

Fracture Patterns among Nonaccidental vs. Accidental Traumas: A Cohort Study

Abhishek Tippabhatla¹, David A Momtaz, Daniel Pereira, Mehul Manoj Mittal, Pooya Hosseinzadeh²

¹Washington University In St. Louis School of Medic, ²Washington Univeristy Orthopedic Surgery

INTRODUCTION: The sociologic complexity of nonaccidental trauma (NAT) poses challenges in its diagnosis. Orthopaedic involvement via fractures is the second most common manifestation of nonaccidental trauma in children that leads to high rates of suffering and mortality in the young population. Situational awareness of guardians' narrative over time must be weighed carefully with the injury patterns of the patient to ascertain risk of nonaccidental trauma. Fracture patterns must be carefully assessed before raising suspicion of NAT. Therefore, this large-scale investigation compares fracture characteristics secondary to nonaccidental trauma with fractures stemming from accidents.

METHODS:

A large, multinational database comprising 55 healthcare organizations is queried for deidentified pediatric patient records between years 2015 to 2022. Children under 12 months of age with no diagnosis of abuse were followed up for 6 years of age. Next, children with a known diagnosis of abuse during the follow-up period were compared to children without an abuse diagnosis. Propensity score matching was performed between the two cohorts adjusting for demographics including age, ethnicity, and gender. Documented fracture locations over time were compared between the groups. Statistical analysis was performed while graphics were created. Statistical analysis was set at 0.05.

RESULTS: An initial 2,182,278 cases were gathered. After performing matching across the two cohorts, 4,753 patients in each group were analyzed. The mean age was 1.2 years, 55% were male, and 50% were White. The NAT cohort experienced a significantly higher rate of overall fractures (RR = 9.17, 95% CI [7.78-10.80]; HR = 10.98, 95% CI [9.27-13.01]; P < 0.0001). Significant fractures of the femur and hip (RR = 35.40, 95% CI [18.91-66.28]; HR = 40.58, 95% CI [20.94-78.64]; P < 0.0001), lower leg and foot (RR = 7.91, 95% CI [5.77-10.83]; HR = 8.32, 95% CI [6.06-11.43]; P < 0.0001), humerus and shoulder (RR = 8.52, 95% CI [6.25-11.62]; HR = 9.22, 95% CI [6.74-12.60]; P < 0.0001), forearm and hand (RR = 6.49, 95% CI [4.60-9.15]; HR = 7.03, 95% CI [4.97-9.94]; P < 0.0001), skull and face (RR = 23.15, 95% CI [14.82-36.16]; HR = 24.42, 95% CI [15.61-38.21]; P < 0.0001), and spine (RR = 4.60, 95% CI [2.32-9.10]; HR = 45.87, 95% CI [6.33-332.58]; P < 0.0001) were noted in the NAT cohort as well compared to the cohort without documented abuse. Notably, rib and sternum fractures were only observed in the NAT cohort (9.7% vs. 0%).

DISCUSSION AND CONCLUSION: Significant attributes of nonaccidental trauma resulting in fractures are evident in this study. A high incidence of fractures, particularly resulting from the skull and face, and femur and hip are observed. We also confirm that rib and sternum fractures are pathognomonic for abuse. Orthopaedic surgeons must remain aware of these highly-suspicious fracture patterns to diagnose nonaccidental trauma in efforts of securing a safer habitat for the pediatric patient.

