We agree with Dobson and colleagues that variations in procedural technique may also be a potential mechanism for variations in study outcomes. Cardioplegia types and techniques, temperature management, and closure of the pericardium may all effect postprocedure RV function. We agree that larger clinical outcome and imaging trials are needed in matched population groups, with careful delineation of the TAVI and surgical techniques and the use of state-of-the-art imaging (such as cardiovascular magnetic resonance imaging) for investigation of myocardial functional and structural effects as well as aortic valve hemodynamics.

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References

1. Crouch G, Bennetts J, Sinhal A, Tully PJ, Leong DP, Bradbrook C, et al. Early effects of transcatheter aortic valve implantation and aortic valve replacement on myocardial function and aortic valve hemodynamics: insights from cardiovascular magnetic resonance imaging. *J Thorac Cardiovasc Surg.* 2015;149:462-70.
2. Fairbairn TA, Steadman CD, Mather AN, Motwani M, Blackman DJ, Plein S, et al. Assessment of valve haemodynamics, reverse ventricular remodelling and myocardial fibrosis following transcatheter aortic valve implantation compared to surgical aortic valve replacement: a cardiovascular magnetic resonance study. *Heart.* 2013;99:1185-91.
3. Kempny A, Diller GP, Kaleschke G, Orwat S, Funke A, Schmidt R, et al. Impact of transcatheter aortic valve implantation or surgical aortic valve replacement on right ventricular function—the reply. *Heart.* 2013;99:349.

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CEREBRAL INFARCTION OCCURS PARTICULARLY IN PATIENTS WITH PORCELAIN AORTA To the Editor:

Porcelain aorta is still an overwhelming hurdle to safely completing aortic valve replacement (AVR).

Recently, Idrees and colleagues¹ reported the outcomes of surgical or transcatheter AVR for patients in whom the operation had been abandoned due to porcelain aorta. Among the 7 surgical cases, the aorta could not be clamped, and the ascending aorta was replaced under deep hypothermic circulatory arrest in 4 patients, whereas the aortic clamp was placed at the less calcified portion in the 3 other patients. None of the patients

FIGURE 1. Double-layered calcification (arrow).

developed complications related to calcification of the aorta, such as embolic stroke, and the authors concluded that surgery for such patients is safe, as in the transcatheter cases.

Although they should be congratulated for their excellent results, we would like to raise a question about their conclusion. Among the 201 patients who underwent AVR for aortic stenosis from 2002–2014 in our institution, aortic cannulation and/or clamping of the aorta was avoided due to severe calcification in 16 patients (8.0%). Cannulation into the axillary artery or the femoral artery or both for arterial return was used in all cases. Aortic clamping was abandoned in 3 cases. AVR was performed after replacement of the ascending aorta in 2 cases and completed under deep hypothermic circulatory arrest with antegrade cerebral perfusion in 1 case, but none of the patients experienced a stroke. In the remaining 13 cases, the ascending aorta was cautiously clamped. A clamping forceps with a curved jaw was applied in 2 cases where there was a higher risk of embolization to avoid injuring the calcified aortic wall. In another case, bilateral axillary arterial perfusion was started, and the left common carotid artery was clamped at the moment of aortic clamping to prevent debris flowing into the cerebral vessels. Among these 16 patients, symptomatic cerebral infarction occurred in 2 patients (12.5%), but asymptomatic infarction was found in 3 other patients on magnetic resonance imaging. We believe that embolic stroke may occur at a higher incidence in patients with a severely calcified aorta and cannot agree with the conclusion drawn by Idrees and colleagues¹ that AVR is safe even in such severely calcified cases. Although stroke was not encountered in the series described by Idrees and colleagues,¹ occult stroke might have been present. Even a small embolus could lead to serious sequelae, and no one can predict or control it.

It is important to determine whether the aorta can be safely clamped in each patient and what type of calcification is related to critical cerebral infarction.² Nishi and colleagues³ reported that the aorta could be clamped safely when calcification was less than 75% of its circumference. However, cerebral infarction was encountered in less calcified cases. In those cases, calcification was not circumferentially distributed, but there was thick intima. By clamping such a portion, bulky emboli might have been generated and caused cerebral infarction. Special attention should be paid to a calcified aorta that looks double-layered on computed tomography scan (Figure 1). In this type, a soft atheroma may be included between 2 layers and pushed out by clamping the aorta, becoming a critical embolus.

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References

1. Idrees J, Roselli EE, Raza S, Krishnaswamy A, Mick S, Kapadia S, et al. Aborted sternotomy due to unexpected porcelain aorta: does transcatheter aortic valve replacement offer an alternative choice? *J Thorac Cardiovasc Surg.* 2015;149:131-4.
2. LeMaire SA. Individualized treatment strategies for patients with aortic valve disease and porcelain aorta. *J Thorac Cardiovasc Surg.* 2015;149:134-6.
3. Nishi H, Mitsuno M, Ryomoto M, Miyamoto Y. Comprehensive approach for clamping severely calcified ascending aorta using computed tomography. *Interact Cardiovasc Thorac Surg.* 2010;10:18-21.

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THE FROZEN ELEPHANT TRUNK

To the Editor:

Shesthra and colleagues¹ have reported their entire experience since 2001 with the elephant trunk (ET) and frozen elephant trunk (FET) procedures, for treatment of acute and chronic type A dissection and of aneurysm. Their results have led them to increasingly apply the FET technique to the management of these 3 conditions. In their discussion, however, the authors fail to acknowledge the 1-stage open technique using a conventional (unstented) polyester graft as another option for the treatment of extensive thoracic aortic disease. Although the 1-stage procedure has been used infrequently for the treatment of acute type A dissection, cumulative experience has created a body of evidence on use of this technique for the management of chronic type A dissection, chronic type B dissection with retrograde extension, and aneurysm.²⁻⁴

Our experience with the 1-stage technique now encompasses 118 patients, with follow-up extending to 14 years, and it includes 75 patients who have chronic type A or chronic type B dissection with antegrade extension, and 39 patients who have degenerative aneurysms. We have recently reported on our experience with this procedure for extensive chronic thoracic dissection in 68 patients, and we invite comparison with the experience of treating 51 patients who had chronic dissection and were treated with the FET, reported by Shesthra and colleagues.^{1,4}

The baseline characteristics of our patients did not differ appreciably from those of Shesthra and colleagues, including a high prevalence of previous thoracic aortic procedures (91% vs 69%, respectively). Hospital mortality for our series was 2.9%, versus 8% in the series of Shesthra and colleagues; Occurrence of reoperation for bleeding was 9% versus 20%; stroke was 1.5% versus 12%; and renal failure requiring dialysis was 7.5% versus 18%. The intraoperative transfusion requirements were comparable.

Of greater concern, however, is the non-negligible occurrence of important spinal cord ischemic injury (paraplegia, paraparesis) that has been reported with use of the FET. In reported single series and meta-analyses, it has ranged as high as 25%.^{5,6} In the series of Shesthra and colleagues,¹ the prevalence with the FET was 5%, and it was highest for the subset of patients with acute dissection (9%).¹ Such injury occurred with lower frequency in the chronic dissection (2%) and aneurysm (3%) groups. For the conventional ET procedure, in some of the largest reported series,⁷⁻¹¹ encompassing a total of >1300 patients, primarily with chronic dissection or aneurysm, the prevalence of this complication ranged from zero to 0.4%. The prevalence was also zero in patients with aneurysm or chronic dissection who had conventional ET repair, in the series of Shesthra and colleagues.¹

In our experience with the 1-stage technique in 118 patients with chronic dissection or aneurysm, most of whom had replacement of half or more of the descending thoracic aorta, spinal cord ischemic injury (paraplegia) occurred in 1 patient (0.8%). Thus, for patients with chronic dissection or aneurysm, the role of a procedure that has consistently resulted in a not-insignificant incidence of spinal cord ischemic injury, with the knowledge that patients with this devastating complication do poorly over the long term, must be seriously questioned. At least 2 other procedures, with comparable early mortality and other morbidity rates, can be performed with a near-zero occurrence rate of this complication. For patients with acute dissection, traditional repair, consisting of ascending aortic repair, or ascending repair and arch replacement, is additionally associated with a near-zero rate of spinal cord ischemic injury, and thus calls into question the role of the FET in this condition as well.