Does Anatomic Variation at the Hip Increase Risk of Injury or Postoperative Complication in Pediatric Proximal Femur Fractures?

Aaron Brandt, MD; Rachael Martino, BA; Sarah Rose Purtell, BS; Patrick Carry, MS; Courtney Michelle Selberg, MD; ***Julia S. Sanders, MD***
Children's Hospital Colorado, Aurora, Colorado, UNITED STATES

Purpose: Pediatric hip fractures are rare but pose a significant challenge due to the high complication rate associated, most notably osteonecrosis (ON). Risk factors affecting the incidence of these injuries and post-treatment outcomes are poorly understood. Recent research on the morphology of the hip has focused primarily on chronic sequelae. The purpose of this study is to evaluate for associations between proximal femur fracture characteristics and outcomes and the presence of anatomic variations around the hip in the pediatric population.

Methods: We queried our institution's electronic medical records to identify skeletally immature patients with proximal femur fractures from 1 January 2012 to 31 August 2020. Radiographic measures included acetabular index (AI), lateral center edge angle (LCEA), neck-shaft angle (NSA), and femoro-epiphyseal acetabular roof (FEAR) index.

Results: A total of 86 patients were included: 44 femoral neck (FN), 11 intertrochanteric (IT), and 31 subtrochanteric (ST) fractures. Hip dysplasia based on AI was seen in 38.4% of injured hips, 37.2% of contralateral hips, and 23.3% bilaterally. AI was not associated with fracture location; however, LCEA was higher in FN fractures compared to IT and ST fractures (24.3° vs 23.5° and 23.6°, P = 0.0467). The incidence of complications was 18.6% overall. After adjusting for age and sex, AI was the only variable associated with risk of subsequent complication with a hazard ratio per 1 unit increase in AI of 1.22 (P = 0.0264). ON was only seen in FN fractures (7/44, 15.9%). When comparing injured and uninjured femurs, for every 1-unit increase in FEAR index compared to the other hip, there was a 20% increase in ON risk (P = 0.0225).

Conclusion: Increased AI was associated with an increased risk of complication. There was no clear association between hip morphology and fracture location. We noted an association between increasing femoral valgus after treatment and ON risk when compared to the uninjured hip. These findings emphasize the importance of anatomic reduction and suggest that the morphology around the hip may play a role in outcomes after femoral neck fractures.