

## Biomechanical Comparison of Quadrilateral Surface Buttress Plates to Traditional Forms of Fixation for Transverse Acetabular Fractures

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**Purpose:** This study evaluated the biomechanical stability conferred by two designs of quadrilateral surface (QLS) plates that can be used in conjunction with the anterior intra-pelvic approach for fixation of transtectal transverse acetabular fractures. We hypothesized that the new fixation devices would be biomechanically equivalent to the current standard fixation constructs using buttress plates and lag screw fixation of both the anterior and posterior columns.

**Methods:** 35 synthetic hemipelvises were allocated to one of five fixation groups after creation of a transtectal acetabular fracture (OTA 62-B1): (1) posterior column plate + anterior column lag screw (posterior column plate), (2) anterior column plate + posterior column lag screw (anterior column plate), (3) anterior and posterior column lag screws (lag screw), (4) infrapectineal QLS plate + anterior column plate (IP), and (5) suprapectineal QLS plate alone (SP). Testing (Fig. 1) consisted of (1) 10 cycles to  $0.25 \times$  body weight (BW) (17.5 N-175 N) to calculate baseline stiffness, (2) cyclical loading (1500 cycles using a stepwise increasing load protocol in 250-cycle increments to  $2.5 \times$  BW) to calculate final stiffness, and (3) load to failure at 1 mm/sec.

**Results:** After 1500 cycles, the IP and SP constructs exhibited the greatest final stiffness (Fig. 2). The IP group was significantly stiffer than the posterior column plate group ( $P = 0.006$ ) and the SP group was significantly stiffer than the posterior column plate and anterior column plate groups ( $P = 0.002$  and  $P = 0.031$ , respectively). The IP group demonstrated significantly less medial subluxation (average 1.2 mm) when compared to anterior column plate (average 2.1 mm,  $P = 0.017$ ) and lag screw groups (average 2.7 mm,  $P < 0.001$ ); the difference between the IP and posterior column plate group (1.4 mm) was not statistically significant ( $P = 0.993$ ). The SP group was equivalent to the posterior column plate and anterior column plate groups in resisting medial subluxation.

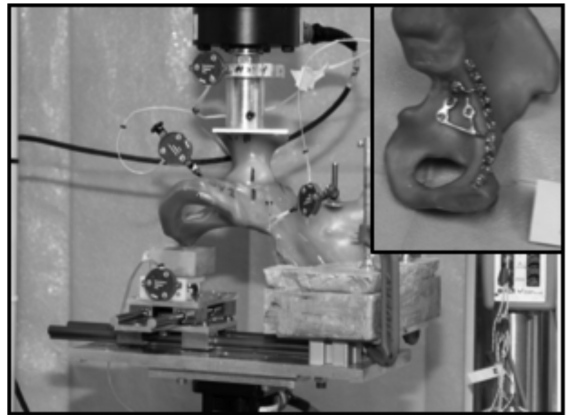


Fig. 1. Test setup. Inset: SP plate.

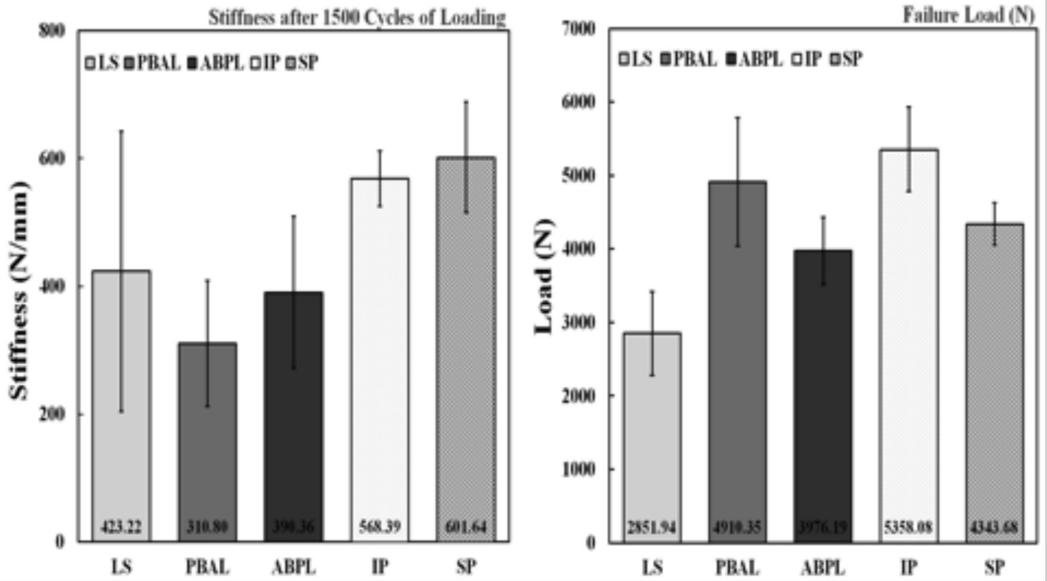


Fig. 2. Stiffness (left) and failure load (right) results.

**Conclusion:** Quadrilateral surface buttress plates (both infrapectineal and suprapectineal) spanning the posterior and anterior columns are at least equivalent and, in some cases, superior to traditional forms of fixation and may present a viable alternative for the treatment of transtectal transverse acetabular fractures when an anterior intrapelvic approach is performed.

• The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.