Commentary: The (Chest) Walls are Closing In: Bone Putty-Based Rigid Fixation to Optimize Recovery After Sternotomy

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Commentary: The (Chest) Walls are Closing In: Bone Putty-Based Rigid Fixation to Optimize Recovery After Sternotomy

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Central Image Legend (84/90): Dominique Vervoort, MD, MPH, MBA, Hillary Lia, BComp, and Stephen E. Fremes, MD, MSc

Central Message (194/200): Adhesive-based rigid fixation using novel bone putties may facilitate sternal union, reduce hospital length of stay and pain, improve patient-reported outcomes, and carry cost-benefit potential.

After open-heart surgery, sternotomies are generally closed through wire cerclage. While widely applied and easily available across institutions, approximately one percent of patients experience mediastinitis and deep sternal wound infection.¹ Sternal closure through wire cerclage is associated with a risk of sternal displacement and subclinical sternal micro-motion, which can result in pain and reduced or slower healing for up to eight weeks after open-heart surgery.² As such, it becomes important to find ways to stimulate and accelerate osteosynthesis and sternal union during today’s minimally-invasive era, which opens the door for novel bone putties for adhesive-based rigid fixation. In this issue of the Journal, Vasanthan et al.³ report the results of a single-center randomized controlled trial (NCT03365843) comparing wire cerclage and Montage hardening bone putty versus wire cerclage alone in 60 patients undergoing open-heart surgery. They found that the addition of a bone putty resulted in a reduced healthcare access and quality index and increased EuroQoL-5D scores at discharge, two weeks, and four weeks. In addition, patients experienced a shorter hospital length of stay, reduced pain, and faster forced vital capacity recovery, suggesting cost-benefit potential. Lastly, the putty proved to be user-friendly, easy to learn, and fast to apply, minimizing logistical adoption concerns. The authors’ findings are
consistent with previous evidence for alternative sternal closure modalities. In a trial of 236 patients across 12 centers in the United States, rigid plate fixation resulted in improved sternal healing and increased sternal union rates at three and six months after surgery as compared to wire cerclage. In this trial, rigid plate fixation was associated with comparable six-month costs as wire cerclage despite higher upfront costs, owing to reduced morbidity and follow-up costs. Similarly, observational studies found improved early post-operative functional outcomes using diverse bone adhesives compared to traditional wire closure. These findings have been confirmed by meta-analyses comparing rigid plate fixation and cable closure to wire cerclage.

Although promising, the findings from Vasanthan et al. are not conclusive and questions remain. Previous putties appeared promising but were not pursued further or more widely adopted, raising the question whether a similar risk exists with this novel putty. In addition, the effects of the putty on emergency reopening are unclear and require further study. Similarly, long-term follow-up is absent and should be explored, including the effects of the putty on post-operative recovery with fewer sternal restrictions, which the authors plan to study in the future. Further, the study’s sample size may obscure low-frequency events, such as wound healing and infection rates, which should be replicated in larger studies to draw conclusions. Lastly, the study design questions the generalizability to and replicability in other centers and settings: the authors excluded emergency cases, included only a small proportion of women (22% of the patients in the study), and the exclusion of patients based on baseline health-related quality of life or physical functioning was left at the discretion of the surgeon. The analysis was performed as-treated rather than an intention-to-treat analysis, although similar conclusions were reached using the intention-to-treat analysis, whereas the risk of Type I error was increased, which may further limit the strength of the evidence generated from this trial.
In summary, we applaud the authors for their important and timely study, which provides promising results in our joint efforts to continue to improve and accelerate patients’ recovery after open-heart surgery, especially in the era of transcatheter, minimally-invasive, and enhanced recovery after cardiac surgery. Further multi-center and longer-term study will be needed to determine whether the chest can indeed be closed better through bone putties or whether the walls continue to close in on our specialty.
References:


