



Uncommon Pediatric Orthopaedic Injuries

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Abstract

Background: *Musculoskeletal injuries are emerging as an epidemic and a rising cause of morbidity and mortality in the pediatric age. Fractures and dislocations predominate in these injuries. Most of these injuries are easily diagnosed and managed due to their common injury pattern, clinical presentation and location, while some are uncommon and present with an unusual pattern so misdiagnosed or completely overlooked because of their rarity or lack of proper evaluation.*

Objective: *This study was done to present the epidemiology, etiology, and pattern of uncommon orthopedic injuries in children to show our experience with these uncommon injuries at a tertiary trauma center, and to determine whether any skeletal survey would promote the ability to make early diagnosis and accordingly afford best management for a good outcome.*

Methods: *A retrospective observational, hospital-based study of 30 children aged 0-14 years who presented to the emergency department and outpatient clinics with a history of trauma and sustained rare orthopedic injuries and fracture/dislocations, in the period between 1996 and 2018 at Al jalaa Trauma Hospital, Benghazi-Libya. The site affected was: 16 (53.3%) had the upper limbs, 13 (43.3%) had the lower limbs affected, and one (3.3%) had a pelvic injury. There were 24 (80%) boys and 6 (20%) girls. Mechanism of injury was falling from standing (FDS) in 20 (66.6%), road traffic accidents (RTA) in 6 (20%), fall from height (FDH) in 3 (10%), and one patient (3.3%) was due to a gunshot wound (GSW). Eleven patients (36.6%) were treated conservatively, whereas 18 (60%) were treated operatively and one had operative and non-operative methods (3.3%). The follow-up period was extended to 18 months and disability and complications were recorded including any subsequent procedure and implant removal.*

Conclusion: *The high incidence of pediatric trauma indicates the need for proper assessment and radiologic surveys to pick up potentially rare injuries.*

Keywords: *uncommon injuries, musculoskeletal injuries, pediatric orthopedic, children.*

Introduction

Trauma is the main cause of death in children even in developed countries⁽¹⁾. The biochemical and physiologic differences between the child's skeleton from that of the adult lead to distinctly

different mechanisms of injury, moreover, every age group from infancy through adolescence has its typical fracture patterns⁽²⁾. Some pediatric musculoskeletal injuries are rare, a few of them can be misdiagnosed and mismanaged, and others

might be overlooked, especially those referred from peripheral hospitals. In the literature, these injuries are described as unusual, rare, extremely rare, or uncommon injuries in children. It is doubtful whether these data merely represent an isolated experience, or a universal yet unappreciated phenomenon. Fracture patterns in accidental circumstances are often specific to age or developmental level. Therefore understanding the typical spectrum of injuries that children sustain as they mature; is an important. What assessment to perform for predicting any potential uncommon injuries remains unclear. Knowledge of common mechanisms for any given fracture type, combined with relevant clinical information, can guide the clinician as to the plausibility of reported injury mechanisms. The medical assessment of the child with musculoskeletal trauma begins with a detailed history as regard to the onset and progression of symptoms related to injury with careful documentation. It should include all recent and remote traumatic events and any medical conditions. The clinical examination should entail inspecting general appearance, and vital signs, documenting any bruising, exposure of all affected areas, all limbs and joints noting any deformity, swelling, tenderness, and limitations in range of motion. The skeletal survey (SS) is the cornerstone of radiographic investigation for fractures in traumatic pediatric injuries because it provides valuable information about bone health and may identify the uncommon skeletal injury.

Patients and Methods

This study was a retrospective observational hospital-based study conducted between 1996 and 2018 at Al jalaa Trauma Hospital–Benghazi, a tertiary trauma center for Eastern and Southern parts of Libya, with a pediatric orthopedic department capacity of 40 beds and average annual admission of 500 cases. It included 30 children aged 0-14 years; who presented to the emergency department and outpatient clinics with uncommon injuries in their limbs, eight of whom were transferred from peripheral hospitals with

undiagnosed injuries and without proper management.

Data were collected from file records and included clinicians' notes, radiological investigations (x-rays, ultrasound scans, C.T. scans, and MRI scans), and follow-up documentation. The age, sex, mechanism, and pattern of injury, definitive diagnosis, the treatment afforded, and complications were collected. Injuries were allocated into a table according to the type of injury, the site affected, and the number of patients.

The literature was reviewed concerning uncommon pediatric musculoskeletal injuries.

Results

There were 30 patients, with ages from 0-14 years (average 3-14 years) with a mean of 8.2 years, and 70% of patients above 5. The gender distribution was 24 (80%) boys and 6 (20%) girls. The site affected was the upper limb in 16 (53.3%), the lower limb in 13 (43.3%), and one child had a pelvic injury (3.3%). The injury type is demonstrated in table (1) and figures (1-11). Mechanism of injury was fall from standing (FDS) in 20 (66.6%), road traffic accidents (RTA) in 6 (20%), fall from height (FDH) in 3 (10%), and one patient (3.3%) was due to a gunshot wound (GSW). Methods of treatment were nonoperative in 11 children (36.6%) and operative in 18 (60%), with one child (3.3%) having a bilateral fracture neck radius treated by surgical fixation of one side and cast for the other.

Conservative treatment was achieved by closed reduction under general anesthesia and fluoroscopy, then p.o.p.cast, and surgical treatment entailed closed reduction and percutaneous k-wire fixation or open reduction and internal fixation by k-wire, screws, or plate and screws. Postoperatively, a p.o.p cast applied for a few weeks. All patients were followed -up by clinical and radiological evaluation for 18 months and continued till full rehabilitation.

Among all patients, 26 (86.6%) had a regular follow-up, and 4 (13.3%) missed after four months

of follow-up.

Sequel and morbidities:

Clinical and radiological healing was seen in 21 (70%) patients, while 5 (16.6%) patients developed

complications that included stiffness, heterotopic ossification, recurrent dislocation, malunion, and deformities.

Table (1): Type of injuries

Diagnosis	No.
Flexion type supracondylar fracture of the humerus.	2
Fracture the neck of radius.	2
Fracture head of the radius.	1
Epiphyseal injury of the neck of radius with dislocation of the elbow.	1
Galeazzi fracture dislocation.	1
Monteggia fracture dislocation.	3
Fracture medial condyle of the humerus with dislocation of the elbow.	1
Supracondylar fracture humerus with ipsilateral fracture of distal radius.	1
Supracondylar fracture humerus with Monteggia fracture dislocation.	1
Posterior dislocation of the elbow.	1
Fracture coronoid process of the ulna and fracture neck of the radius with a dislocated elbow.	1
Bilateral fracture of the neck of radius.	1
Fracture of the patella.	2
Cut of the patellar tendon.	1
Fracture of the talus.	2
Epiphyseal avulsion injury of the proximal tibia.	1
Anterior hip dislocation with ipsilateral femur fracture .	2
Bilateral femur fracture.	1
Posterior hip dislocation.	3
Gunshot injury with fractured neck of the femur.	1
Open book injury of pelvis with Morel-Lavallée lesion of a pelvic region.	1



Fig.(1): AP. X-ray view of diaphyseal fracture both femurs.



Fig.(2): (A) AP. X-ray view of Monteggia fracture-dislocation, (B) Lat. X-ray view after closed reduction and casting.

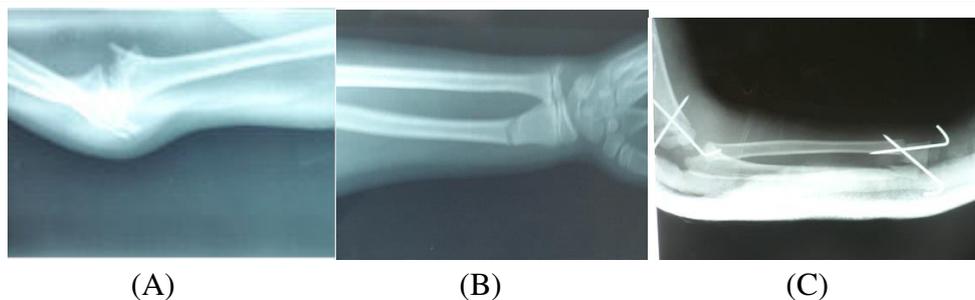


Fig.(3): Supracondylar fracture humerus with ipsilateral distal radius fracture, (A): Preoperative Lat. X-ray view of elbow joint, (B): Preoperative AP. X-ray view distal forearm and (C): Lat. X-ray view after closed reduction and internal fixations of both fractures.



Fig.(4): Missed Monteggia fracture-dislocation, (A): AP. X-ray view and (B): Lat. X-ray view.

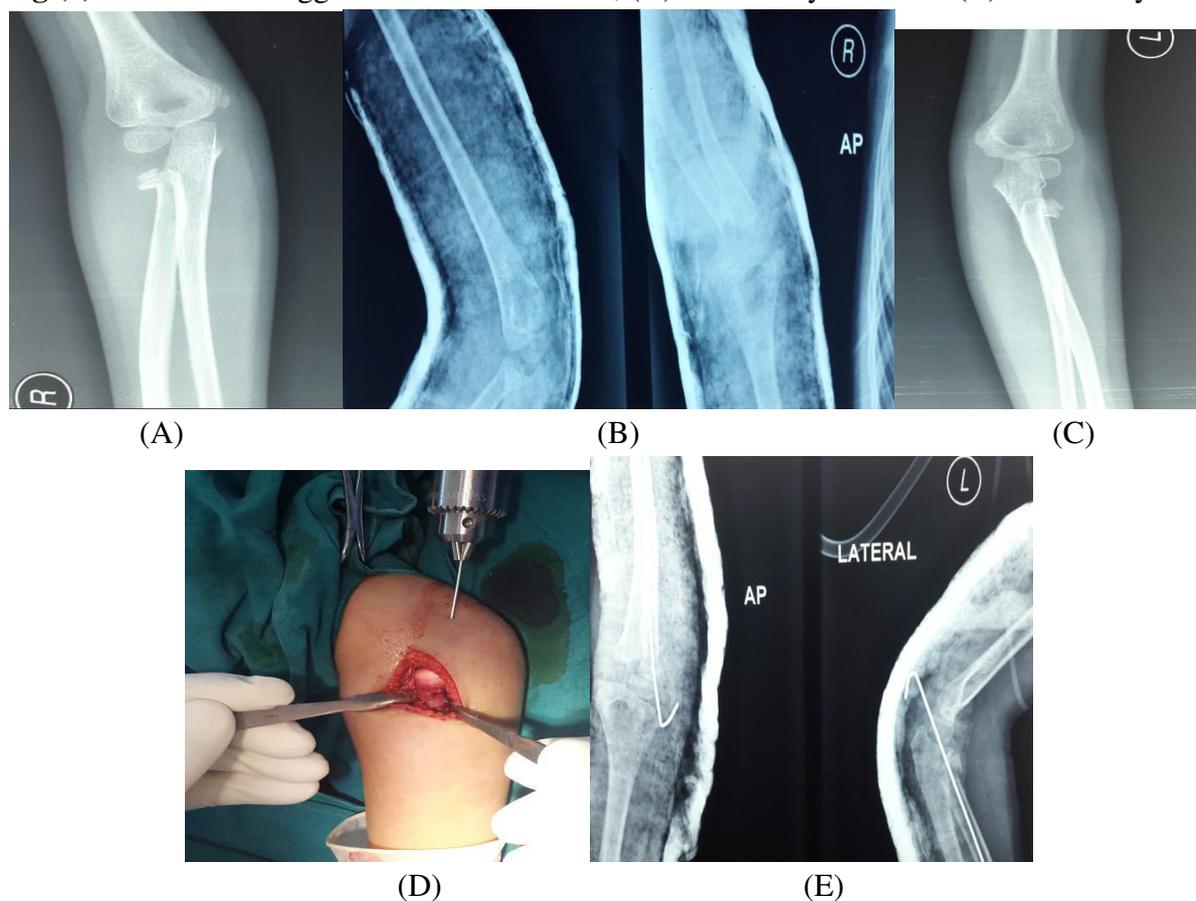


Fig.(5): Bilateral fracture neck of radius, (A):AP. X-ray view Rt. side, (B): AP. & Lat. X-ray views after closed reduction & casting, (C):AP.view Lt. side, (D): intraoperative clinical picture showing open reduction and K.wire fixation, (E): Postoperative AP. & Lat. X-ray views of left side.

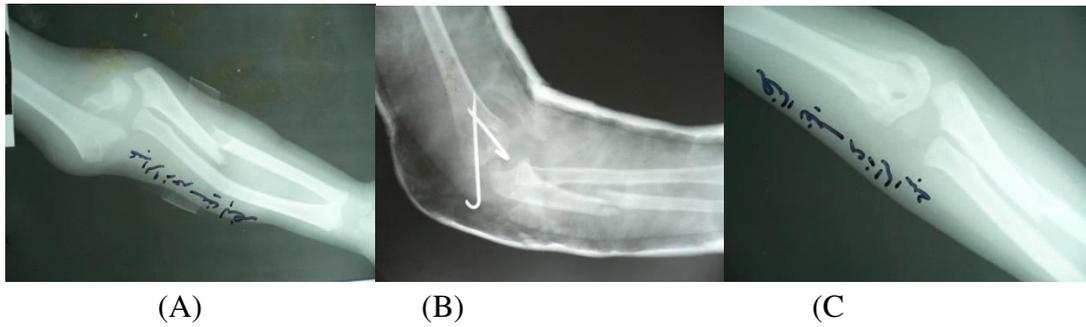


Fig.(6): Supracondylar fracture humerus with Monteggia fracture dislocation, (A): preoperative AP. X-ray view, (B): postoperative AP. X-ray view, (C): AP. X-ray view after 3 months.

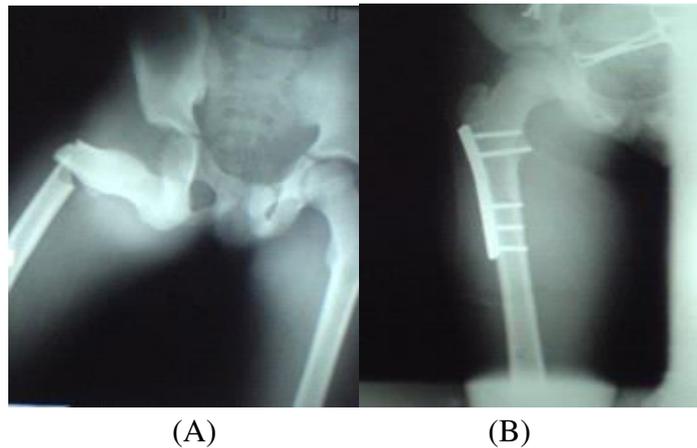


Fig.(7): Anterior Rt. hip dislocation with ipsilateral fracture femur, (A): preoperative AP. X-ray view, (B): postoperative AP. X-ray view.

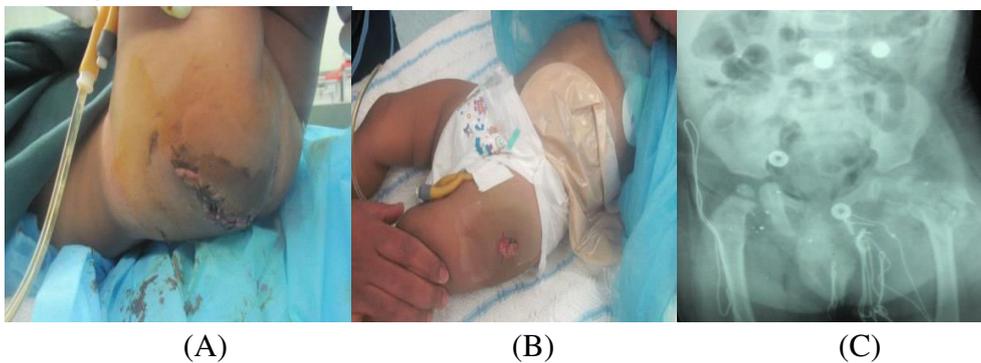


Fig.(8): Gunshot injury with fracture neck Lt. femur, (A) and (B): Clinical pictures of gunshot wounds, (C): Pelvic AP. X-ray view shows comminuted fracture neck and proximal femur.

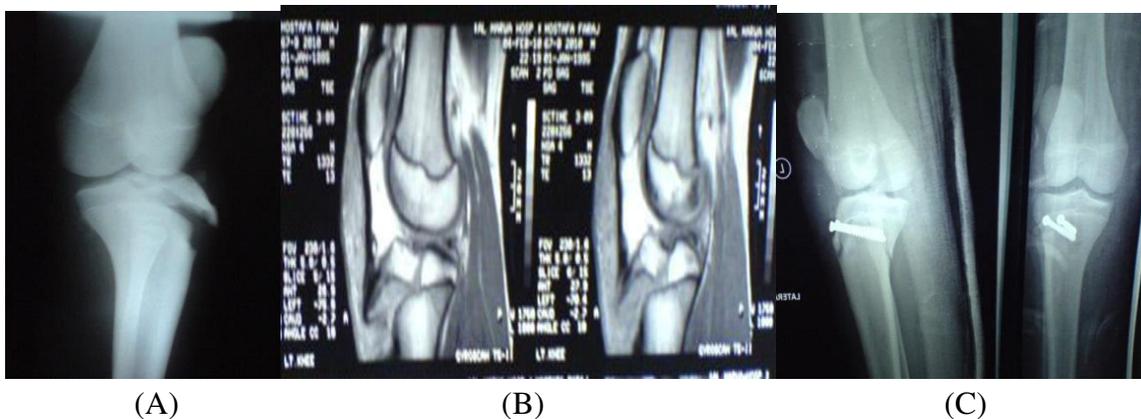


Fig.(9): Epiphyseal avulsion injury proximal tibia, (A): preoperative X-ray view, (B): MRI sagittal view, (C): AP. & Lat. postoperative X-ray views.



Fig.(10): Fracture neck talus, (A): Immediate postoperative Lat. X-ray view, (B): AP. and Lat. X-ray views one year postoperative.

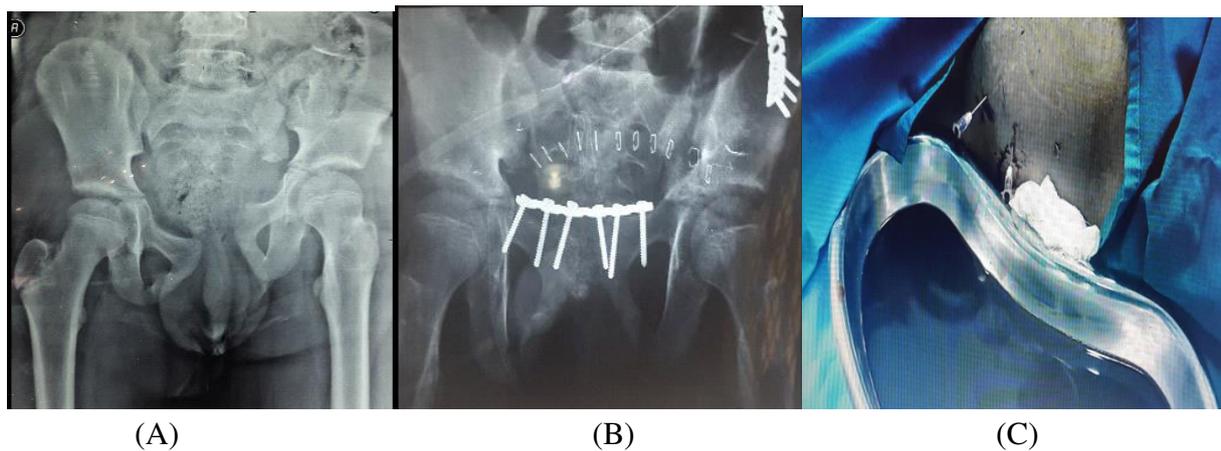


Fig.(11): (A): Open book pelvic fracture AP. X-ray view, (B): Postop. AP. X-ray view, (C): Clinical picture of Morel-Lavallée lesion of a pelvic region with an aspiration of bloody fluid from injured Lt. side of pelvic region.

Discussion

Optimal treatment of injured children necessitates good knowledge of anatomy and physiology. Uncommon pediatric injuries and fractures need good clinical and radiological evaluation to avoid underdiagnosis which may be due to delayed presentation, inconsistent history, and multiple injuries which remain associated with clinical problems worldwide. Musculoskeletal injuries presented in this study described as uncommon pediatric orthopedic injuries. Concerning literature, to our knowledge, this entity has not been mentioned in special types of injuries that were mentioned as case reports.

Monteggia published his observation about this lesion which can result in poor function if not diagnosed and treated properly⁽³⁾. Monteggia fracture-dislocation is classified into four types, named Monteggia variants which are extremely

rare. Monteggia and Galeazzi fracture dislocations might be underdiagnosed because of improper x-ray views or poor interpretation⁽⁴⁾. Mikic reported cases of Galeazzi fracture dislocations, all were treated conservatively⁽⁵⁾. Fowles and Kasab described fracture neck of the radius as uncommon and recommended early diagnosis and accurate reduction and fixation⁽⁶⁾. This matches our findings. Just similar to our result, Gaston showed that adequate closed methods have better results than open methods for this injury⁽⁷⁾. Metaizean used oblique k-wire to fix unstable epiphyseal injuries of the radial head, this is in disagreement with our conservative treatment⁽⁸⁾. A flexion-type supracondylar humerus fracture is also considered quite rare, accounting for 2%-3% of all supracondylar fractures, we had two patients treated by closed reduction and percutaneous pinning. Wilkins advised for open reduction and

internal fixation of type three of this fracture⁽⁹⁾. With regard to supracondylar fracture of the humerus with ipsilateral forearm bones fractures, we agree with C L Stanitski⁽¹⁰⁾ who described these injuries as unusual and each of these ipsilateral injuries requires its own management, however, both injuries in our series were fixed in the same surgical setting. Most hip dislocations are posterior and usually managed by closed reduction. We had two children presented with anterior hip dislocation with ipsilateral femur fracture which is quite a rare injury, one treated by closed method for both injuries whereas the other treated by a closed reduction for the dislocation and open reduction and internal fixation for fracture shaft femur, this is following Vialle R et al. who demonstrated that anterior hip dislocation is much less frequent than posterior hip dislocation⁽¹¹⁾. Fracture neck of the femur at pediatric age is quite a rare injury, accounting for only 1% of pediatric fractures, usually caused by high-energy trauma⁽¹²⁾. Open fracture neck of the femur in children due to gunshot injury has not been reported in the literature; our patient was treated by wound debridement and spica cast with a sound union. Patella fracture is extremely rare in children⁽¹³⁾. Two cases reported in this study misdiagnosed; in one, the knee was aspirated twice for recurrent haemarthrosis. The patellar tendon cuts can occur, though uncommonly in children⁽¹⁴⁾; one case in our series had a glass injury at the infrapatellar region missed for two weeks and then diagnosed by ultrasound and MRI before surgical repair. Fracture separation of the epiphysis of the upper tibia is a rare event. Waston-Jones classified this injury into three types⁽¹⁵⁾. One case illustrated in this series was due to sports injury with excessive knee flexion leading to type four epiphyseal avulsion injury with a partial tear of the anterior cruciate ligament and lateral meniscus, was managed surgically. Fracture talus occurs much less commonly in children⁽¹⁶⁾, with injury appearing to be caused by forced dorsiflexion. Boyed and Knight recommended closed reduction and casting⁽¹⁷⁾. Two patients fell from a height, one

treated by closed method with good healing, and the other by an open method which ended with avascular necrosis. Pelvic fractures with Morel-Lavallée soft tissue lesion (MLL) is a rare occurrence, its management is still under discussion⁽¹⁸⁾. Our case was treated with open reduction and internal fixation of pelvic fractures and delayed urethral injury repair. For MLL repeated aspirations done without debridement, this is inconsistent with Christian Luzius Steiner et al. recommending debridement for early and delayed treatment of MLL⁽¹⁹⁾.

Conclusion

We attempted to shed light on uncommon pediatric orthopedic injuries as the literature is sparse in this regard. Understanding these injuries will lead to early diagnosis and management, aiming at minimizing complications.

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