

AAOS Abstract

Title: The Effect of Gap Displacement of Infratectal T-type Acetabular Fractures on Contact Area and Contact Pressure of the Acetabulum: A Biomechanical Analysis

Introduction:

Acetabulum fractures result in significant loss of motion and function, often requiring surgical intervention. This research was aimed to determine the most effective displacement of the acetabulum in the reconstruction of T-type acetabular fractures through the analysis of resulting contact area and contact pressure.

Methods: Three fresh-frozen left human hemi-pelvises were used to analyze contact force and contact pressure placed upon piezoresistive sensors resting within the acetabulum. A 700N load was exerted to replicate three-fourths of the average human body weight. The specimens were tested in 5 different positions representing: standing (0° adduction 0° flexion); hip range of motion (ROM) during normal walking gait (0° adduction 10° extension and 0° adduction 30° flexion); hip ROM during stair ascending gait (5° abduction 0° flexion and 10° adduction 60° flexion). Widening gaps of 0-mm, 1-mm, 2-mm, and 5-mm for both 0-mm and 2-mm step-offs were compared.

Results: A step-off of 2-mm and 0-mm widening resulted in statistically significant increases in contact area and decreased contact pressure compared to other step-off and widening combinations. With a 2-mm step-off and 1-mm widening, the difference in contact area was negligible ($P = 0.250$), however the measured contact pressure increased ($P = 0.015$). At a 2-mm step-off and 2-mm widening, the contact area reduced ($P = 0.004$) and the measured contact pressure increased ($P = 0.002$). With a 2-mm step-off and 5-mm widening, contact area decreased ($P < 0.001$) and measured contact pressure increased ($P < 0.001$). Step-off comparisons also showed significant changes. With a 0-mm step-off and 0-mm widening, statistically significant changes were observed. Contact area decreased ($P = 0.016$) and measured contact pressure decreased ($P = 0.005$).

Conclusion: The biomechanical analysis of different step-offs and widening gaps in the reconstruction of T-type acetabular fractures revealed that a 2-mm step-off and 0-mm of widening resulted in the least contact pressure and greatest contact area.