FIGURE 1. A, Preoperative esophagography shows esophageal stenosis caused by a Kommerell diverticulum. B, Postoperative esophagography shows improvement of the esophageal stenosis.

frail, elderly patient is a good candidate for hybrid repair. We plan to use both treatments for Kommerell diverticulum, according to the patient's condition.

Endovascular repair is a reasonable treatment for Kommerell diverticulum in frail patients; however, the long-term results are still unknown. Also, there is a risk of aorto-esophageal fistula after endovascular repair. It is a rare complication, but it has been reported at an incidence of 1.5% to 1.9% and can be a devastating.²⁻⁴

Finally, we appreciate the commentary of Keshavamurthy and colleagues and plan to report the late outcomes of our technique in the future.

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References

1. Idrees J, Keshavamurthy S, Subramanian S, Clair DG, Svensson LG, Roselli EE. Hybrid repair of Kommerell diverticulum. *J Thorac Cardiovasc Surg.* 2014;147:973-6.
2. Eggebrecht H, Mehta RH, Dechene A, Tsagakis K, Khl H, Huptas S, et al. Aorto-esophageal fistula after thoracic aortic stent-graft placement: a rare but catastrophic complication of a novel emerging technique. *JACC Cardiovasc Interv.* 2009;2:570-6.
3. De Masi M, Amabile P, Bal L, Piquet P. Management of endograft infection coupled with aorto-esophageal fistula: extra-anatomic aortic bypass and endograft explantation. *J Thorac Cardiovasc Surg.* 2013;146:e11-3.
4. Czerny M, Eggebrecht H, Sodeck G, Weigang E, Livi U, Verzini F, et al. New insights regarding the incidence, presentation and treatment options of aorto-oesophageal fistulation after thoracic endovascular aortic repair: the European Registry of Endovascular Aortic Repair Complications. *Eur J Cardiothorac Surg.* 2014;45:452-7.

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ROSS OPERATION OR AORTIC VALVE REPAIR IN NEONATES AND INFANTS?

To the Editor:

We read with interest the recent article by Brancaccio and colleagues¹ that described 55 children younger than 18 years who underwent Ross procedures from 1993 to 2012. Thirteen patients were younger than 1 year, including 4 neonates (7%) and 9 infants (16%). In-hospital mortality was 13% (7/55), including 3 neonates and 3 infants, thus, bringing mortality in these age subgroups to 75% (3/4) and 33% (3/9), respectively. Brancaccio and colleagues¹ mentioned that 2 of those neonates with critical aortic valve stenosis underwent urgent Ross procedures for severe aortic insufficiency after balloon valvuloplasty, and this played major role in increasing mortality. Some comments appear to be appropriate in a view of the high mortality after the Ross procedure in neonates and infants.

We have recently reported our experience² with 100 children younger than 18 years who underwent the Ross procedure from 1995 to 2012. Nineteen patients were younger than 1 year, including 6 neonates and 13 infants. In-hospital mortality was 6%, including 4 neonates and 2 infants, thus bringing mortality in these age subgroups to 67% (4/6) and 15% (2/13), respectively. Similarly, we also observed that children younger than 1 year had a higher mortality.

Currently, we try to avoid Ross procedures in neonates and infants. We recently reported our strategy in performing aortic valve repair, with subsequent reoperative aortic valve repair if necessary, to delay the Ross procedure until the child is past infancy.²⁻⁵ Aortic valve repair allows us to delay the valve replacement while preserving the ventricular function. The number of aortic valve repairs in our institution has increased

FIGURE 1. A unicuspid dysmorphic aortic valve with severe aortic stenosis (A) was repaired by removal of excessive fibrous tissue, commissurotomy, and 2 trigonal cusp extensions of autologous glutaraldehyde-treated pericardial patches (B). Recurrent overgrowths of the fibrous tissue occurred on the aortic cusps, and the balloon valvuloplasty resulted in tear of the larger cusp, with severe aortic insufficiency (C). The tear was repaired with an autologous glutaraldehyde-treated pericardial patch (D). *LCA*, Left coronary artery; *RCA*, right coronary artery.

relative to Ross procedures during recent years.⁵ With the exception of exceedingly rare cases of severe aortic valve endocarditis, *all* aortic valves can be repaired in neonates and infants. Neonates and infants with left ventricular outflow tract obstruction who are considered for the Ross-Konno procedure are often better suited to univentricular repair. Most importantly, severe aortic insufficiency after failed balloon dilatation is not an absolute indication for the Ross procedure. The following case report illustrates this point. A 3-day-old girl (3.3 kg, aortic valve annulus 4.7 mm) with critical aortic stenosis and severely reduced left ventricular function underwent aortic valve repair (Figure 1, A and B). She was discharged with normal left ventricular function and was seen for aortic balloon dilatation at 5 months of age (6 kg, aortic valve annulus 8 mm) with mean gradient of 60 mm Hg and normal left ventricular function. Aortic balloon dilatation resulted in severe aortic insufficiency and cardiac fibrillation. The patient underwent emergency extracorporeal membrane oxygenation support through the neck vessels, and emergency reoperative aortic valve repair was performed (Figure 1, C and D). After the operation, extracorporeal membrane oxygenation was discontinued,

and the neck vessels were repaired. The patient is doing well at 1 year of age (9 kg, aortic valve annulus 9 mm), with no aortic insufficiency and mild stenosis.

We believe that Ross procedures should be postponed beyond infancy, ideally into adulthood if feasible.

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References

1. Brancaccio G, Polito A, Hoxha S, Gandolfo F, Giannico S, Amodeo A, et al. The Ross procedure in patients aged less than 18 years: the midterm results. *J Thorac Cardiovasc Surg.* 2014;147:383-8.
2. Tan Tanny SP, Yong MS, d'Udekem Y, Kowalski R, Wheaton G, D'Orsogna L, et al. Ross procedure in children: 17-year experience at a single institution. *J Am Heart Assoc.* 2013;2:e000153.
3. Siddiqui J, Brizard CP, Galati JC, Iyengar AJ, Hutchinson D, Konstantinov IE, et al. Surgical valvotomy and repair for neonatal and infant congenital aortic stenosis achieves better results than interventional catheterization. *J Am Coll Cardiol.* 2013;62:2134-40.
4. Siddiqui J, Brizard CP, Konstantinov IE, Galati J, Wheaton G, Cheung M, et al. Outcomes after operation for bicuspid aortic valve disease in the pediatric population. *Ann Thorac Surg.* 2013;96:2175-83.
5. d'Udekem Y, Siddiqui J, Seaman CS, Konstantinov IE, Galati JC, Cheung MM, et al. Long-term results of a strategy of aortic valve

repair in the pediatric population. *J Thorac Cardiovasc Surg.* 2013;145:461-7; discussion 467-9.

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Reply to the Editor:

We appreciate the huge experience recently published by Tan Tanny and colleagues¹ regarding the Ross operation in 100 patients in a pediatric population, confirming our results in which greater mortality was observed in neonates and infants.

For this reason, they have been trying to switch the treatment from the Ross procedure to aortic valve repair in neonates and infants. We believe that this could be a very good strategy to follow, with 2 main observations.

First, the real benefit of aortic valve conservative surgery can be evaluated in depth only after 2 decades of follow-up. Second, aortic repair at a low patient weight will be a very technically demanding operation requiring a long learning curve.

Considering that the Melbourne Centre is a leading institution in such a field worldwide, we sincerely appreciate their results.² However, a word of caution must be given, because their numbers are not so easily reproducible in most centers without a specific commitment.