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STERNAL HEALING COMES FROM STABLE BEGINNINGS

Reply to the Editor:

We appreciate the interest Dr Yutaka and colleagues had in our multicenter, single-blinded, prospective, randomized trial comparing rigid plate fixation with traditional wire cerclage (WC) after median sternotomy. In our study, sternotomy closure with rigid plate fixation resulted in significantly better sternal healing, fewer sternal complications, and no additional cost compared with WC at 6 months after surgery.

The primary goal of sternal closure is to return stability to the chest wall to promote healing and prevent complications. Although most surgical disciplines involved in the management of fractures/osteotomies adhere to the biomechanical principles of approximation, compression, and stabilization of the bone using rigid fixation, the majority of cardiac surgeons continue to use WC for sternotomy closure because of the perceived low rate of sternal wound complications and the low cost of wires. Although wires are effective at sternal approximation, they fail to provide rigid fixation with stable compression, thus failing in 2 of 3 important principles to achieve proper bone healing. Without the presence of all 3 of these principles, nonunion, delayed healing, and complications can occur, as was demonstrated in the WC group in our randomized trial.

Stability of the sternum presents unique challenges to healing because of the immediate and constant forces on the sternum from respiration, coughing, and ambulation. Although biologics such as osteoinductive growth factors, osteoconductive matrix, and osteogenic cells may offer advantages for bone healing, they are only effective when combined with the 3 biomechanical principles for bone healing, which includes rigid fixation. Biologics, for example, are routinely used for grafting in large defects or areas where large amounts of bone are needed (eg, spine fusion) and may have applications in sternotomy closure for accelerated healing in high-risk patients or for sternal reconstructions, but not in the absence of rigid fixation. Although our study did not demonstrate complete sternal union in all rigid plate

FIGURE 1. Emergency reentry is accomplished by using standard wire cutters to cut the cross-sections of the sternal plates.

fixation cases, the sternal union rates at both 3 months (41% vs 16%; $P < .0001$) and 6 months (80% vs 67%; $P = .03$) were significantly higher than with WC and resulted in reduced complications.

The technique for reoperation after sternotomy closure with rigid plate fixation was outlined in the article and is achieved by removal of the plates and screws, or in emergency situations by cutting the plates through the center sections (Figure 1). Subsequent closure is achieved by using new plates, and if the replacement screws are placed in the same holes then “rescue” screws are used, which are larger in diameter than the original screws and provide additional purchase into the bone.

Rigid plate fixation is currently the standard of care for fracture and osteotomy management and used by all disciplines *except* cardiac surgeons. In a prospective, randomized, single-blinded, multicenter trial, sternotomy closure using rigid plate fixation compared with WC resulted in improved sternal healing and fewer sternal complications with no additional healthcare-related costs through 6 months and confirmed that better sternal healing comes from stable beginnings.

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