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Pelvic fractures in severely injured children

Results from the TraumaRegister DGU

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Abstract

Injuries in the pelvic region in children and adolescents are very rare and often associated with a high energy trauma. Aim of this prospective multicenter study was, by analyzing the data from the TraumaRegister Deutsche Gesellschaft für Unfallchirurgie (TR-DGU), to evaluate any correlation between the severity of pelvic fractures and resulting mortality in different age groups.

These study findings are based on a large pool of data retrieved from the prospectively-setup pelvic trauma registry established by the German Trauma Society (DGU) and the German Section of the Association for Osteosynthesis/Association for the Study of Internal Fixation (AO/ASIF) International in 1991. The registry provides data on all patients suffering pelvic fractures within a 14-year time frame at any 1 of the 23 level 1 trauma centers contributing to the registry. The analysis covers 4 age groups ranging from 0 to 17 years, covering different factors regarding pelvic fractures and their treatment.

We identified a total of 9684 patients including 1433 pelvic fractures in children aged ≤17 years. Those patients were divided into 4 subgroups according to the patients' age (groups A–D) and according to the fracture severity (group 1 = Abbreviated Injury Scale (AIS) score pelvis ≤2, and group 2 = AIS pelvis ≥3). The mortality in group 1 was 8.8% with a RISC (Revised Injury Severity Score) II of 8.6%, standard mortality rate (SMR) of 1.02 and 7.2% in group 2 with an RISC II of 9.9% (SMR 0.73). In pelvic factures of Type A (Tile classification of pelvic fractures), an SMR of 0.76 was recorded, in Type B fractures the SMR was 0.65, and in Type C fractures 0.79. Severe pelvic injuries (AIS pelvis ≥2) were associated with a higher rate of whole body computer tomograph (CT) scans (1–5 years: 80%, 6–10 years 81.8%, 11–14 years 84.7%, and 15–17 years 85.6%). The rate of pelvic surgery rose with the pelvic injury's severity (AIS 2: 7.6%, AIS 3: 35%, AIS 4: 65.6%, AIS 5 61.5%). We observed higher rates of preclinical and initial clinical hypotension defined as Riva-Rocci (RR) <90 mmHG) as well as of preclinical fluid application in all age groups. The presence of a pelvic injury was associated with a higher rate of severe abdominal injuries with an AIS of ≥3 (25.1% vs. 14.6%) and of severe thorax injuries with an AIS≥3 (43.6% vs. 28.6%).

We have been able to analyze an enormous number of pelvic fractures in children and adolescents including different age groups by relying on data from the TR-DGU. Mortality seems to be associated with the severity of the pelvic injury, but is lower than the RISC II score's prognosis.

Abbreviations: AIS = Abbreviated Injury Scale, CT = computer tomograph, DGU = Deutsche Gesellschaft für Unfallchirurgie/ German Trauma Society, ER = emergency room, ICU = intensive care unit, MOF = multiorgan failure, MSCT = Multiple Slice Computer Tomography, RISC = revised injury severity score, RR = Riva-Rocci, Sektion NIS = Committee on Emergency Medicine, Intensive Care, and Trauma Management, SMR = standard mortality rate, TR-DGU = TraumaRegister DGU.

Keywords: children, pediatric pelvic fracture, pediatric pelvic fractures, pelvic fracture, TraumaRegister DGU

1. Introduction

Trauma and its associated injuries are the commonest cause of death in children.[1] Pelvic trauma and fractures in children and adolescents are rare with an incidence between 2.4 and 7.5%[2,3] and the mortality is significant with a reported range of 1.4% to 25%.[4–6]

Most patients with a pelvic fracture are therefore multi-traumatized patients with injuries to the head, chest, abdomen, and extremities.[6] High-energy traumas are the leading cause for these injuries.[2] The morbidity and mortality associated with them are usually higher in comparison to other types of orthopedic trauma.[7] Keshishyan et al identified in a postmortem study of trauma patients a high rate of pelvic fracture-related deaths and a high incidence of pelvic fractures.[8] Because of multiple life-threatening injuries caused by high energy trauma,[9] the child's initial treatment is usually less focused on pelvic injury. Moreover, cardiopulmonary resuscitation (CPR) in children after severe trauma seems to result in a better outcome than in adults, and appears to be more justified than current guidelines would imply. Resuscitation in the emergency room (ER) is even associated with a better neurological outcome compared to resuscitation in a preclinical context or in both the preclinical phase and ER.[10,11]

Children's pelvic bones are less brittle, covered with thick periosteum, more elastic, and more cartilaginous than an adult's. Moreover, the bony matrix is flexible, the ligaments are relatively stronger, and growth centers are still present which, together with the sacroiliac joints and pubic symphysis, enable a significant

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