5 mg/kg ticlopidine as antiplatelet therapy. Warfarin was not used even though they had a patient with arteriovenous valve replacement. How did they control the thrombogenic potential here?

Measurement of the lower lobe index is an important adjunct to evaluate candidates for the Fontan operation. The predictive value of the Nakata index is less informative than the lower lobe index, which was introduced to optimize the preoperative selection of Fontan candidates. Lower lobe index may be more predictive to evaluate the adequacy of the pulmonary vascular tree, given that central pulmonary arteries used to calculate the Nakata index can be enlarged before or during the Fontan operation.⁴

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Reply to the Editor:

We appreciate Dr Sersar's comments on our recent article, "Feasibility of the Extracardiac Conduit Fontan Procedure in Patients Weighing Less than 10 Kilograms." These comments raise several questions concerning the following: (1) choice of conduit type, (2) anticoagulation therapy after the Fontan procedure, and (3) examination of the pulmonary arteries for evaluating the pulmonary vascular tree.

In our article, we describe our strategy for the extracardiac Fontan operation without fenestration. Our strategy aimed to eliminate cyanosis as soon as possible. Fenestration might reduce the duration of pleural drainage but cannot eliminate cyanosis even after the Fontan procedure. We mentioned in the article that peritoneal drainage might be able to reduce the duration of pleural drainage in small children in particular. In addition to the obvious purpose of the drainage of ascites itself, drainage of ascites also results in the drainage of the inflammatory factors present in the ascites.¹ In our series at least, there were no patients with recurrent ascites after the cessation of the initial peritoneal drainage. We have a chance to use a Contegra conduit² if this conduit is an attractive option for reducing ascites and pleural effusion. However, the use of this conduit for the Fontan operation is not permitted in Japan. The fate of the conduit as a xenograft, especially in terms of obstruction of conduit and durability of valve function, over the long term should be investigated.

With regard to anticoagulation agents, we did not previously use warfarin in any small patients because of the complexity of warfarin control. However, we have recently used warfarin in patients with artificial valve replacement or suboptimal conditions after the Fontan operation.

Regardless of the methods used for evaluating Fontan candidates, we believe that the most important evaluation parameters are pulmonary vascular resistance, pulmonary artery pressure, and atrial pressure or ventricular end-diastolic pressure in patients undergoing the bidirectional Glenn procedure. We showed the Nakata index as the reference morphologic index for the pulmonary vascular tree to compare with other study groups, because the body size of our patients was relatively small and there were no alternative conventional indicators of the pulmonary vascular tree.

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CHALLENGES OF SMALL CARDIAC UNITS

To the Editor:

We read with interest the recent articles by Shahian and Normand¹ and Carey and colleagues² and would like to shed some light on the current prac-

tice of small cardiac units in the Middle East and third world countries. Numerous cardiac care units are located in several hospitals throughout a single city, and approximately 100 open surgeries are performed each year in these units. Many hospital administrations are racing and competing with each other to provide this delicate and highly sophisticated service without detailed understanding of the magnitude and financial commitment. It has to be emphasized that cardiac surgery, although highly needed and vital, is a complex, comprehensive and multidisciplinary subspecialty. Vast financial resources are needed to provide the nursing and medical staff, and cardiology and cardiac surgery equipment. Unfortunately, there is no administrative collaboration or even communication to obtain at least a satisfactory output. These small units share similar features and face the same difficulties and obstacles, including unsteady patient volume and flow, and a series of average cases followed by difficult high-risk cases. The overall setup is substandard and aimed for business, profit, and fame based on the attraction of more patients customers called to other subspecialties. Emergency catheter laboratory complications add to the problems and increase the surgical risk. Limited intensive care beds, limited nurse/staff coverage, and cardiac anesthesia shortages exist because these units are run with limited resources and 1 or 2 anesthesiologists working 1 or 2 days per week and involved with general surgery the rest of the week.

Each cardiac case requires an extensive arrangement of blood and blood products, intensive care unit beds and anesthesia during the day of surgery, and night coverage at least for the first night. The cardiac surgeon bears most of the responsibility. Each morbidity or mortality dramatically worsens the results. The overall system arrangement is suboptimal, with marginal benefit and substantial cost.

Administrators and health providers have to be aware of such problems.

Cardiac surgery cannot attain the expected productivity unless the necessary professionals and adequate resources are provided. Full coverage, 24 hours per day, 7 days per week, of diagnostic services, elective and emergency operations, post operative followup and rehabilitation, are crucial for success of these programs.

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Reply to the Editor:

Dr Al-Ebrahim's Letter to the Editor reinforces an important concept from our article. The fact that some lower-volume cardiac surgery programs have achieved excellent results should not be viewed as a general endorsement for developing more such programs. The justification for any new cardiac surgery program must be critically evaluated, including the adequacy of resources and referral base.

Ideally, such new programs are developed to serve populations who have no other local or regional access to cardiac surgery. To be successful, smaller cardiac surgery programs must be provided with the substantial hospital resources necessary to care for these complex patients. They should also be encouraged to use the strategies mentioned in our commentary to help compensate for their smaller volumes.