Clinical characteristics, management, and outcomes of polytraumatized children: a retrospective cohort study

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Abstract

Introduction Pediatric polytrauma remains a major cause of morbidity and mortality worldwide. Owing to age-specific anatomical and physiological characteristics, children are particularly vulnerable to traumatic brain injury (TBI), which frequently represents the most severe component of polytrauma. This study aimed to evaluate injury mechanisms, injury patterns, treatment strategies, complications, and outcomes in pediatric polytrauma patients treated at a tertiary trauma center.

Methods A retrospective single-center cohort study was conducted including pediatric patients (< 18 years) with polytrauma, meaning with an Injury Severity Score (ISS) ≥ 16, treated at the University Hospital Bonn between 2023 and 2025. Demographic data, injury mechanisms, injury patterns, ISS, Maximum Abbreviated Injury Scale (MAIS) scores, surgical interventions, intensive care unit (ICU) treatment, complications, and discharge outcomes were analyzed. Correlations between head MAIS, ISS, age, and length of hospital stay were assessed using Spearman's rank correlation coefficient, while differences in ISS between injury mechanisms were evaluated using the Kruskal–Wallis test.

Results Thirty-two pediatric patients were included. The median age was 13.5 years (range 2–17 years), and 50% were female. Traffic accidents were the predominant mechanism of injury (75%), followed by falls from heights greater than 3 m (12.5%). Head trauma was the most common injury pattern, including skull fractures (34.4%), subarachnoid hemorrhage (28.1%), subdural hematoma (25.0%), and epidural hematoma (9.4%). Thoracic, abdominal, pelvic, and extremity injuries were also frequently observed. Fifteen patients (46.9%) required surgical intervention. The median ICU stay was 3 days (range 0–69 days). Complications occurred in five patients (15.6%) and included meningitis, aseptic bone necrosis, epidural rebleeding, soft tissue infection, and pulmonary complications. No in-hospital mortality was observed. Most patients (84.4%) were discharged directly home, while 6.3% required inpatient rehabilitation and 9.4% were transferred to another hospital. No significant correlations were found between head MAIS and length of hospital stay ($\rho = 0.28$, $p = 0.127$), head MAIS and ISS ($\rho = 0.07$, $p = 0.714$), ISS and hospitalization duration ($\rho = 0.10$, $p = 0.581$), or age and head MAIS ($\rho = 0.03$, $p = 0.883$).