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Commentary: What are the greatest unanswered questions? Toward a unified theory on cardiac surgery treatment

Lars G. Svensson, MD, PhD

Unanswered questions concerning physics, life, consciousness of the mind, universe or multiple universes, and of course, the future of coronavirus disease 2019, continue to perplex scientists, physicians, and researchers.

For cardiac surgeons, treatment of acute aortic dissection¹⁻⁹ has been an enigma that, if solved, would illuminate our practice with a universal theory and standard protocol of cardiac surgery involving the principles of cardiopulmonary bypass, myocardial protection, temperature control, management of valves and coronaries, brain protection, other end organ protection (particularly kidney, gastrointestinal, and spinal cord), hematologic management, preoperative and postoperative care, and long-term recovery and quality of life.

A large Japan Cardiovascular Surgery Database data set (n = 29,486) study by Okita and colleagues¹ hypothesizes many theories and leads to some reasonable conclusions. Being a retrospective clinical trial and not a randomized prospective trial does indicate some limitations. However, there are currently no prospective randomized data to guide surgical strategies,² and, for example, if a patient undergoes a liver transplant for an inborn metabolism error and is cured, a randomized trial is not needed.

In the current study,¹ conclusions are based on theory. Thirty-day mortality was 9.2%, and hospital mortality was 11%. Overall mortality has been reported to be 4% to 15%¹⁻⁹ (as in an older study of 690 patients⁹); similarly, risk of stroke has not changed, but spinal cord injury has

From the Department of Thoracic and Cardiovascular Surgery and Aorta Center, Heart, Vascular, and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio.

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Address for reprints: Lars G. Svensson, MD, PhD, Heart, Vascular, and Thoracic Institute, Cleveland Clinic, 9500 Euclid Ave/J1-227, Cleveland, OH 44195 (E-mail: svenssl@ccf.org).

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Lars G. Svensson, MD, PhD

CENTRAL MESSAGE

No standard operation for extent of surgery for acute aortic dissection exists, leaving surgeons to determine best surgical course while balancing risks of more extensive versus conservative repairs.

become more common with the use of frozen elephant trunks, and risk factors for death have been described. The only documented major improvement in treatment of acute aortic dissection that occurred within the current study (2013 to 2018) is less-prolonged ventilation, *pari passu* with other areas of cardiac surgery.¹

Other reasonable conclusions are noted in the study.¹ Although surgery numbers increased annually, it is unclear if this indicates that aortic dissection is becoming more common. Body temperature was not related to risk, longer pump times increased risk, and retrograde brain perfusion reduced risk of postoperative stroke, as noted in a Society of Thoracic Surgeons study.² The benefits of axillary cannulation were not reported in the current study,¹ although others have noted this.^{2,3,5}

This landmark article addresses issues like antegrade, retrograde, and other methods of brain perfusion, temperature of arrest, and added risks of extensive arch repairs, root surgery, and valve surgery; although it remains for surgeons to determine the best surgical course according to aortic pathology, presentation, and patient characteristics. A surgeon's primary goal is to save the patient by restoring flow to the dominant true lumen in the downstream aorta while balancing increased risks in more extensive repairs compared with simpler, more conservative procedures, a debate that has continued for 3 decades.⁷ This is tempered

by the challenge of unknown long-term benefits (eg, survival and quality of life, including from spinal cord injury) of more aggressive root or arch operations. The central question of acute aortic dissection surgery as far as extent of repair remains: Is the added risk of more definitive repairs at the index procedure justified to influence better long-term survival (as noted)? Only a 4-arm, randomized trial with a comparison of conservative versus aggressive arch repair or conservative versus aggressive aortic valve surgery, would better inform us. Even then, conservative surgery may have better outcomes at 30 days but not better long-term outcomes. True benefits can only be concluded following restricted means analysis of late survival benefits comparing arm groups, say at 5 years, if not 10 years.

Like so many unanswered questions, it will remain a mystery that will unlikely be definitively answered in our lifetimes. If the authors can access long-term follow-up data from this valuable data set, additional conclusions may be imputed supporting a universal theory of best cardiac surgery practice, particularly for aortic dissection.

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Commentary: Short-term outcomes following type A repair: A small step or a giant leap?

Joshua C. Grimm, MD,^a and Arman Kilic, MD^b

With the continued growth of robust, acute type A aortic dissection databases, the preponderance of outcomes-based analyses in the literature over the past decade has increased substantially. In a recent examination of the Japanese experience published in the *Journal*, Okita and

Joshua C. Grimm, MD, and Arman Kilic, MD

CENTRAL MESSAGE

Short-term results following repair of acute type A aortic dissections have improved dramatically. It is imperative, however, to understand the long-term effects of intraoperative decision making.

colleagues¹ reviewed nearly 30,000 dissection patients who underwent repair over a 6-year period. Although the authors' conclusions largely mirror a number of similar

From the ^aDivision of Cardiac Surgery, The University of Pennsylvania School of Medicine, Philadelphia; and ^bDivision of Cardiac Surgery, The University of Pittsburgh Medical Center, Pittsburgh, Pa.

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Address for reprints: Arman Kilic, MD, University of Pittsburgh Medical Center, 200 Lothrop St, Suite C-700, Pittsburgh, PA 15213 (E-mail: kilica2@upmc.edu).

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