High-Energy Intertrochanteric Fractures in Young Patients: Injury Patterns and Factors Associated with Complications After Surgical Fixation

Derek S Stenquist, Spencer Albertson, Daniel Bailey, Lucas Paladino, Christopher Flanagan[1], David Timothy Watson, Benjamin Maxson[2], Roy W Sanders[3], Hassan Riaz Mir[3]
[1]Case Western Reserve University, [2]Florida Orthopaedic Institute, [3]University of South Florida

INTRODUCTION: Intertrochanteric femur (IT) fractures in young patients are associated with high-energy trauma. While geriatric IT fractures have been studied extensively, there are relatively few studies on high-energy IT fractures in young patients. Prior studies have reported high complication rates after surgical fixation but lack objective radiographic analysis. The objectives of this study were to describe the fracture patterns and associated injuries of young patients with high-energy intertrochanteric hip fractures and to report on factors associated with complications.

METHODS: A retrospective chart review was conducted of all patients <50yo undergoing surgical fixation of an IT fracture at our institution between 2011-2020. Patients with a low-energy mechanism or a subtrochanteric fracture without IT involvement were excluded. Patient demographics, fracture patterns, and surgical and radiographic outcomes were recorded. Univariate comparisons were conducted using Independent t-tests and Mann-Whitney U tests for continuous variables and Fisher Exact tests for categorical comparisons.

RESULTS:

80 patients with a high-energy IT fracture met inclusion criteria (avg 38yo, 85% male, 55% polytraumatized). Average ISS score was 17, and there were 7 open fractures (9%), 8 patients with an ipsilateral femoral shaft fracture (10%), and 16 with associated pelvic trauma (20%). 39% of the fractures were stable patterns (OTA/AO 31A1), 40% unstable (OTA/AO 31A2) and 21% reverse obliquity (OTA/AO 31A3). The average obliquity of the typical (coronal) IT fracture line was 62 degrees and average femoral shortening was 1.5cm. 89% were treated with a CMN and 67% required open reduction.

44 patients (38 CMN, 6 SHS) were followed for $\geq$ 6 months or until clinical and radiographic union (average 1.8yrs, range 3mo-10 yrs). Overall reoperation rate was 7%: 2 IT fracture nonunions (5%) and 1 deep infection (2%). There were 5 varus malunions (12%) and 3 greater trochanter nonunions (7%). In univariate analyses, anterior lag screw position ($p=0.001$), and varus malreduction ($p<0.001$) were associated with malunion. Four-part fracture (OTA/AO 31A2.3/Jensen 5) ($p=0.028$) and residual calcar gap >3mm ($p=0.030$) were associated with reoperation.

DISCUSSION AND CONCLUSION:

Surgical treatment of high-energy IT fractures in young patients is technically demanding with potential untoward outcomes. These injuries demonstrate considerable fracture pattern heterogeneity and a high severity of associated injuries. Heterotopic ossification and greater trochanter escape may affect outcomes despite successful healing of the IT fracture. While injury factors (comminution) can be used for patient counseling, technical factors (reduction/compression, lag screw placement) should be addressed intra-operatively to minimize complications. Further studies are needed to determine rates of symptomatic malunion.