

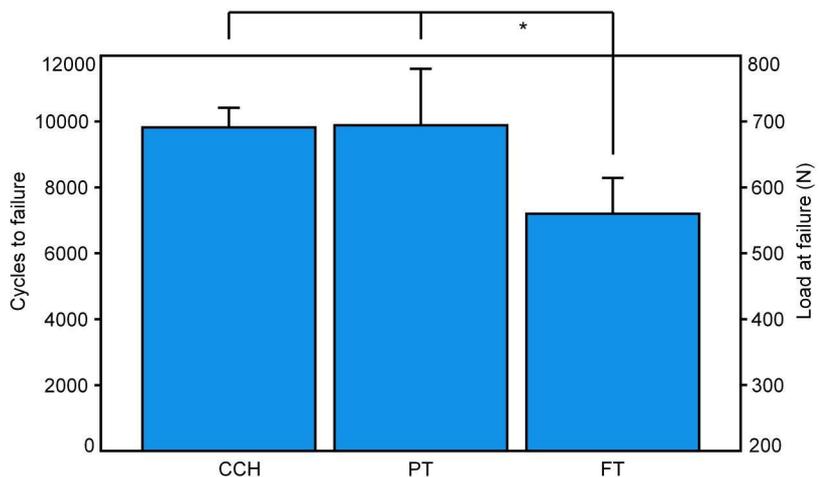
Evaluation of Cannulated Compression Headless Screw (CCHS) as an Alternative Implant in Comparison to Standard S1/S2 Screw Fixation of the Posterior Pelvis Ring: A Biomechanical Study

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Purpose: Posterior pelvic ring injuries represent typical high-energy trauma injuries in young adults. Joint stabilization with 2 cannulated sacroiliac (SI) screws at the level of sacral vertebrae S1 and S2 is a well-established procedure. However, high failure and implant removal (IR) rates have been described. Especially the washer recovery can pose the most difficult part of the IR surgery, which is often associated with complications. The purpose of this study was to evaluate the biomechanical stability of S1-S2 fixation of the SI joint using 3 different screw designs.

Methods: 18 artificial hemipelvises were assigned to 3 groups ($n = 6$) for SI joint stabilization through S1 and S2 corridors via 2 cannulated compression headless screws (group CCH), 7.5 mm in diameter, 90 mm long, 2 partially threaded SI screws (group PT) and 2 fully threaded SI screws (group FT) measuring 7.3 mm in diameter and being 90 mm long. An SI joint dislocation injury type III APC (anteroposterior compression) according to the Young and Burgess classification was simulated before implantation. All specimens were biomechanically tested to failure in upright standing position under progressively increasing cyclic axial loading. Interfragmentary and bone-implant movements were captured via optical motion tracking and assessed at 4 intermittent time points between 4000 and 7000 cycles.

Results: Combined relative interfragmentary angular displacement movements in coronal and transverse plane (gap angle) between ilium and sacrum, cumulated over the measured 4 time points, were significantly higher in group FT versus both groups CCH and PT, $P \leq 0.047$. In addition, angular displacement of the screw axis in these 2 planes within the ilium (screw tilt ilium) was associated with significantly higher values in group FT versus group PT, $P = 0.038$. However, no significant differences among the groups were observed for screw tip cut-out movements in the sacrum, $P = 0.321$. Cycles to failure were the highest in group PT (9885 ± 1712), followed by group CCH (9820 ± 597), and group FT (7202 ± 1087), with significantly lower values in group FT compared to both groups CCH and PT, $P \leq 0.027$.



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.