

Sternal Closure Using Rigid Plate Fixation: Design Improvements for Enhanced Patient Recovery

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Objectives

In a multicenter randomized trial, sternotomy closure using **rigid plate fixation (RPF)** showed^{1,2}

- improved bone healing
- reduced sternal complications
- improved postoperative quality of life
- decreased pain scores
- RPF was cost neutral compared to wire cerclage through 6-month follow-up.

This bench top study evaluated the biomechanical properties and innovations of a next generation RPF system.

Methods

Biomechanical bench testing in a simulated sternotomy model compared the threshold for failure of an RPF that incorporates an integrated amorphous cable (*SternaLock XP*, Zimmer Biomet, Jacksonville, FL) to the legacy plating system (*SternaLock Blu*, Zimmer Biomet, Jacksonville, FL). The amorphous band increases surface area and resist pull through (**Figure 1**).

- Lateral stiffness/fatigue tests were performed by applying cyclic load in a uniaxial direction for 200K cycles
- Failure of the test constructs was defined as lateral distraction exceeding 2mm sternal displacement
- Design improvements that improve ease of use and facilitate faster screw delivery and better screw engagement were also evaluated (**Figure 2**) (*SternaLock EZ*, Zimmer Biomet, Jacksonville, FL).

SternaLock XP



Figure 1: SternaLock XP is a sternal closure system featuring a plate with integrated amorphous cable that expands when tensioned to increase surface area and provide enhanced stability and strength.

SternaLock EZ



Figure 2: SternaLock EZ is a next-generation sternal closure system featuring innovative implants and instruments designed for speed of closure and ease of use.

Results

SternaLock XP with an integrated amorphous cable cerclage performed significantly better and was 50% stronger compared to the legacy RPF system alone (**Fig 3**). SternaLock EZ compared to the legacy RPF system was 15% stronger and should be easier to use with faster implants and better screw engagement through its enhanced implant instruments and features (**Fig 4**).

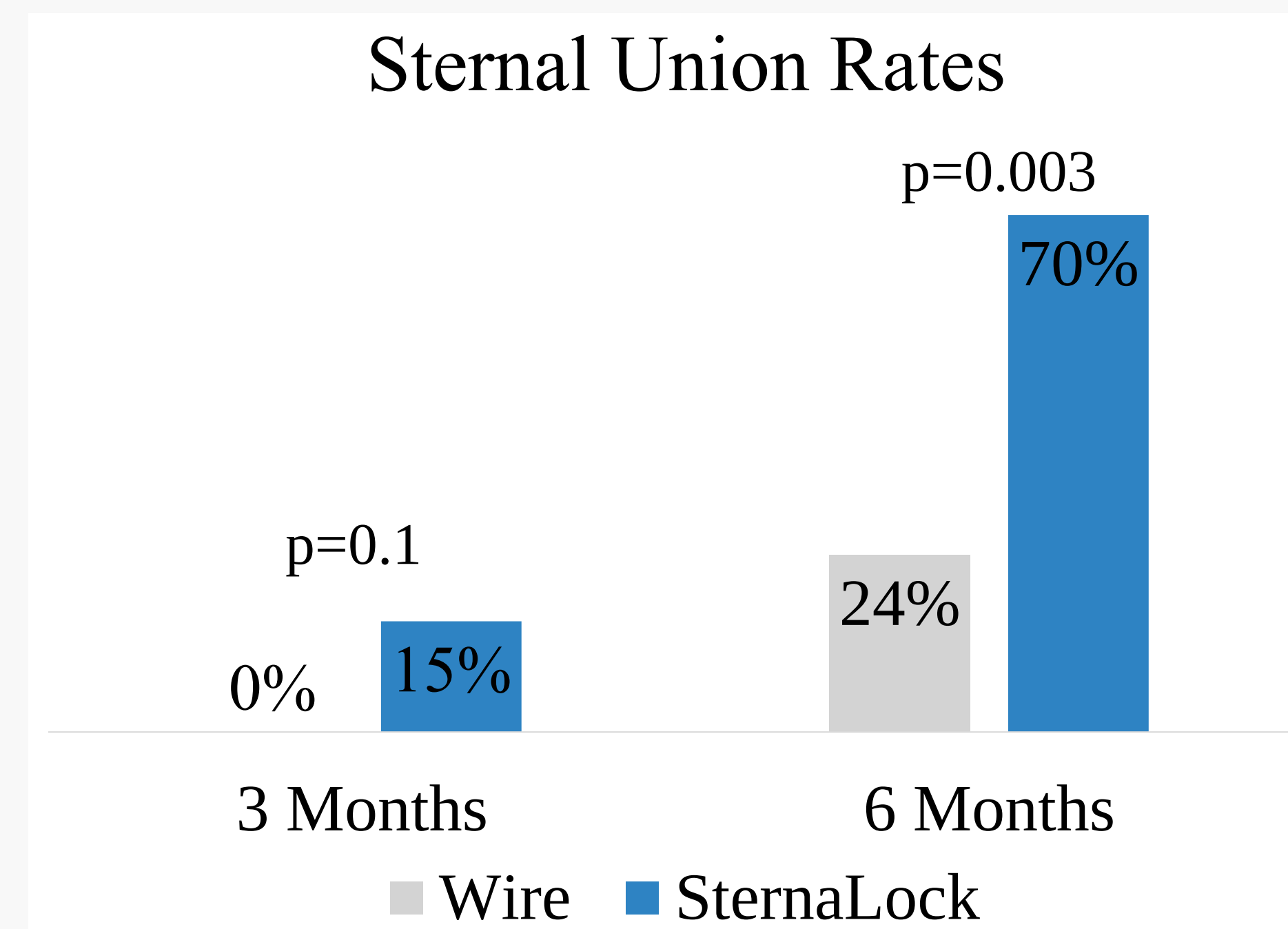
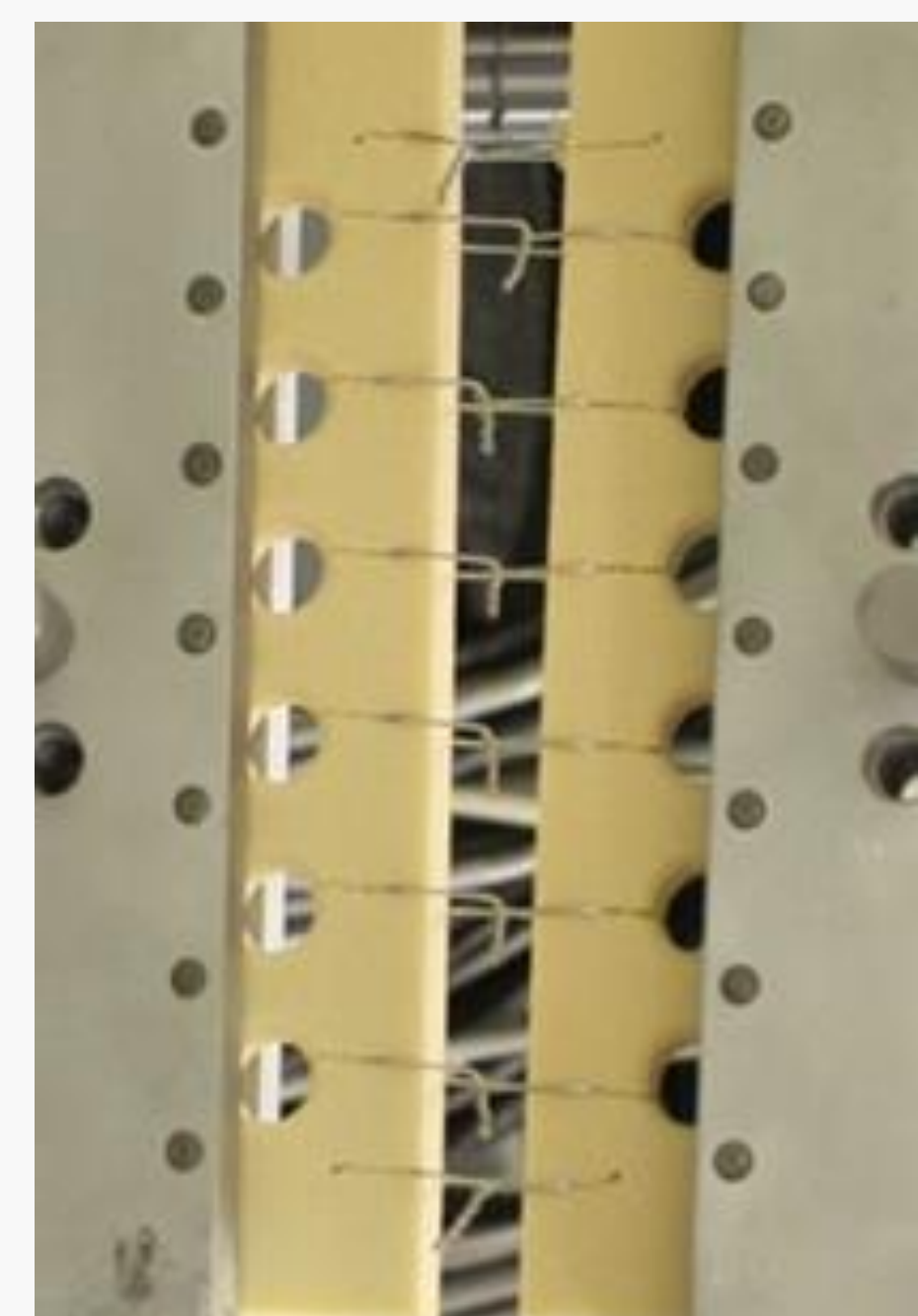


Figure 3: Rigid Plate Fixation is more robust closure technique with improved sternal healing, fewer complications, improved patient recovery at a lower total cost compared to wire cerclage.

#5 Wire



SternaLock Blu (Legacy)

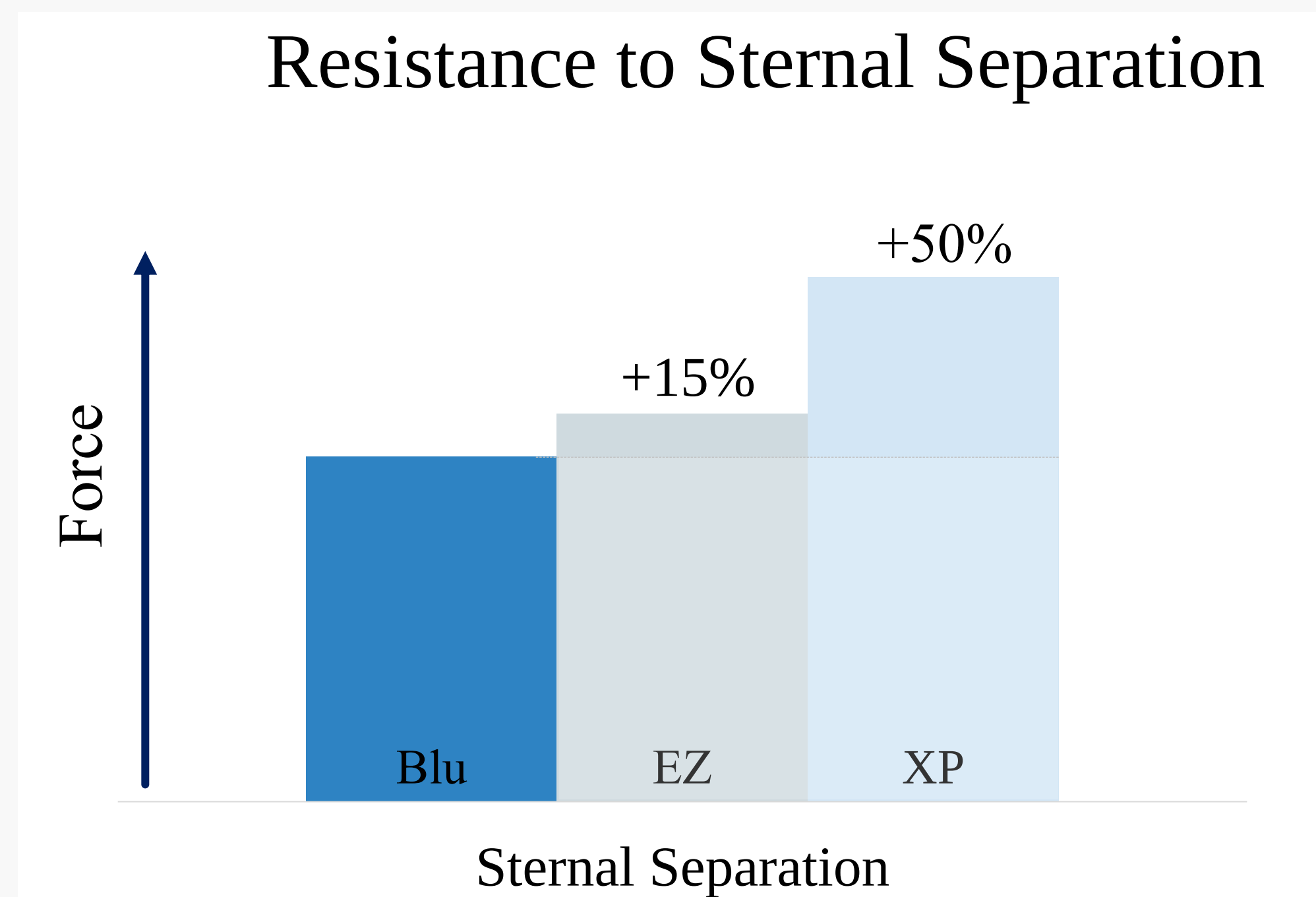
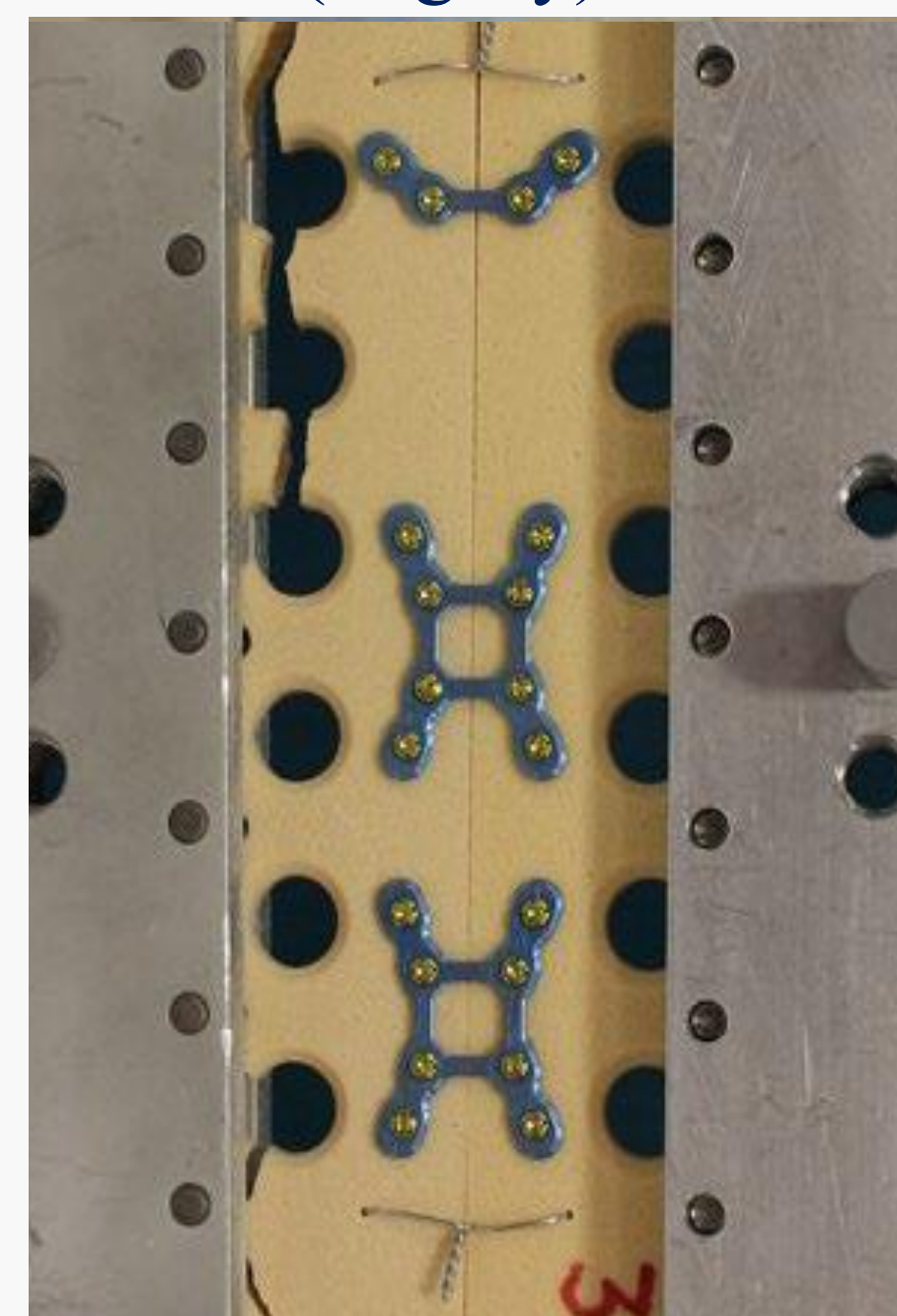
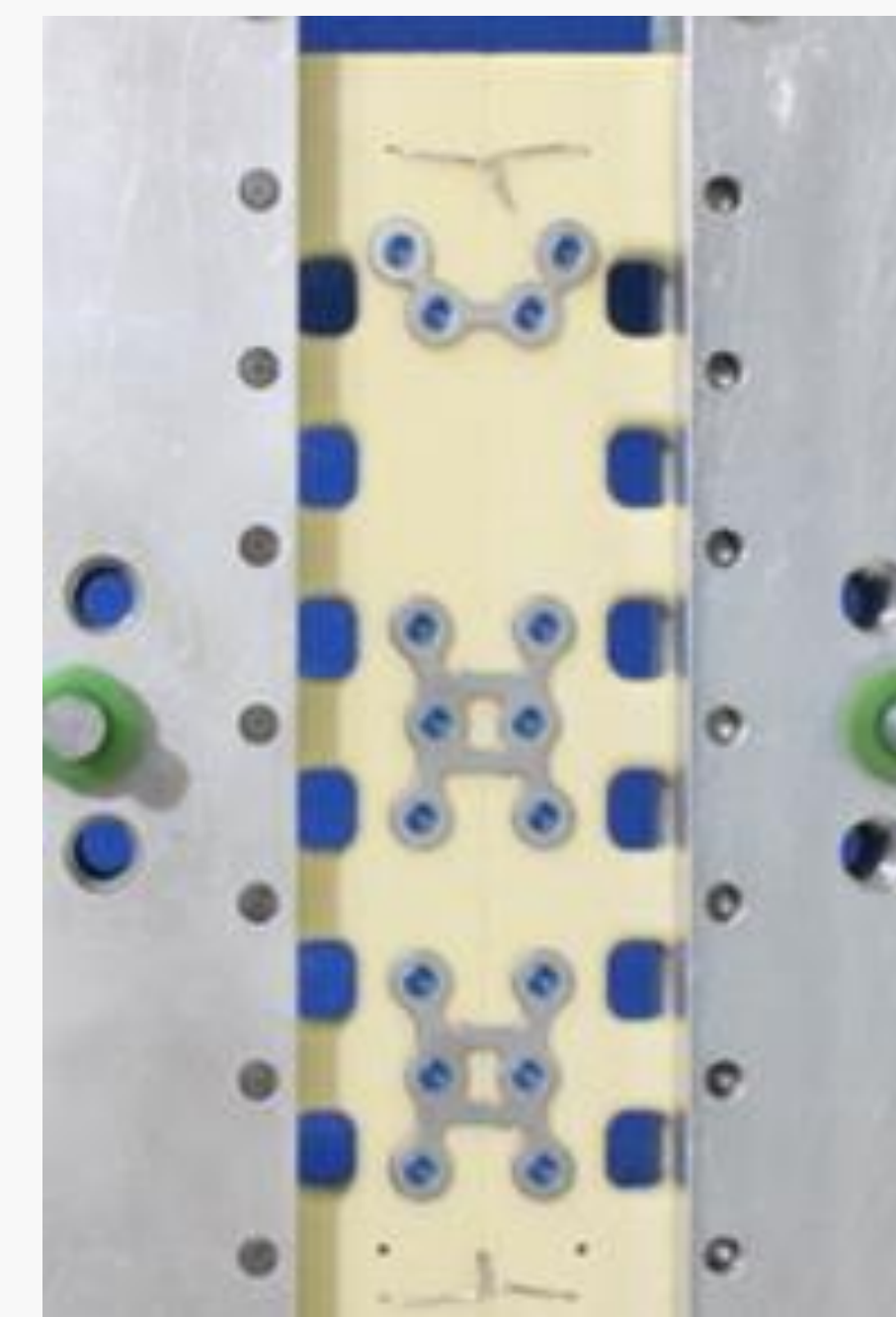
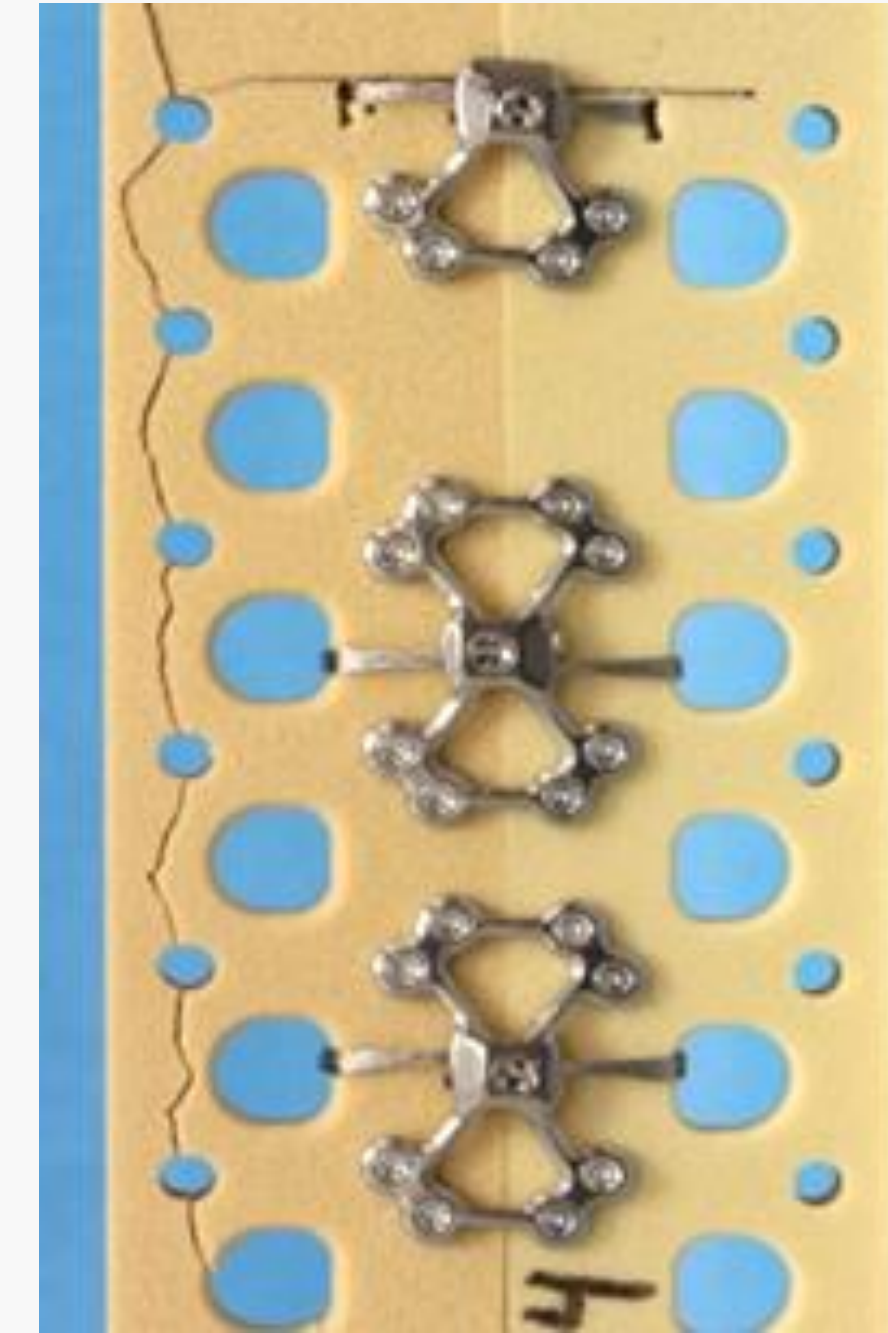


Figure 4: Compared to SternaLock Blu, SternaLock EZ demonstrates 15% increase resistance to sternal separation and SternaLock XP demonstrates 50% increase in resistance to sternal separation.

SternaLock EZ



SternaLock XP



Conclusions

Design enhancements over a current legacy RPF system which incorporate an **integrated amorphous cable** with the plate provides a **significantly stronger construct** making it suitable for patients who require a very robust construct (morbidly obesity/dense bone).

- In addition, new innovations such as **EZ Driver and screw caddies** may make RPF easier and faster

References

1. Allen KB, Thourani VH, Naka Y, et al. Randomized, multicenter trial comparing sternotomy closure with rigid plate fixation to wire cerclage. J Thorac Cardiovasc Surg 2017.
2. Allen KB, Thourani V, Naka Y, et al. Sternal Closure Using Rigid Plate Fixation Versus Conventional Wire Cerclage: Patient Reported and Economic Outcomes from A Prospective, Randomized Multi-Center Study. Ann Thorac Surg 2018.