ONE NUMBER, INNUMERABLE VARIABLES

Reply to the Editor:

We welcome the insightful comments by Drs Poon and Field toward the mortality data acquired during our population-based study on thoracic aortic dissections and thoracic aortic aneurysms in Ontario.¹ We reported 20.6% operative mortality for type A aortic dissections, a statistic that was unchanged over the 12-year study period. The operative mortality for this province-wide administrative dataset is comparable to other large registry datasets in North America and Europe published over the last decade.²⁻⁴ Drs Poon and Field imply that the consistency of these large datasets suggest a degree of stagnation in the forward progress to improve outcomes with this complex and lethal disease. They formulate an interesting distribution curve composed of 37 observational studies, 4 voluntary registries, and 5 administrative databases. They create a bell-shaped distribution curve and postulate that institutions benchmark 10% to 15% as a target operative mortality for surgical repair of type A aortic dissections. The 10% to 15% benchmark is derived from the fact that operative mortality in this range represents the area under their created curve for approximately 0.5 standard deviations from the mean.

We must always strive to improve our outcomes in all aspects of healthcare, and type A aortic dissections are no exception. However, for many of the reasons nicely highlighted by Drs Poon and Field, to propose a sweeping, all-inclusive, institution-wide target operative mortality for an emergent complex pathology like type A aortic dissections may prove difficult. There exist innumerable variables, many of which are difficult to capture and measure, that inevitably affect outcomes. Higher operative mortality could reflect substandard performance, but could also reflect an aggressive approach to salvage cases commonly declined by other surgical units. In these competing scenarios, although the statistics may mirror one another, the underlying cause is completely different. Variance in population densities, inter-hospital transfer resources, local infrastructure, aortic surgical, anesthetic and intensive care expertise, and, most important, patient clinical status⁵ all greatly influence operative mortality. Moreover, the weight of individual variables will vary across institutions.

Considering all these influential factors, operative mortality must first be assessed locally, weighing and balancing institutional-level variables. This establishes a baseline and allows for institutional trends to be followed over time. This can also identify local specific variables that are potential

targets for improvements. Comparative analysis of one's own operative mortality is far less at risk for confounding relative to comparative analyses with other institutions. Despite these considerations, we agree that there is a broad, globally established expected operative mortality for type A dissection based on large registry datasets, and mortality rates that fall significantly outside these expected norms must be scrutinized.

Although statistics don't lie, they can be misleading when not interpreted in the appropriate context. The Ontario analysis nicely highlights this point. Despite perceived improvements in medical and operative interventions, we observed an unchanged operative mortality statistic. However, though the operative mortality for type A aortic dissection remained stable at 20.6%, we also reported that the per-year total hospital mortality significantly declined (65.1% in 2002 to 48.4% in 2012; $P < .001$). The total hospital mortality includes all patients having undergone medical, endovascular, or surgical treatment of the disease. Recognizing that medical management of a type A aortic dissection is a palliative treatment option with approximately 100% hospital mortality, and that endovascular treatment occurs in negligible numbers, the only way total hospital mortality can decrease in the face of a constant operative mortality is if patients who previously would have been declined surgery (thus received palliative medical treatment) underwent surgical repair and survived. Therefore, higher-risk patients underwent surgical repair and operative mortality remained constant. This represents a significant improvement for the healthcare system with respect to the management of type A aortic dissections.

Finally, we would advise caution when interpreting the distribution curve created by Drs Poon and Field. The true distribution of observational datasets is a theoretical construct, and although it can be estimated with some accuracy, it cannot be fully realized because of publication bias. The true distribution is void of any voluntary registry data and administrative datasets. It is constructed by all observational case series currently in publication alongside the myriad of unpublished case series for the treatment of type A aortic dissections. The unpublished datasets frequently arise from smaller centers, with less volume and higher operative mortality. These unpublished datasets typically shift the distribution curve rightward. The mean of the true distribution curve likely aligns closely with the 20% operative mortality reported by large administrative datasets such as the Ontario analysis. A major strength of administrative data is that they capture all events from all centers within the defined cohort, accounting for many of the unpublished events not captured in observational case series. Indeed, the disease

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is complex and so too are the many variables that affect its management.

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DOES THE USE OF POLYTETRA FLUOROETHYLENE FELT AND BIOLOGICAL GLUE IN THE REPAIR OF ACUTE TYPE A AORTIC DISSECTION

SIGNIFICANTLY IMPACT THE SURGICAL OUTCOME?

To the Editor:

We read with great interest the article on a simple and effective approach to aortic root and arch repair in acute type A aortic dissection by Yang and colleagues.¹ We

congratulate them on their excellent outcomes of acute type A aortic dissection repair with meticulous suturing with 5-0 Prolene (Ethicon Inc, Somerville, NJ) sutures without Teflon felt (The Chemours Company, Wilmington, Del) or BioGlue (CryoLife Inc, Kennesaw, Ga). The simple approach, however, may result in more aortic root replacements. Most severely dissected aortic sinuses are suddenly dilated as a result of weakness of the dissected thin inner and outer walls. Except for aortic roots that are severely dilated (>4.5 cm), most dissected aortic roots can be re-modeled with BioGlue on the dissected plane. Aortic wall necrosis from BioGlue does not occur frequently²; however, poor perfusion of the dissected planes, as well as toxic effects from BioGlue, may cause tissue death. In our center, which has a small volume of acute type A aortic dissection surgeries, most dissected sinuses are reattached with BioGlue, and the sinotubular junction is reinforced 2 felt strips (Figure 1).³ During a 9-year study period, we performed aortic root replacement or reimplantation in only 7% of these patients (7/99 cases) and had a second operation for a noncoronary sinus aneurysm occur in only 1 patient. The aneurysmal sinus was replaced with a teardrop vascular graft, and the remaining 2 sinuses (previously repaired with BioGlue) remained intact. The injection of BioGlue into the false lumen may produce hemostasis² and reduce aortic root replacement. Use of a 6-0 Prolene suture at the torn site and application of BioGlue in the dissected sinuses can avoid aortic root replacement, especially in cases with a torn intima or adventitia in the aortic root (Figure 1). To obliterate the false lumen of the dissected sinuses, the false lumen should be completely dried and thoroughly attached without gaps with BioGlue. On the basis of recent reports of the low surgical mortality and rare reoperation for aortic root,^{3,4} the use of BioGlue for aortic root repair should not be considered taboo. We do not use BioGlue for the repair of distal aortic dissection with hemiarch or total arch replacement because of the risk of distal embolization. We always first repair the dissected aortic root under aortic cross-clamping while lowering the temperature with cardiopulmonary bypass.³

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