

Outcome Disparities Following Ballistic Fractures with Soft-Tissue Injury

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Disclosures: No disclosures

BACKGROUND: Gunshot fractures are a common and expensive traumatic injury in many major cities. Over 40% of GSW patients present with more than one orthopedic injury and nearly 20% require immediate orthopedic surgery. Common sites of injury in orthopedic GSW cases are the femur and tibia; these sites are at risk for several serious orthopedic complications such as infection, nonunion, and reoperation. For these reasons studies have explored the similarities between GSW fractures and open fractures as compared to the conventional approach of treating ballistic injuries as closed fractures. The similarity in complication rates between open and ballistic fractures exemplifies the role of soft tissue in bone healing. These effects may differ between patients of varying socioeconomic status as urban patients with lower income experience higher rates of surgical complications due to varying factors.

OBJECTIVES: This retrospective cohort study describes fracture healing outcomes following bone fractures sustained due to ballistic injuries and examines the impacts of social determinants of health (SDOH) and soft-tissue damage for their effects on orthopedic outcomes such as nonunion, loss of follow-up, infection, and reoperation. We hypothesize that social disadvantage would be associated with adverse fracture outcomes.

METHODS: Electronic medical records were reviewed for adult orthopaedic surgery patients treated at University Medical Center (UMC) who have sustained a bone fracture related to ballistic trauma from April 2023 to March 2026. Data extracted includes demographics (age, sex, ethnicity), health characteristics, injury characteristics, Area Deprivation Index (ADI), treatments, and outcomes. ADI is a composite measure of social disadvantage and is calculated by national percentile and state decile. Higher ADIs represent greater social disadvantage. Regression analysis was used to test for association between ADI and clinical outcomes while controlling for subject demographics using Stata/SE 19.

RESULTS: Preliminary analysis included 32 subjects with femur fractures from ballistic trauma. Mean subject age was 32 years and 81% of subjects were male. The mean distance from the subjects' homes and UMC was 54 miles (range 2.7-504 miles). The mean ADI national percentile was 76.4 ± 9.3 (range 58-96). Increasing ADI was positively associated with more likely loss to follow up ($\beta=18.2$ [95% CI 2.0-34.4]; $p=0.037$). Distance from home to UMC was not associated with loss to follow up. Complications related to soft tissue infection, bone infection, and bone healing were low; however, loss to follow up may have affected the ability to accurately reflect complications.

CONCLUSIONS: Preliminary results highlight the large catchment area for which UMC provides trauma care and a patient population with high social disadvantage as reflected by mean 74% percentile ADI. ADI was associated with loss to follow up while actual distance was not, suggesting that social disadvantage affected patients care access more than potentially large physical distances. This study will increase the understanding of the underlying challenges faced by orthopaedic trauma patients affected by gun violence.