

## Does an Independent 6.5-mm Posterior Column Screw Reduce Acetabular Fracture Site Motion as Compared to a Plate and Screw Construct? A Biomechanics Study

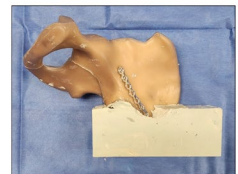
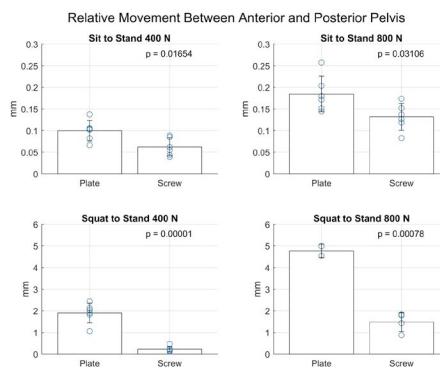
*Helyn G. Fraser, MD; Michael Maceroli, MD; Daniel Thompson, ME, BS; Adam Boissonneault, MD; William Godfrey, MD; Wesley Honeycutt, MD; Shadman Ibnamasud, BS; Ming Phen, MD*

**Purpose:** Our objective was to determine whether a posterior pelvic reconstruction plate and screw (P&S) construct or a single 6.5-mm cannulated posterior column screw (PCS) construct is superior for fixation of a posterior column acetabulum fracture. We hypothesized that the PCS construct would exhibit less fracture gap motion and interfragmentary rotation than the P&S construct.

**Methods:** 12 fourth-generation composite hemipelvi (Sawbones, Model 3409, US) were utilized for this study; 6 for each construct. The P&S construct included a 7-hole 3.5-mm straight acetabular reconstruction plate, with two 3.5-mm cortical posterior column screws perpendicular to the fracture line. The PCS construct included a 6.5 mm x 135 mm partially threaded cannulated screw placed in antegrade fashion from the pelvic brim, across the fracture and seated at the ischial tuberosity. Clay molds were constructed and utilized to create comparable posterior column fracture lines in each hemipelvis, as well as comparable trajectories for the screws of each construct. Testing was performed on an Instron E3000 Linear-Torsion All-Electric Dynamic Test Instrument (Instron E3000), and fracture motion was evaluated with an optical 3D motion tracking system. The pelvis models were cyclically loaded at 0.5 cycles/second for 100 cycles at both 400 N and 800 N. Models were first tested in a sit-to-stand position, and subsequently in a squat-to-stand position.

**Results:** Under sit-to-stand loading, the PCS construct outperformed the P&S construct with significantly less relative movement at both 400 N ( $0.06 \pm 0.02$  vs  $0.1 \pm 0.02$ ,  $P = 0.02$ ) and 800 N ( $0.13 \pm 0.03$  vs  $0.19 \pm 0.04$ ,  $P = 0.03$ ). Under squat-to-stand loading, the PCS construct exhibited significantly less relative movement than the P&S construct at both 400 N ( $0.22 \pm 0.13$  vs  $1.9 \pm 0.5$ ,  $P < 0.001$ ) and 800 N ( $1.48 \pm 0.44$  vs  $4.77 \pm 0.3$ ,  $P < 0.001$ ). At 800 N, half of the repairs (6 of 12) ultimately sustained catastrophic failure, including 2 of 6 PCS and 4 of 6 P&S.

**Conclusion:** Fixation of a posterior column acetabulum fracture with a single 6.5-mm cannulated screw is biomechanically superior to fixation with a posterior pelvic reconstruction plate with two 3.5-mm cortical posterior column screws. The results of this biomechanical analysis demonstrate equipoise for prospective analyses investigating the safety of earlier advancement of weightbearing for posterior column acetabulum fractures when they are repaired with a PCS construct.



The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.