Elevated Joint Contact Stress Is Associated With Radiographic Measures of Osteoarthritis in Operatively Treated Acetabular Fractures at 2 Years

Holly Thomas-Aitken, MS; Kevin Dibbern, MS; Tyler Carllee, MD; J. Lawrence Marsh, MD; Michael Willey, MD; Jessica Goetz, PhD; Donald Anderson, PhD

Purpose: Our purpose was to determine if elevated joint contact stress (JCS) after fixation of acetabular fracture is associated with development of posttraumatic osteoarthritis (PTOA) at 2-year follow-up.

Methods: CT scans from 10 patients with operatively treated acetabular fractures were obtained at >2-year follow-up. 5 had Kellgren-Lawrence (KL) grade <2 (No OA group), and 5 cases had KL grade ≥2 (OA group). Discrete element analysis (DEA) was performed on surface models generated from the CT scans to compute JCS during gait. For each patient, maximum contact stress during the stance phase of gait was compared to their KL grade. Contact stress patterns for these 2 groups of patients were also compared to 5 asymptomatic, uninjured patients.

Results: Maximum JCS for the OA group (10.4 MPa) was significantly higher (P <0.001) than both the No OA patients (7.2 MPa) and normal hips (8.9 MPa). While there was no significant difference in maximum contact stress between No OA and normal hip patients, the No OA group did have lower stress near heel-strike and higher stress near toe-off. There was a positive correlation between the maximum JCS and KL grade ($R^2 = 0.546$).

Conclusion: Acetabular fracture patients who developed PTOA had significantly higher JCS, confirming that exposure to abnormally high JCS in the hip leads to the development of osteoarthritis. While not all fracture patients developed PTOA, the shift in maximum contact stress to later in the gait cycle indicated that surgical reduction has not returned fractured hip joints to a normal mechanical state.

OTA Grant
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