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(CASE REPORT)

Exceptional Combined Upper Limb Injury in an Adolescent: Radial Head Fracture, Both-Bone Forearm Fractures, Distal Ulnar Epiphyseal Separation and Scaphoid Fracture: A Case Report

Achraf Lahjouji *, Mohamed Amine Lamris, Khalid El Jebbouri, Abdessamad Rajaallah, Charaf Eddine El Kassimi, Abdeljabbar Messoudi, Mohamed Rahmi and Mohamed Rafai

Faculty of Medicine and Pharmacy of Casablanca, Department of Orthopedic and Trauma Surgery, P32, Ibn Rochd University Hospital Center, Casablanca, Morocco.

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Abstract

Background: Combined injuries of the elbow, forearm, and wrist in adolescents are exceptionally rare and usually result from high-energy trauma. These complex patterns pose diagnostic and therapeutic challenges, particularly in patients with incomplete skeletal maturity.

Case presentation: We report a rare case of a 17-year-old adolescent who sustained a complex left upper limb injury following a fall from height. Radiological assessment revealed a Mason type II radial head fracture, both-bone forearm fractures, a Salter–Harris type II distal ulnar epiphyseal separation, and a Schernberg type III scaphoid fracture. Surgical management included plate fixation of the forearm bones, screw fixation of the radial head and scaphoid, and temporary Kirschner wire stabilization of the distal ulna. Postoperative immobilization was followed by progressive rehabilitation, leading to satisfactory healing and functional recovery.

Conclusion: This case emphasizes the importance of comprehensive assessment and early surgical management in complex upper limb injuries in adolescents to optimize functional outcomes.

Keywords: Adolescent; Upper limb injury; Forearm fracture; Radial head fracture; Scaphoid fracture; High-energy trauma; Case report

1. Introduction

Traumatic injuries of the forearm and wrist in adolescents are common and most often result from accidental falls. However, complex injury patterns involving the elbow, forearm, and carpal bones simultaneously remain rare, particularly in young patients whose skeletal growth is not yet complete. Most fractures in this age group occur in isolation, and their diagnosis and management are well established in the literature.

We report a rare case of a complex combined injury of the forearm and wrist in a 17-year-old adolescent following a high-energy trauma. The purpose of this case report is to emphasize the importance of a comprehensive injury assessment, to discuss the surgical management strategy, and to highlight the diagnostic and therapeutic specificities in adolescent patients.

* Corresponding author: Achraf Lahjouji

2. Case presentation

A 17-year-old patient with no significant past medical history was admitted to the emergency department following a fall from an estimated height of approximately five meters, with direct impact to the left forearm. On admission, the patient exhibited the typical posture of an upper limb trauma involving the left side. (Fig 1)

Figure 1 Clinical photograph illustrating the typical posture of the traumatized left upper limb at initial presentation

Clinical examination revealed a globally swollen left upper limb with an obvious deformity and shortening of the forearm, strongly suggestive of a displaced fracture of both forearm bones, along with near-complete functional impairment of the limb. There was intense pain aggravated by mobilization and palpation of the different bony segments. No skin wounds or open injuries were noted, thus ruling out an open trauma from the outset. Pain was also elicited on mobilization of the left wrist and elbow. Distal peripheral pulses were well palpable. Capillary refill time was normal. Neurological examination showed no sensory or motor deficits. Sensation in the median, ulnar, and radial nerve territories was preserved. Active finger motion was possible but limited due to pain.

Standard radiological assessment, including radiographs of the elbow, forearm, and wrist, demonstrated an unusual combined injury pattern consisting of a Mason type II radial head fracture, a mid-diaphyseal fracture of both forearm bones, a distal ulnar epiphyseal separation classified as Salter–Harris type II, and a scaphoid fracture classified as Schernberg type III (distal waist fracture). (Fig 2)

Figure 2 Preoperative radiological assessment showing a radial head fracture, mid-diaphyseal fractures of both forearm bones, distal ulnar epiphyseal separation, and an associated scaphoid fracture

Given the complexity of the injuries, surgical management was indicated. The patient was taken to the operating room where general anesthesia was administered, with the patient positioned supine and a pneumatic tourniquet applied at the root of the limb.

The procedure began with management of the fractures of both forearm bones. The radius was approached through an anterior approach (Henry approach), allowing anatomical reduction followed by internal fixation using a dynamic compression plate (DCP). The ulna was then addressed through a direct posterior approach, with open reduction and internal fixation using a second DCP plate. The radial head fracture was reduced under direct visualization and stabilized using two cannulated screws, providing stable fixation and restoration of the articular surface. The distal ulnar epiphyseal injury was stabilized with percutaneous transphyseal–metaphyseal Kirschner wire fixation. Finally, the scaphoid fracture was treated with antegrade screw fixation using a Herbert screw. (Fig 3)

Figure 3 Postoperative radiographs showing satisfactory alignment and stable fixation of the fractures after surgical treatment

Postoperatively, immobilization of the left upper limb with a plaster cast was maintained for six weeks. Analgesic and anti-edematous treatments were prescribed. The immediate postoperative course was uneventful, with no infectious or neurovascular complications.

At six weeks postoperatively, removal of the ulnar Kirschner wires was performed. A progressive functional rehabilitation program of the left upper limb was subsequently initiated, aiming to restore joint mobility and overall limb function.

Clinical and radiological follow-up showed a favorable outcome. Serial radiographs demonstrated satisfactory bone healing of the radius, ulna, and scaphoid, with no secondary displacement or hardware-related complications.

At the latest evaluation, the patient had achieved a satisfactory functional recovery of the left upper limb, with near-full range of motion of the elbow and wrist. Forearm pronation and supination were also well restored, allowing a gradual return to daily activities.

3. Discussion

Complex upper limb injuries in adolescents represent a significant diagnostic and therapeutic challenge, particularly when they result from high-energy trauma. The present case illustrates an exceptional combined injury pattern involving the elbow, forearm, and wrist simultaneously, reflecting the severity of the traumatic mechanism and highlighting the potential seriousness of such accidents in young patients. Such combinations are very rarely reported in the literature, which is largely dominated by isolated injuries or associations limited to a single anatomical segment [1–3].

In adolescents, forearm and wrist fractures account for a substantial proportion of osteoarticular injuries, most commonly resulting from low- to moderate-energy falls [4]. In contrast, combined injuries involving multiple levels of

the upper limb are uncommon and may be overlooked during the initial assessment, particularly in emergency settings. This underscores the need for a thorough injury assessment in all cases of high-energy upper limb trauma, systematically including radiological evaluation of the elbow, forearm, and wrist [5].

Radial head fractures are relatively uncommon in children and adolescents compared with adults. The Mason classification remains a widely used reference to guide therapeutic management [6]. Mason type II fractures may be treated conservatively in selected cases; however, surgical treatment is recommended in the presence of significant displacement, instability, or associated injuries, in order to restore articular congruence and prevent functional limitations of the elbow [7,8].

Both-bone forearm fractures represent major injuries due to their direct impact on pronation and supination. In adolescents approaching skeletal maturity, plate osteosynthesis is widely recognized as a reliable method, allowing precise anatomical realignment and providing sufficient stability to achieve optimal fracture healing [9,10]. This approach is particularly indicated in displaced fractures or when associated with other complex injuries, as in the present case.

Distal ulnar epiphyseal separation is a rare entity but may have potentially serious consequences. Several authors have emphasized the risk of growth disturbances, distal radioulnar joint imbalance, and secondary deformities when anatomical reduction is not achieved [11,12]. Temporary stabilization with Kirschner wires allows maintenance of alignment while minimizing damage to the growth plate, making it a suitable therapeutic option in adolescents.

Scaphoid fractures are uncommon in young patients because of relative bone elasticity and favorable vascular supply. Nevertheless, they may occur following high-energy trauma and are often associated with other wrist or forearm injuries [13]. Distal waist fractures, classified as Schernberg type III, carry a non-negligible risk of delayed union or nonunion if insufficiently stabilized [14]. Fixation using a Herbert screw provides stable interfragmentary compression and remains a reference technique to promote fracture healing [15].

In the present case, the choice of an early and comprehensive surgical approach aimed to restore anatomy, ensure stability of the different osseous segments, and allow harmonious fracture consolidation. Postoperative immobilization with a plaster cast was part of a strategy to protect the fixation constructs and promote bone healing. Secondary removal of the Kirschner wires, followed by the initiation of a progressive functional rehabilitation program, is consistent with current recommendations designed to limit joint stiffness and optimize functional recovery [16,17].

This case highlights the importance of a global and individualized approach to the management of complex upper limb injuries in adolescents. Comprehensive clinical and radiological assessment, combined with appropriate surgical management, is essential to prevent long-term complications and to ensure a favorable functional outcome.

4. Conclusion

Complex combined upper limb injuries in adolescents are rare entities, most often resulting from high-energy trauma, and they pose significant diagnostic and therapeutic challenges. The present case highlights the importance of a comprehensive injury assessment in the setting of severe upper limb trauma in order to avoid missing associated lesions that may compromise functional outcomes.

Early and appropriate surgical management aimed at restoring anatomy and stability of the different osseous segments, combined with protective immobilization followed by progressive functional rehabilitation, allows satisfactory fracture healing and optimizes functional recovery. This case emphasizes the need for a global and individualized approach in the management of complex upper limb trauma in young patients.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

Not applicable. Case reports are exempt from ethical approval at our institution.

Statement of informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Author contributions

ACHRAF LAHJOUJI : patient management, data collection, manuscript writing and revision.
All authors contributed equally to the preparation of this case report.

Data availability statement

The data generated or analyzed during this study are available from the corresponding author upon request.

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