

Are the Fractures We Treat Becoming More Complex? Trends in Orthopaedic Fracture and Injury Severity—A Level-I Trauma Center Experience

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Purpose: Our objective was to define the trends in fracture complexity and overall injury severity of orthopaedic trauma patients at a tertiary Level I trauma center. We hypothesize that patients presenting to this center in the late 2000s will be more severely injured and have increasingly complex fractures compared to a cohort of patients in the 1990s as determined by the ISS and the AO/OTA fracture classification.

Methods: We conducted a retrospective review of a prospectively collected trauma database to determine the ISS and AO/OTA classification of the most common fractures at this institution from 1995-1999 and from 2008-2012. Inclusion criteria included lower extremity fractures of the femur, tibia, and pelvis (AO/OTA 31-33 A-C, 41-43 A-C, 61-62 A-C) within the years of interest. Exclusion criteria were age <18 years, pathologic fracture, and insufficient medical record to determine ISS or AO/OTA classification.

Results: The total number of fractures increased from 4869 to 5902 between the two cohorts. There was an increase in the percentage of lower extremity periarticular fractures (20.7% to 23.4%, $P < 0.001$), an increase in the percentage of pelvic and acetabular fractures (32.7% to 39.9%, $P < 0.001$), and a decrease in the percentage of lower extremity extra-articular fractures (46.6% to 36.7%, $P < 0.001$). The overall complexity of fractures based on the AO/OTA classification significantly increased between the two time periods (A-type fractures compared to B and C types, ie, extra- vs. intra-articular) ($P = 0.041$). Specifically, the ratio of intra-articular tibial pilon fractures relative to extra-articular tibial fractures increased from 0.29 to 0.60 ($P < 0.001$). The ratio of intra-articular tibial plateau fractures relative to extra-articular tibial fractures increased from 0.49 to 0.81 ($P < 0.001$). Thus, for each extra-articular tibia fracture, there were 0.79 intra-articular tibial fractures in the earlier cohort compared to 1.4 intra-articular tibia fractures in the later cohort. The ratio of intra-articular distal femur fractures to femoral shaft fractures remained unchanged (0.26 to 0.22, $P = 0.14$). However, the proportion of femoral shaft fractures decreased from 17.1% to 13.2% ($P < 0.001$) of the total fractures, and extra-articular tibia fractures decreased from 19.4% to 13.9% ($P < 0.001$). Acetabular and unstable pelvis fractures significantly increased from 26.9% to 34.4% of the total fractures ($P < 0.001$). The average ISS from 2008-2012 increased compared to 1995-1999 (ISS = 19.2 vs. 15.1), being significantly greater for each 10-point stratification of the ISS data (Pearson χ^2 $P < 0.001$).

Conclusion: Health-care economics continue to change in the US, with provider and hospital reimbursements shifting toward being based on patient outcomes with potential penalties for complications and readmissions. In this evolving reimbursement environment, accurate determination of case mix index and patient risk stratification based on anticipated outcomes is increasingly important. These data demonstrate that the complexity of certain lower extremity fractures and the severity of injury of patients treated at this referral institution are high and continue to increase. In the setting of increasing injury severity, we

observed proportionally fewer diaphyseal fractures and increased periarticular, acetabular, and unstable pelvic fractures. This information should be considered as new reimbursement algorithms are developed.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off label” use). For full information, refer to page 600.