

## Risk Factors for Early Conversion Total Hip Arthroplasty After Pipkin 4 Femoral Head Fracture

Kyle Cichos, BS; Patrick F. Bergin, MD; Parker A. White, MD; Elie S. Ghanem, MD; Clay A. Spittler, MD; Gerald McGwin, MS, PhD

University of Alabama at Birmingham, Birmingham, AL, United States

**Purpose:** The purpose of this study is to determine risk factors for early conversion total hip arthroplasty (THA) after Pipkin 4 femoral head fractures.

**Methods:** 262 patients with Pipkin 4 fractures managed at two Level I trauma centers treated from 2009 to 2019 were identified. The average follow-up was 18 months (range, 3-111 months) with exclusion of all with less than 1-year follow-up. Patients were separated for analysis into 2 groups by AO/OTA classification of femoral head fracture: 31C1 (shear-type fractures) and 31C2 (impaction-type fractures). Patients with 31C2.1 fractures (chondral lesions) were excluded. Demographics, operative, and in-hospital variables were compared between patients undergoing conversion THA and those with native hip survival.

**Results:** Of the 65 total AO/OTA 31C1 fractures, 19 (29%) underwent conversion THA within 1 year, at a mean of 7 months from index surgery (3-12 months); 25 of 65 (38%) underwent conversion within 2 years. The conversion THA patients were similar to those not requiring conversion THA in body mass index (BMI), acetabular fracture classification (Letournel), femoral head comminution, management of femoral head fracture (excision vs open reduction and internal fixation [ORIF]), dislocation at time of injury, posterior wall comminution, no difference in postoperative acetabular fracture reduction (Matta reduction criteria), femoral head fracture location (suprafoveal vs infrafoveal [47% vs 28%,  $P = 0.12$ ]), operative duration, blood loss, and time to surgery from admission. Patients with conversion THA in this group had increased rates of surgical site infection (SSI) after index ORIF (32% vs 2%,  $P = 0.002$ ) and postoperative recurrent hip instability (42% vs 4%,  $P < 0.0001$ ) and were older on average at time of injury (46 vs 38 years,  $P = 0.049$ ). Of the 72 total AO/OTA 31C2 fractures, 20 (27.8%) underwent conversion THA within 1 year, at a mean of 7 months from index surgery (0-12 months), and 31 of 72 (43%) underwent conversion within 2 years. In this group of patients, those requiring conversion THA had increased rates of age (51 vs 43 years,  $P = 0.048$ ), time to surgery from admission (4.2 days vs 3.3 days,  $P = 0.02$ ), femoral head fracture location—suprafoveal (80% vs 46%,  $P = 0.008$ ), and femoral head fracture location—posterior ( $P = 0.008$ ). All other variables were similar between the two groups.

**Conclusion:** Pipkin 4 fractures have a high overall rate of conversion THA within 1 year (28.5%). Outcomes of shear-type (AO/OTA 31C1) fractures depend on the age of the patient and post-ORIF outcomes such as SSI and redislocation. Femoral head fixation compared to excision in these cases does not impact the rate of conversion THA. Outcomes of patients with impaction-type (AO/OTA 31C2) fractures depend on the location of the femoral head impaction (suprafoveal and posterior location are high risk), age of the patient, and delayed time to surgery from admission, which likely increases the risk of osteonecrosis development resulting in early conversion THA.