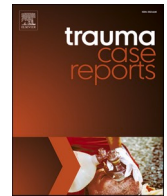




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Case Report

Simultaneous ipsilateral Monteggia fracture-dislocation and distal radius fracture: A report of a pediatric case and review of the literature

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ABSTRACT

We present the case of a 12-year-old boy who suffered from a combination of Monteggia fracture-dislocation along with ipsilateral distal radius fracture. The patient underwent closed reduction of the Monteggia lesion and the distal radius followed by percutaneous pinning. The postoperative course was satisfactory. Associated Monteggia fracture-dislocation and ipsilateral distal forearm fracture are rare. Our case and the literature review highlight the presence of common clinical features in pediatric patients with these particular injuries, including male dominance, age around 9 years, fall from a height, and lateral displacement of the dislocated radial head.

Introduction

The Monteggia fracture-dislocation is a rare but complex injury involving a fracture of the ulna and dislocation of the radial head [1]. This injury is uncommon in children. The combination of a Monteggia injury with an additional injury such as an ipsilateral distal radius fracture is even more rare. After a thorough literature search, we identified only eight pediatric cases of Monteggia injury with ipsilateral forearm fracture on record [2–9]. As there has been no comprehensive review of these cases, the clinical features of patients with those double fractures remain uncertain. In this report, we present an additional pediatric case of Monteggia fracture-dislocation with ipsilateral distal radius fracture and discuss clinical characteristics of this injury type by reviewing the literature.

Statement of informed consent

The patient and his parents were informed that data concerning the case would be submitted for publication and each of the patient and his parents agreed.

Case presentation

A 12-year-old boy fell off a bicycle onto his right outstretched hand and sustained an injury to the right forearm. The patient was brought to a nearby hospital. Following physical and radiographic examinations, he was promptly referred to the emergency

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department of the authors' hospital with a diagnosis of right proximal ulna fracture. Upon examination, his right wrist and elbow were swollen and restricted in motion. No surface wound was found on the right forearm or hand. All fingers of the right hand could be moved voluntarily. Radiographs showed fractures of the distal radius and proximal ulna along with a lateral dislocation of the radial head (Fig. 1A-D). Three-dimensional (3D) CT scans of the right forearm demonstrated a physeal fracture of the distal radius (Fig. 2A and B). The patient was diagnosed with Monteggia injury (Bado type III) [1] with ipsilateral physeal fracture of the distal radius. The right upper limb was immobilized with a cast splint and the patient was admitted to the hospital for surgical intervention scheduled on the following morning.

At surgery, the patient was anesthetized and placed in a supine position on the operating table. First, the radial head was reduced by valgus manipulation of the fractured proximal shaft of the ulna on the fully extended elbow and by supination of the forearm. In the reduced state of the joint, a long intramedullary Kirschner wire was passed into the ulna through the tip of the olecranon (Fig. 3A and B). Second, the fracture of the distal radius was reduced by manual traction to the wrist joint and fixed with a Kirschner wire passing through the radial styloid process (Fig. 3C and D). The arm was immobilized in a long arm splint with the elbow in 90° flexion and the forearm in full supination.

The splint was removed at 7 weeks after surgery. The Kirschner wires were removed at 12 weeks after surgery. At 7 months after the surgery, radiographs showed that the radius and ulna fractures had healed and the radial head was maintained in normal alignment (Fig. 4A-D). The patient had regained full range of motion of the elbow and wrist joints with full functional use of his hand.

Discussion

In this report, we presented the case of a 12-year-old boy who suffered from the combination of a Monteggia fracture-dislocation and an ipsilateral distal radius Salter II injury. Table 1 summarizes our case alongside the clinical pictures of the eight other reported pediatric cases with simultaneous Monteggia injury and ipsilateral distal radius injury.

As shown in the table, the case subjects comprised seven boys and two girls, aged 5 to 12 years with an average age of 8.6 years at the time of injury. According to the Bado classification [1], there were five type III injuries (lateral displacement of the radial head), three type I injuries (anterior displacement) and one type II injury (posterior displacement). The cause of injury was a fall from a height in seven patients.

With regard to the distal radius injury, six patients had a physeal fracture and three patients had bony fractures of the distal parts of the radius and the ulna. Treatment included closed reduction of the Monteggia lesion and the distal radius in all patients followed by immobilization with casting alone, percutaneous pinning or plate fixation. Treatment outcomes were satisfactory in all cases in the literature and in our case.

Ramski et al. [10] analyzed a total of 112 pediatric patients with acute Monteggia injury. The mean age of these patients was 6.9 years and 54% were male. Sixty-five percent were Bado type I injuries and 25% were type III injuries. Compared to these patients, the nine patients with simultaneous Monteggia and ipsilateral distal radius injuries were older, more male dominant and more prone to



Fig. 1. Preoperative radiographs of the right elbow (A: frontal view, B: lateral view) and the right wrist (C: frontal view, D: lateral view), showing a fracture of the proximal ulna with lateral dislocation of the radial head, and a fracture of the distal radius.

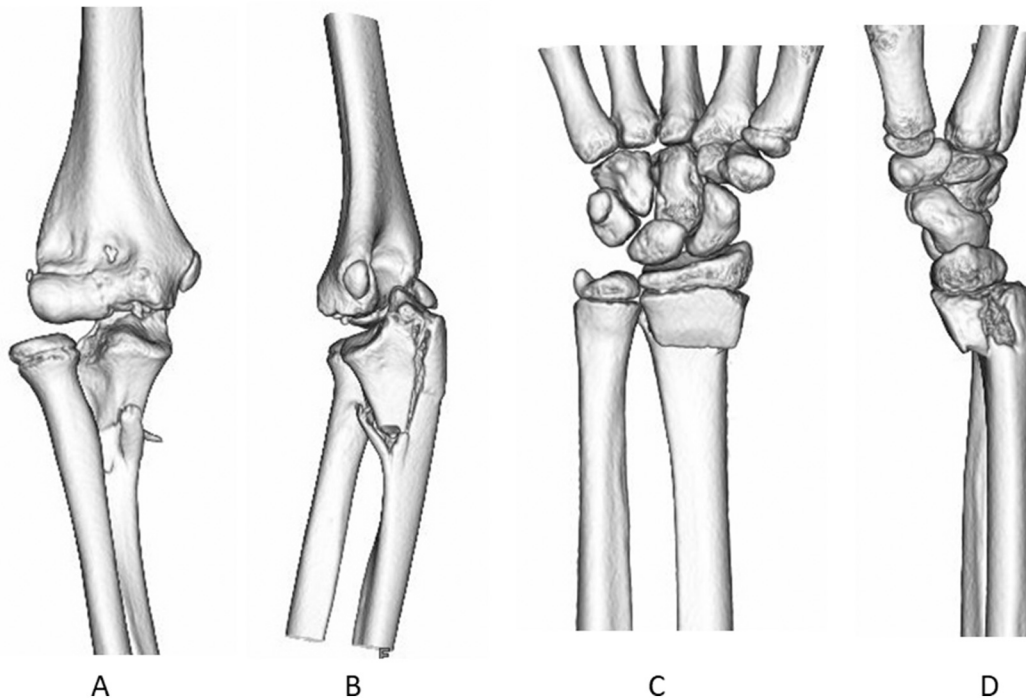


Fig. 2. Preoperative 3D-CT scans of the right elbow (A: frontal view, B: lateral view) and the right wrist (C: frontal view, D: lateral view), showing a short oblique fracture of the proximal ulna and a physeal fracture of the distal radius.

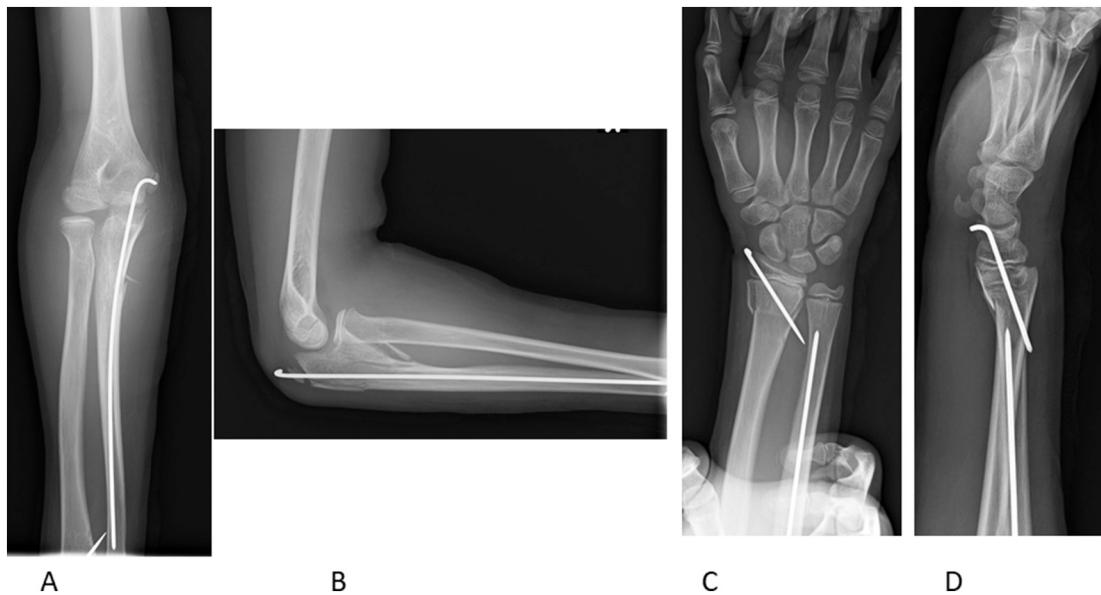


Fig. 3. Postoperative radiographs of the right elbow (A: frontal view, B: lateral view) and the right wrist (C: frontal view, D: lateral view).

Bado type III injuries.

The reason that the radial head most often displaces laterally in patients with Monteggia injury in conjunction with ipsilateral distal radius injury should be discussed. The proposed mechanisms of Bado type I injury include direct blow, hyperpronation, or hyperextension of the elbow and forearm [1]. Of these three mechanisms, direct blow to the posterior aspect of the forearm and hyperpronation of the forearm do not cause fracture of the distal radius. Only the hyperextension mechanism, which is caused by a fall on an outstretched arm with forward momentum, can lead to both type I Monteggia injury and distal radius fracture. This may be the reason that anterior displacement of the radial head is relatively rare in patients with combined Monteggia and distal radius injuries. In



Fig. 4. Radiographs seven months after surgery of the right elbow (A: frontal view, B: lateral view) and the right wrist (C: frontal view, D: lateral view), showing that the radial head is maintained in its normal alignment and the fractures of the proximal ulna and the distal radius are healed.

Table 1

Clinical data on cases of simultaneous ipsilateral Monteggia injury and distal radius injury reported in the literature and in our case.

Patient	Age (Year)	Gender	Side	Monteggia type (Bado)	Distal radius injury	Cause of injury	Treatment		Reference
							Monteggia	Distal radius	
1	5	M	Rt	I	Fracture	Fall from a height (2-3 m)	CR	CR	2
2	5	M	Rt	III	Physeal fracture	Fall from a height (1.5 m)	CRPP	CRPP	3
3	6	M	Rt	III	Fracture	Fall from a height (3 m)	CRPP	CRPP	4
4	8	F	Rt	II	Physeal fracture	Fall from a height (2-3 m)	CR	CRPP	5
5	8	F	Rt	III	Fracture	Fall from a height (3 m)	CR	CR	6
6	10	M	Rt	III	Physeal fracture	Fall from a height (1 m)	CRPP	CRPP	7
7	11	M	Lt	I	Physeal fracture	Fall from a height (1.5 m)	CRIF	CR	8
8	12	M	Rt	I	Physeal fracture	Fall while playing basket ball	CRIF (plate)	CR	9
Our case	12	M	Rt	III	Physeal fracture	Fall off a bicycle	CRPP	CRPP	

CR: closed reduction, CRIF: closed reduction and internal fixation, CRPP: closed reduction and percutaneous pinning.

contrast, the proposed mechanism of Bado type III injury is varus stress at the level of the elbow in combination with a fall on an outstretched hand [1]. This mechanism can also cause distal radius injury.

Ipsilateral distal forearm fracture is one of the potential complications in the early stages of Monteggia injuries, along with delayed diagnosis, nerve injuries, and compartment syndrome [1]. Pain, swelling and deformity caused by the distal forearm fracture distract the examiner from focused examination to detect Monteggia lesion, nerve injuries and compartment syndrome, which can lead to severe consequences.

In regard to management of the Monteggia lesion, in our present case, the ulnar fracture was treated with intramedullary pin fixation, given the difficulty in maintenance of ulnar alignment following reduction. Intramedullary pin fixation is considered reasonable for alignment-unstable, length-stable type ulnar fractures such as transverse or short oblique fracture, as in the present case [10]. In contrast, plate fixation is recommended for length-unstable ulnar fractures (i.e. long oblique or comminuted fractures) [10].

Associated Monteggia fracture-dislocation and ipsilateral distal forearm fracture may not be as rare as suggested in the literature. Our case and the literature review emphasize the importance of a thorough physical examination and close attention to the sites of pain and swelling during the diagnostic approach. In addition, there are common clinical features in pediatric patients with these particular injuries, including male dominance, age around 9 years, fall from a height, and lateral displacement of the dislocated radial head. Awareness of these characteristics will help physicians avoid missed injuries and achieve satisfactory patient outcomes.

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