FIGURE 1. Modified Allen test. Both radial and ulnar arteries are occluded with three fingers each, with counterforce provided by ipsilateral thumb on dorsum of wrist for as long as 10 seconds while patient closes hand. This ensure that recurrent superficial palmar artery arising early from radial artery is occluded, thus avoiding false-negative results.

internal thoracic artery as a T, inverted T, or Y graft.³ Alternatively, the shortened graft can be used in a horseshoe anastomotic configuration with the internal thoracic artery.⁴

Of more importance are the anomalies of RA or ulnar artery aplasia and incomplete superficial (13% of 650 dissected hand specimens) or deep palmar (3% of 200 dissected hand specimens) arches.⁵ In most of these cases of anatomic forearm and hand anomalies, a modified Allen test should allow detection of the vascular insufficiencies. With a cutoff point of 5 seconds, the modified Allen test has sensitivity and specificity of 65.8% and 81.6%, respectively, with a diagnostic accuracy of 80%.⁶ With a cutoff limit longer than 6 seconds, the modified Allen test has a poorer sensitivity of 54.5%, a better specificity of 91.7%, and a somewhat lower diagnostic accuracy of 78%.⁶ I therefore recommend using a cutoff point of 5 seconds.

The presence of a more proximally arising superficial palmar branch of the RA, however, may yield a false-negative result. To avoid such a false-negative result, I recommend performing the modified Allen test with three fingers to occlude the RA and ulnar artery, as shown in Figure 1. This modification, which is commonly performed in our unit, ensures occlu-

sion of a proximally arising superficial palmar branch from the RA.

Various other methods have been reported to improve diagnostic accuracy, such as digital plethysmography to measure pulse-volume recording or digital-brachial index, duplex Doppler ultrasonography with dynamic Doppler, or arteriography to assess anatomy and flow. A simple intraoperative assessment of sufficiency of ulnar collateralization of the palmar circulation is to check the distal stump pressure or to feel for a pulse when occluding the proximal RA with a bulldog vascular clamp before division of the RA.

Because the prevalence of clinically relevant RA and ulnar artery anomalies is probably less than 0.01%, the routine use of arteriography is not recommended. A properly performed modified Allen test, with or without digital plethysmography supplemented by duplex Doppler ultrasonography in marginal cases, may be sufficient to detect vascular anomalies that are relevant. The addition of intraoperative stump pressure assessment should further help to reduce the incidence of postoperative hand ischemia.

Chee Fui Chong, MD(Lond),
FRCSEd(CTh), BSc(Lond)
Thoracic Unit

Department of Surgery
RIPAS Hospital
Bandar Seri Begawan
Brunei Darussalam

References

1. McCormack LJ, Cauldwell EW, Anson BJ. Brachial and antebrachial arterial patterns. A study of 750 extremities. *Surg Gynecol Obstet.* 1953;96:54.
2. Weathersby HT. Anomalies of brachial and antebrachial arteries of surgical significance. *South Med J.* 1956;49:46-9.
3. Tashiro T, Nakamura K, Iwakuma A, Zaitu R, Iwahashi H, Murai A, et al. Inverted T graft: novel technique using composite radial and internal thoracic arteries. *Ann Thorac Surg.* 1999;67:629-31.
4. Aguero OR, Navia JL, Navia JA, Mirtzouian E. A new method of myocardial revascularization with the radial artery. *Ann Thorac Surg.* 1999; 67:1817-8.
5. Coleman SS, Anson BJ. Arterial patterns in the hand based upon a study of 650 specimens. *Surg Gynecol Obstet.* 1961;113:409-24.
6. Jarvis MA, Jarvis CL, Jones PR, Spyt TJ. Reliability of Allen's test in selection of patients for radial artery harvest. *Ann Thorac Surg.* 2000;70:1362-5.

doi:10.1016/j.jtcvs.2008.11.021

INAPPROPRIATE COMPARISON OF SURVIVAL RATES AT 30 DAYS IN TRANSPLANTED PATIENTS PREVIOUSLY IMPLANTED OR NOT WITH LEFT VENTRICULAR ASSIST DEVICES

To the Editor:

The statement by Cleveland and colleagues¹ that “for the deaths that occurred in all 317 patients, 19% of the patients without left ventricular assist devices died within 30 days of transplant, whereas 80% of the patients with left ventricular assist devices died within 30 days of transplant ($P < .01$)” is unfortunate. In fact, the authors have failed to present this result using the traditional presentation wherein the percent survival at 30 days is separately reported for the left ventricular assist device (LVAD) group and for the no-LVAD group, along with the statistical level of significance of the comparison.

The total deaths of the LVAD group resulted from a follow-up of 6 years,

and the total deaths of the no-LVAD group resulted from a follow-up of 19 years. Hence, it is not surprising that, in terms of death counts, the initial 30 days in the LVAD group included a much higher percentage of total deaths than in the no-LVAD group; this is simply because 30 days weigh much “more” in comparison to 6 years than in comparison to 19 years.

Thus, we welcome a re-presentation of this important finding, in the manner we have mentioned above, no matter if the new *P* value will remain, as we expect, far from the level of statistical significance.

Andrea Messori, PharmD
Sabrina Trippoli, PharmD
Laboratory of Pharmacoeconomics
Careggi Hospital
Firenze, Italy

Reference

1. Cleveland JC, Grover FL, Fullerton DA, Campbell DN, Mitchell MB, Lindenfeld J, et al. Left ventricular assist device as bridge to transplantation does not adversely affect one-year heart transplantation survival. *J Thorac Cardiovasc Surg.* 2008;136:774-7.

doi:10.1016/j.jtcvs.2008.10.050

Reply to the Editor:

We thank Drs Messori and Trippoli for their interest. They have critically examined our statistical methods regarding early deaths (30 days) following cardiac transplantation with and without left ventricular assist devices (LVADs). From a purely statistical argument, they are correct: as the LVAD group had shorter follow-up, 30 days provided a greater influence in 6 years versus 19 years of follow-up. Upon reanalysis with the “traditional presentation,” of the 294 no-LVAD subjects, 23 (8%) died early. Of the 23 LVAD subjects, 4 (17%) died early. This difference was indeed, not significant (*P* = .11).

As clinicians, we believe that important observations can be learned from our reported experience.¹ Although we acknowledge this important statistical correction, we do not believe that transplantation with an LVAD is the

same operation as transplantation without an LVAD. Our bedside observations in caring for these patients have indicated that when patients transplanted from an LVAD develop problems, these problems often occur early in the posttransplant period. This occurrence likely reflects the surgical complexity of explanting the LVAD. Our primary finding of this report—no difference exists in 1-year survival after heart transplantation with or without LVAD—stands.

Joseph C. Cleveland, Jr, MD
Associate Professor of Surgery
Surgical Director, Cardiac
Transplantation and MCS
University of Colorado at Denver
Denver, CO

Reference

1. Cleveland JC, Grover FL, Fullerton DA, Campbell DN, Mitchell MB, Lindenfeld J, et al. Left ventricular assist device as bridge to transplantation does not adversely affect one-year heart transplantation survival. *J Thorac Cardiovasc Surg.* 2008;136:774-7.

doi:10.1016/j.jtcvs.2008.12.002

NONOPERATIVE MANAGEMENT OF AN EXTENSIVE TRACHEAL INJURY IN AN 860-g PRETERM NEONATE

To the Editor:

We read with great interest the report of Denlinger and colleagues¹ on nonoperative management of large tracheal injuries in adult patients. Neonatal airway complexities are extremely rare and are usually associated with congenital tracheal stenosis rather than iatrogenic complications. Due to the neonate's tracheal diameter, injuries in neonates most commonly occur in the subglottic anterior wall or cricothyroid junction in contrast to the common posterior wall injury in adults. Because the management decisions in our patient were extrapolated from the experience with older patients, Denlinger and associates¹

article is an excellent segue to share an extremely rare complication of an iatrogenic posterior wall tracheal injury in a premature neonate from orotracheal intubation.

A preterm neonate born spontaneously at 25 3/7 weeks of gestation, weighing 860 g and measuring 33 cm, had been orotracheally intubated for respiratory failure. The infant had worsening failure with progressive bilateral pneumothoraces and a pneumomediastinum and was transferred to our institution. Chest roentgenogram (Figure 1) showed the distal portion of a 2.5-mm endotracheal tube below the diaphragm. Bronchoscopy revealed the entire membranous and a portion of the cartilaginous trachea to be disrupted at the carina for nearly two-thirds the total tracheal circumference. The endotracheal tube was positioned 1 cm above the injury, and low-pressure ventilation was provided until the patient was initially extubated 36 hours later before being reintubated several days later. Pleural drains were placed and broad-spectrum antibiotics were continued for 28 days. Repeat bronchoscopy at 9, 12, and 20 days revealed progressive healing without evidence of stenosis. There was never evidence of mediastinitis, and the mediastinal emphysema resolved. Twenty days after initial presentation, a persistent patent ductus arteriosus contributing to pulmonary overcirculation was ligated. Surgery was uneventful via a left posterolateral thoracotomy with normal-appearing mediastinal anatomy. The neonate was discharged at 118 days of age.

There are no recommendations for membranous and/or cartilaginous tracheal injuries in premature neonates. In older individuals, the literature supports a conservative nonoperative management strategy with good results for membranous injuries with less optimal outcomes for cartilaginous injuries.² However, tracheal surgery has significant risk and morbidity in extremely low-birth-weight premature