The Journal of Emergency Medicine, Vol. 47, No. 2, pp. 140–146, 2014

0736-4679/$ - see front matter

http://dx.doi.org/10.1016/j.jemermed.2014.04.036

Original Contributions

PATTERNS OF INJURY AND MANAGEMENT OF CHILDREN WITH PELVIC FRACTURES AT A NON–TRAUMA CENTER

Henry W. Ortega, MD,* Samuel Reid, MD,* Heidi Vander Velden, MS,† Walter Truong, MD,‡ Jennifer Laine, MD,‡ Libby Weber, MD,‡ and James Engels, MD‡

*Emergency Services, Children's Hospitals and Clinics of Minnesota, Minneapolis, Minnesota, †Research and Sponsored Programs, Children's Hospitals and Clinics of Minnesota, Minneapolis, Minnesota, and ‡Orthopedic Surgery, Children's Hospitals and Clinics of Minnesota, Minneapolis, Minnesota

Reprint Address: Henry W. Ortega, MD, Emergency Services, Children's Hospitals and Clinics of Minnesota, MS 17-750, 2525 Chicago Avenue South, Minneapolis, MN 55404

☐ **Abstract—Background: Pelvic injuries in young children are rare, and it has been difficult to establish clinical guidelines to assist providers in managing blunt pelvic trauma, especially in non–Level 1 trauma centers. Objective: Our aim was to describe the relationship among clinical findings, mechanism of injury, and the radiographic resources utilized in children with pelvic fractures presenting to a non–Level 1 trauma center. Methods: A retrospective review of patients with a pelvic fracture treated in two urban pediatric Level 3 emergency departments was performed. Results: Between 2001 and 2010, a total of 208 patients were identified. Avulsion/iliac wing fractures were the most common fractures (58.7%), and sports-related injuries were the most common mechanism of injury (50.0%). Children with sports-related injuries were more likely to sustain an avulsion fracture ($p < 0.001$), less likely to have a computed tomography scan obtained in the emergency department ($p < 0.001$), and less likely to have an associated injury ($p < 0.001$) than other children. Children struck by a motor vehicle ($p < 0.001$) or involved in a motor vehicle accident ($p < 0.001$) were more likely to receive a computed tomography scan ($p < 0.001$) and have associated head and extremity injuries ($p < 0.001$). Mechanism of injury was associated with abnormal computed tomography scans. Nearly all patients were treated nonoperatively (98.1%) and no deaths were reported in this study. Conclusions: Patterns of injury, based on mechanism of injury, have been reported to assist the assessment and management of children with minor pelvic injuries.** © **2014 Elsevier Inc.**

☐ **Keywords—pelvis fracture; computed tomography; pediatric**

INTRODUCTION

Injury is the leading cause of disability and death in children, with > 12,000 deaths and 9 million emergency department (ED) visits per year (1). Pediatric pelvic fractures constitute between 2% and 5% of annual pediatric trauma admissions to Level 1 trauma centers, with a mortality rate between 1.4% and 17% (2–4). Despite their infrequency, the morbidity and mortality resulting from pelvic fractures remain high compared with other forms of orthopedic trauma (5).

The majority of severe pelvic injuries are caused by blunt trauma and may be difficult to diagnose, as children frequently have a multisystem pattern of injury and distracting injuries (6). Pediatric blunt trauma victims have been shown to have a lower rate of pelvic fractures compared with adult patients, likely related to the greater elasticity at the symphysis and sacroiliac joints in

RECEIVED: 3 September 2013; FINAL SUBMISSION RECEIVED: 28 January 2014;
ACCEPTED: 28 April 2014

younger children (7–9). Currently, the evaluation and management of pediatric trauma are based largely on extrapolation from adult trauma experience (10,11).

Although management strategies of children with pelvic fractures at Level 1 trauma centers have been widely reported, the majority of injured children in the United States receive emergency care at non−Level 1 trauma centers (1–9,12). Because of the potential for high morbidity and mortality associated with pelvic fractures, many children are transferred to Level 1 trauma centers regardless of the mechanism of injury or clinical findings (2,4,6,7). To our knowledge, there are no reports on the incidence and characteristics of pelvic fractures presenting to non−Level 1 trauma centers or on the morbidity and mortality associated with them.

The purpose of this study was to describe the clinical findings associated with children with pelvic fracture treated in a pediatric Level 3 trauma center ED, in an attempt to increase knowledge about this relatively rare occurrence in children. We hypothesize that the mechanism of injury is strongly correlated with pelvic fracture type, radiographic utilization in the ED, associated nonpelvic injuries, and hospital admission rates.

METHODS

Study Design, Patient Selection, and Fracture Classification

Our institution maintains two EDs in freestanding, urban, university-affiliated children's hospitals that have a combined annual census of >90,000 visits/year.

This retrospective review was approved by our Institutional Review Board. We used our electronic medical records system (CERNER, Kansas City, MO) data warehouse to identify all patients who had an International Classification of Disease, 9th revision (ICD-9) diagnosis code containing 808 ("fracture of pelvis"). We also screened medical records for those patients who were admitted to the ED for an evaluation for blunt abdominal injury. We collected demographic data, including age, race, and sex, directly from the electronic database on children presenting between 2001 and 2010. Clinical data such as mechanism of injury, Glasgow Coma Scale (GCS), Injury Severity Score (ISS), radiographic findings, management, and ED disposition were extracted from the medical record by a single study investigator.

During the study period, our institution did not have a standardized protocol in place to assist providers in treating pelvic fractures in the ED. Decisions regarding care, including CT scans, were at the discretion of the treating physicians.

All radiology studies were read by a board-certified pediatric radiologist. We excluded patients from this study if they were medically complex, had a history of pre-existing bone disease, sustained a penetrating injury, or if their injury happened >7 days before the ED visit. We determined children to be medically complex if they had pre-existing bone disease, were dependent on mechanical ventilation, had a significant chromosomal disorder that resulted in severe developmental delays, or were nonambulatory. Pelvic fractures were classified according to the scale described by Torode and Zieg (13).

Statistical Analysis

Descriptive statistics were used to identify the population, including frequency distributions for dichotomous variables such as sex and race/ethnicity, and mean and standard deviation and median (range) for continuous variables such as age. Differences in injury types among injury mechanisms were assessed using χ^2 test or Fisher's exact tests. The α levels of 0.05 were adjusted with Bonferroni correction if multiple comparisons were done, with significance determined to be ≤ 0.0125 (0.05/4) if four groups were compared (14). Computation of relative risk (RR) with 95% confidence intervals (CI) was performed for assessing the risk of an associated injury with pelvic fractures in this study. All analysis was performed in SPSS software, version 15.0 (SPSS Inc., Chicago, IL).

RESULTS

We identified a total of 208 patients who were admitted to the ED between January 1, 2001 and December 31, 2010 and had an ICD-9 diagnosis code of 808 (pelvic fracture). Table 1 shows the demographics and injury severity (GCS, ISS) of the study groups. Most patients were

Table 1. Demographic Characteristics of Children With Pelvic Fractures

Variable	Finding
Age (years)	
Median	14.46
Mean ± SD	13.13 (4.13)
Sex, n (%)	
Male	122 (58.7)
Female	86 (41.3)
Race/ethnicity, n (%)	
White/Caucasian	112 (53.8)
African American/black	32 (15.4)
Latino/Hispanic	22 (10.6)
Asian	20 (9.6)
Biracial	6 (2.9)
Other/declined	18 (7.7)
Glasgow Coma score, median (range)	15 (8–15)
Injury Severity Score, median (range)	12 (4–69)
Transferred from an outside institution, n (%)	78 (37.5)

SD = standard deviation.