Make sternotomy great again

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Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication June 20, 2018; revisions received June 20, 2018; accepted for publication June 22, 2018; available ahead of print Aug 11, 2018.

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J Thorac Cardiovasc Surg 2018;156:2133-4

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2018.06.076>

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Central Message

Minimally invasive approaches must be rigorously validated by well-designed randomized clinical trials. Innovations for sternal closure may also enhance patient recovery and should be explored.

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Our specialty's history is decorated with brave individuals who could develop and apply innovations to boldly explore the frontiers of cardiac surgery. The conventional sternotomy has facilitated many of these advances. Curiously, we have not substantially innovated the technique of sternal closure since its introduction at the dawn of cardiac surgery. We continue to split the sternum and secure it with traditional wire cerclage. We wait and hope for bony fusion. Patients' discomfort, respiratory mechanics, and functional physical recovery are tightly associated with this slow healing process. In an effort to accelerate recovery and improve patient satisfaction, talented surgeons have minimized or even avoided the sternotomy. With competing advances in wire-based interventions, the urgency and frequency of minimally invasive and sternal-sparing procedures has accelerated. The reliable, safe, and steadfast sternotomy is now perceived as obsolete—sometimes even a disappointment when required.

In this issue of the *Journal*, Nair and colleagues¹ present the results of a pragmatic randomized, controlled trial comparing patient recovery and costs between conventional sternotomy and a minimally invasive approach that divides only the upper half of the sternum. The study convincingly shows that there is no significant cost saving or benefit to patient recovery provided by a minimal sternal incision. This study is well designed and executed. It reflects the best evidence to date on the effects of “ministernotomy” relative to conventional full sternotomy. This study design should be acknowledged as a criterion standard for future studies. Clinical studies to assess surgical approaches and effects on recovery must include qualitative patient-centric metrics. Such data will be critical to maintain open-chest cardiac surgery as relevant in the current era. We must temper our enthusiasm until we have rigorously validated our minimally invasive innovations.

The response in our surgical community to the article of Nair and colleagues¹ will be intriguing. Enthusiasts will argue that substantial differences would have been shown by more experienced surgeons or newer minimally invasive approaches (limited thoracotomy). Accordingly, use of expertise based randomized clinical trials may mitigate

such concerns for future studies.² Expertise-based trials are well suited to validating surgical innovations. Surgeons perform only the procedure for which they have expertise in each arm of the trial.

More conventional surgeons will be reassured by the data of to the article of Nair and colleagues.¹ Full sternotomy still provides excellent outcomes. I predict that the vast majority of surgeons will not change their approach for access to the aortic valve. Both approaches are shown to be safe and effective. These data should inform us, however, and, in so doing, substantially shape the conversations that we have with both patients and referring physicians.

Perhaps more effort needs to be focused on improving the technique of sternal closure, rather than on minimizing or avoiding it. Improved early bone fixation with external mechanical devices can accelerate sternal bone healing and improve outcomes.³ Similarly, my translational research team has developed an approach with novel biocompatible adhesives^{4,5} that improved early bone fixation, reduced pain, and accelerated recovery. We are validating a new iteration that is promising (NCT03365843).⁶ Sternotomy can be made great again. Robust study designs will be required.

References

1. Nair SK, Sudarshan CD, Thorpe BS, Singh J, Pillay T, Catarino P, et al. Mini-Stern trial: a randomized trial comparing mini-sternotomy to full median sternotomy for aortic valve replacement. *J Thorac Cardiovasc Surg*. 2018;156:2124-32.e31.
2. Devereaux PJ, Bhandari M, Clarke M, Montori VM, Cook DJ, Yusuf S, et al. Need for expertise based randomised controlled trials. *BMJ*. 2005;330:88.

3. Raman J, Lehmann S, Zehr K, De Guzman BJ, Aklog L, Garrett HE, et al. Sternal closure with rigid plate fixation versus wire closure: a randomized controlled multicenter trial. *Ann Thorac Surg*. 2012;94:1854-61.
4. Fedak PW, Kolb E, Borsato G, Frohlich DE, Kasatkin A, Narine K, et al. Kryptonite bone cement prevents pathologic sternal displacement. *Ann Thorac Surg*. 2010;90:979-85.
5. Fedak PW, Kieser TM, Maitland AM, Holland M, Kasatkin A, Leblanc P, et al. Adhesive-enhanced sternal closure to improve postoperative functional recovery: a pilot, randomized controlled trial. *Ann Thorac Surg*. 2011;92:1444-50.
6. US National Library of Medicine. NCT03365843: Montage-Enhanced Sternal Closure. Available at: <https://clinicaltrials.gov/ct2/show/NCT03365843>. Accessed May 1, 2018.