The pressure is on

Thomas G. Gleason, MD

From the Division of Cardiac Surgery, University of Pittsburgh School of Medicine, Pittsburgh, Pa.

Disclosures: Dr Gleason receives institutional research support but no personal remuneration from Medtronic and Boston Scientific. He serves on Medical Advisory Boards for Abbott and Cytosorb for which he receives modest remuneration for his time only.

Received for publication July 1, 2018; revisions received July 1, 2018; accepted for publication July 2, 2018.

Address for reprints: Thomas G. Gleason, MD, Division of Cardiac Surgery, University of Pittsburgh School of Medicine, 5200 Centre Ave, Ste 715, Pittsburgh, PA 15232 (E-mail: gleasontg@upmc.edu).

J Thorac Cardiovasc Surg 2018;156:1404-5

0022-5223/\$36.00

Copyright © 2018 Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2018.07.002>

Ikeno and colleagues¹ report a rather simple intraoperative quantitative test, their so-called mean pressure buildup (mPB) test, to aid in determining valve competency during valve-sparing aortic root replacement (VSRR) before an aortic crossclamp is removed. The advantage of performing such a test (if accurate) would be that it could dramatically reduce the need for reapplication of the aortic crossclamp to address valve incompetency following VSRR, and thus reduce cardiac ischemia and overall cardiopulmonary bypass times and potentially improve valve repair results. The authors modified a technique that is widely used by aortic root surgeons to both test valve function and administer antegrade cardioplegia following root replacement—namely to temporarily clamp the replacement graft while administering antegrade cardioplegia. Their modification is to monitor and record the pressure in the cardioplegia circuit during infusion and measure the time elapsed between the points when the circuit pressure is 50 mm Hg and then 200 mm Hg. They then calculate the mPB as the pressure change (or 150 mm Hg) divided by the pressurization time ($T \text{ at } P_{200 \text{ mm Hg}} - T \text{ at } P_{50 \text{ mm Hg}}$). Statistical analysis of their formula included both Kruskal-Wallis and Wilcoxon rank sum testing.

Based on their results, they chose an mPB threshold of 10 mm Hg/sec to identify an unacceptable (with respect to insufficiency) VSRR/valve repair. Their results, as graphically depicted in their article, suggest that this threshold yields a better specificity than sensitivity given that 30% to 40% of patients with mild aortic insufficiency following repair (outliers) had a mPB above 15 mm Hg/sec, giving rise to a potentially suboptimal predictive value at least at this threshold setting. Moreover, irrespective of the fact that those valves that exhibited mild or worse insufficiency by initial mPB measurement saw improvement in their mPB with further modification before crossclamp removal, they still had postmodification mPBs < 10 mm Hg/sec (ie, less than threshold). Consequently, it is not clear what the test actually prevented clinically in these patients because there was only 1 patient who had severe insufficiency, and that patient required

Graft pressurization following root replacement before clamp removal is commonplace.

Central Message

A straightforward, quantitative assessment of aortic valve performance following valve-sparing aortic root replacement before crossclamp removal may reduce operative times and improve results.

See Article page 1399.

aortic valve replacement. We do not know whether the 3 patients with mild insufficiency would have had more after crossclamp removal had they not undergone a mPB test and subsequent modification, nor do we know what degree of aortic insufficiency they had during the initial mPB test by clinically relevant testing (eg, echocardiography) due to the inability to obtain these data.

Despite these limitations, it is clear that this relatively minor adjustment to a technique that is already widely used in a qualitative way to assess valve function before crossclamp removal can quantitatively identify at least some valves that are unacceptably insufficient and thus provoke further valve repair modification before a crossclamp is removed. Other techniques of valve assessment before clamp removal have been developed and utilized; for example, angioscopic or endoscopic interrogation with crystalloid pressurization.^{2,3} However, all of the techniques previously described provide qualitative but not quantitative assessments. Ideally, the technique of Ikeno and colleagues¹ needs further validation to prove its efficacy over other qualitative methods currently in use. When considering the potential benefit and ease of application over the minimal risk, it may be practical to institute this strategy more broadly in the context of VSRR and other aortic valve repair surgeries. Dr Ikito's group has a long-standing history of making influential contributions to the thoracic aortic surgery arena, and

they should be congratulated for their continued efforts toward that end.

References

1. Ikeno Y, Tanaka H, Okita Y. Intraoperative aortic root pressure study for quantitative assessment of aortic regurgitation during valve-sparing root replacement: a preliminary report. *J Thorac Cardiovasc Surg.* 2018;156:1399-401.
2. Tsagakis K, Benedik J, El Khoury G, Jakob H. Aortic valve repair: intraoperative evaluation of valve geometry by angioscopy. *J Thorac Cardiovasc Surg.* 2015;149:1666-8.
3. Miyahara S, Oka T, Takahashi H, Inoue T, Matsumori M, Tanaka H, et al. Feasibility of intraoperative water testing in aortic valve repair: direct visualization from left ventricle with a videoscope. *J Thorac Cardiovasc Surg.* 2017;154:24-9.