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## International Journal of Surgery Case Reports

journal homepage: [www.casereports.com](http://www.casereports.com)

# A Monteggia variant associated with unusual fracture of radial head in a young child: A case report

Yousef Alrashidi <sup>a,b,\*</sup><sup>a</sup> College of Medicine, Taibah University, Al-Madinah Al-Munawwarah, Saudi Arabia<sup>b</sup> Department of Orthopedics, King Fahad Hospital, Al-Madinah, Saudi Arabia

## ARTICLE INFO

## Article history:

Received 27 October 2020

Received in revised form

27 November 2020

Accepted 29 November 2020

Available online 2 December 2020

## Keywords:

Case report

Monteggia fracture

Monteggia variant

Monteggia equivalent

Radial head

Salter Harris

## ABSTRACT

**INTRODUCTION:** Monteggia fracture and its variants are not common among children but may be challenging and lead to serious complications if not treated in acute stage. The different types of associated growth plate fractures of proximal radius are not yet clearly defined in any variant classifications.

**PRESENTATION OF CASE:** A 6-year-old girl was brought to the emergency room after a fall on the left elbow. The plain radiographs showed unstable fracture of proximal ulna with a laterally displaced and comminuted radial head fracture. The patient was treated surgically as a case of a Monteggia variant. The case has been re-evaluated twenty months following the surgery and did not show any radiological signs of growth disturbance nor residual deformity.

**DISCUSSION:** The presented Monteggia variant is rare in terms of associated unique intra-articular fracture of proximal radius. The successful management of the case is based on adhering to the principles of treatment of Monteggia fractures.

**CONCLUSION:** Early recognition of unusual Monteggia variant patterns is crucial to avoid delay in treatment. Adherence to the principles of surgical management in unstable variants is encouraged.

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## 1. Introduction

Monteggia fracture is a combination of fracture of proximal ulnar shaft associated with radial head dislocation (proximal radio-ulnar joint subluxation or dislocation). Such an injury is not common among children but may be challenging and lead to serious complications if not treated in acute stage. The original Bado's classification of this injury depends upon the direction of radial head dislocation and ulnar fracture apex. Over time, variant types have been described and subclassified [1]. It has been suggested that in skeletally immature patients, radial head dislocation can be substituted by fracture through the growth plate. Few studies reported variants accompanied by growth plate injury of proximal radius, mainly of Salter-Harris (SH) type I and II [2–7]. Therefore, different types of growth plate fractures are not yet clearly defined in any variant classifications [8]. In this paper, a rare Monteggia variant associated with unusual radial head fracture is presented. The case was managed in the main public hospital of the city. This case has been reported in line with the SCARE criteria [9].

## 2. Case report

A 6-year-old girl had a fall on the left elbow while playing in the school. She was brought to the hospital by an ambulance. At the emergency room, the patient was fully conscious and has normal vital signs. The patient has unremarkable medical and family history. On local limb examination, the elbow was swollen, no open wounds, and the distal neurovascular status was normal. No tenderness over distal forearm, hand, or shoulder. Plain radiographs showed comminuted meta-diaphyseal fracture (unstable) of proximal ulna with a laterally displaced and comminuted fracture of radial head. It was not easy to differentiate the epiphysis from metaphyseal fracture fragments on anteroposterior view, but the displacement of radial head epiphysis was more obvious on the lateral and oblique views (Fig. 1). The diagnosis was established as “unstable Monteggia variant”. The limb was immobilized on a posterior slab. A decision was made for surgical treatment. An informed consent for surgery was obtained from the patient's guardian. The necessity of intra-operative arthrogram was anticipated if closed reduction of radial head is not successful.

The patient received an intravenous antibiotic prophylaxis 30 min prior to surgery. The procedure was performed by an orthopedic consultant (the author). After induction of general anaesthesia, the patient was kept on supine position with the arm on an arm table. Prepping and draping was done. The ulnar fracture was approached through posterior incision. The ulnar fracture was reduced, and the ulnar length was restored. A small semi-tubular

\* Correspondence to: College of Medicine, Taibah University, P.O. Box 30001, Al-Madinah 41411, Saudi Arabia.

E-mail address: [yrashidi@taibahu.edu.sa](mailto:yrashidi@taibahu.edu.sa)

<https://doi.org/10.1016/j.ijscr.2020.11.142>

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**Fig. 1.** Initial radiographs of left elbow, which show comminuted fracture of ulna at meta-diaphyseal junction and another comminuted fracture of proximal radius with a lateral displacement of proximal radial epiphysis. **A:** Anteroposterior (AP) view. **B:** oblique view. **C:** lateral view.

plate was used for fracture fixation. Under fluoroscopy guidance, an attempt of gentle closed manipulation of radial head fracture with assistance of a Kirschner wire (K-wire) as a joystick was successful. Percutaneous K-wires were used for the fixation. The alignment of the radial head fracture was confirmed by fluoroscopy. Note that the alignment of ulna and smoothness of the metaphyseal margin was restored in the shown fluoroscopic picture (Fig. 2a). The sur-



**Fig. 2.** Postoperative radiographic pictures of left elbow, which show restoration of the alignment and length of ulna and smoothness of the metaphyseal margin. Cast shadow is observed on the lateral view **A:** Anteroposterior (AP) view (fluoroscopic). **B:** Lateral view.

gical incision was closed in layer. The limb was immobilized on a posterior slab. An immediate postoperative plain radiograph is shown in Fig. 2b. The patient tolerated the procedure. The patient had no signs of posterior interosseous nerve injury following the surgery. The postoperative course was uneventful. The skin sutures

were removed after 10 days and no signs of infection reported. The K-wires have been removed at the 5th week follow-up visit. The patient has been followed for twenty months. The last follow-up radiographs are shown in Fig. 3. The patient has no pain at the last follow-up visit, nor residual deformity (Fig. 4). The treatment approach was highly appreciated by the patient and her family.

### 3. Discussion

Few studies in English literature, mainly case reports, described Monteggia variants involving growth plate injury of the proximal radius, mostly SH types I and II [2–5,7,8]. Reina et al. reported a variant associated with SH type I injury and anterior radial head dislocation, which was treated by an open reduction and fixation of both ulnar and radial fractures [8]. In study by Shaan et al., closed reduction and pinning was successful in treatment of a variant in association with a separation of the physis through SH type I injury without radial head dislocation [2]. ElKhouly et al. reported another variant in association with SH type II injury of proximal radius without head dislocation, which was treated by nailing of the ulnar fracture followed by closed reduction of proximal radial fracture [7]. Younus et al. illustrated another variant accompanied by a fracture dislocation of radial head with SH type II injury. Closed reduction was not successful in the latter case and eventually open reduction was necessary [4]. Clark et al. described the management of an open forearm injury with a Monteggia variant in a 5-year-old child with non-ossified radial head. The radial head fracture dislocation could not be reduced by closed means and there was an intra-operative difficulty to visualize the radial head even with help of arthrogram. Such an issue necessitated to awaken the patient to do a Computerized Tomography scan and had the patient back to the operating room for open reduction of the radial head. In the latter case, the radial head and neck were found to be comminuted [6]. In the case in hand, the radial head fracture has an intra-articular element, and appeared to be comminuted on available plain radiographs. A summary of published case reports of Monteggia variants involving proximal radial growth plate are illustrated in Table 1.

Per original Bado's classification, the case presented here does not fit for true Monteggia type III in which the radial head is dislocated laterally or anterolaterally in association with ulnar metaphyseal fracture [10]. Bado's classification has been modified since its original publication to include more fracture variants. Type I variants have been subclassified into: "isolated anterior radial head dislocation, ulnar fracture with radial neck fracture, isolated radial neck fracture, and ulno-humeral dislocation with or without fracture of proximal radius". Type II variant is represented by posterior dislocation of radial head accompanied by proximal radial epiphyseal or radial neck fracture. Type III and IV variant have been described to contain distal humeral fractures with proximal forearm fractures [1]. In author's opinion, the case discussed in this paper is difficult to fit to a specific Bado's modified classification per the latest Rockwood and Wilkins' book [1].

The SH types were not clearly defined in Bado's modified classification. In a retrospective review of 111 pediatric Monteggia cases, Cepelik et al. found that the proximal physeal separation through a SH type II was the most typical among variants in their study; while the most dominant pattern of ulnar fracture was olecranon fracture [5]. The case discussed here may represent an associated type IV SH injury of proximal radius.

In a study by Olney and Menelaus, 102 pediatric patients with acute Monteggia fractures were reviewed and found that type I equivalent lesions were the third most common lesion after true type I and true type III. The latter study indicated that Monteggia variants may be more common than what was believed in the past [11–13]. In a retrospective study by Pesl and Havranek, it has been proposed to classify pediatric Monteggia fractures according to the



**Fig. 3.** Radiographs of left elbow at 20-month-followup-visit, which show healed fractures of ulna and radius. The radio-capitellar joint congruence is maintained. No signs of growth disturbance. **A:** Anteroposterior (AP) view. **B:** Lateral view.

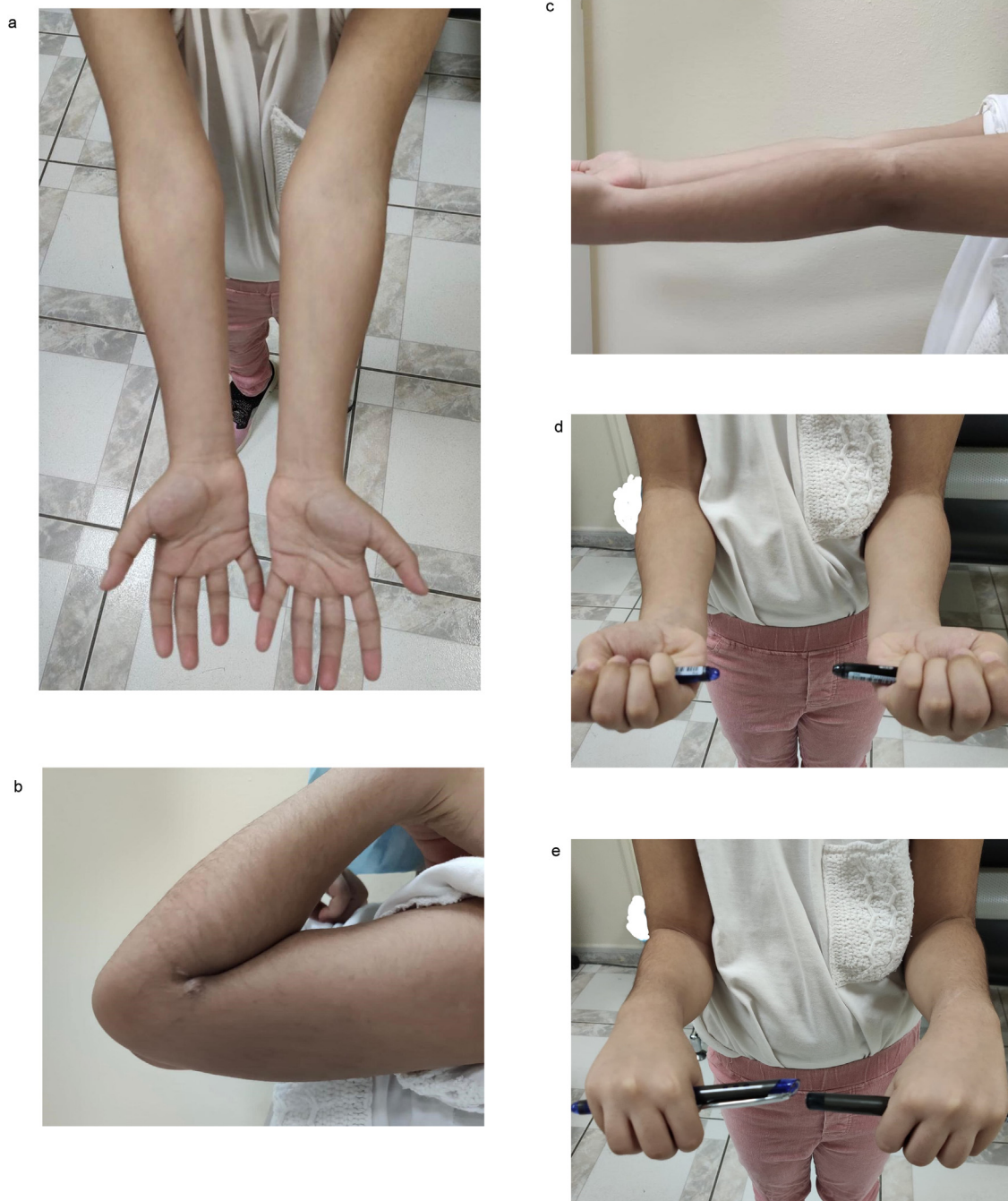
**Table 1**

A summary of published case reports which described pediatric Monteggia variants involving growth plate of proximal radius.

Study, year	Age of patient	Mechanism of injury	Ulnar fracture	Proximal radius fracture	Pattern of growth plate injury	Treatment	Follow-up duration	Reported outcome
Reina et al. [8], 2012	13 years	Car accident	Diaphyseal (Proximal third)	Associated radial head dislocation	SH type I	Open reduction and internal fixation (plating of ulna and pinning of radius)	4 years	Excellent based on “Oxford Elbow Score (47/48) or the Broberg and Morrey functional index”. Minimal supination limitation Full ROM of elbow
Shaan et al. [2], 2017	12 years	Fall	Diaphyseal (Proximal third)	Anterolaterally displaced	SH type I	Closed reduction and pinning of both ulna and radius	5 months	Minimal limitation of flexion and extension
Clark et al. [6], 2017	5 years	Fall from height	Diaphyseal	Associated head fracture dislocation	Comminuted radial head and neck fractures	Closed reduction and pinning of ulna. Open reduction and pinning of radial head	4 weeks	Normal ROM of elbow and forearm
Jangir [3], 2017	12 years	Fall from height	Olecranon	Associated radial head dislocation	SH type I	Open reduction and internal fixation (pinning of radial physis and tension band of olecranon)	6 months	Normal ROM of elbow and forearm
ElKhouly et al. [7], 2018	10 years	Fall	Diaphyseal (Proximal third)	Anteriorly displaced	SH type II	Nailing of ulnar fracture and closed reduction of proximal radius fracture	3 months	Normal ROM of elbow and forearm
Younus et al. [4], 2019	9 years	Fall	Proximal metaphyseal	Associated radial head dislocation	SH type II	Open reduction and fixation. Additional cerclage wire for ulnar fracture	3 months	Normal ROM of elbow and forearm
The present case	6 years	Fall	Comminuted proximal meta-diaphyseal (unstable)	Laterally displaced and comminuted fracture of radial head with metaphyseal extension	? SH Type IV	Open reduction of ulna. Closed reduction and pinning of radial head	20 months	Normal ROM of elbow and forearm

Abbreviations: SH: Salter Harris injury; ROM: range of motion.





**Fig. 4.** Clinical illustration of both elbow joints at 20-month-followup-visit, which demonstrates nearly normal carrying angle of left elbow in comparison to the other side. The range of motion was fully regained. **A:** Carrying angle. **B:** Flexion. **C:** Extension. **D:** Supination. **E:** Pronation.

stability rather than anatomical aspects to guide the best treatment approach [14]. In the management of unstable Monteggia injuries, the ulnar length and alignment should be restored first to keep congruence of proximal radio-ulnar joint and counteract deforming forces [15]. The radial head fracture and/or dislocation can be tackled initially by closed maneuvers such as Israeli’s technique, Métaizeau’s technique or K-wire joystick technique. The latter technique was utilized in the presented case to successfully reduce the radial head fracture.

**4. Conclusion**

The case demonstrated a successful surgical treatment of a rare Monteggia variant. Early recognition of unusual Monteggia variant

patterns is crucial to avoid delay in treatment. Adherence to the principles of surgical management in unstable variants is encouraged.

**Declaration of Competing Interest**

Nothing to declare.

**Funding**

None.

**Ethical approval**

Ethical approval is not necessary for case reports in our locality.

**Consent**

Written informed consent was obtained from the patient's guardian for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

**Author contribution**

YA: Study concept, writing the manuscript and critical review of final draft (Guarantor).

**Registration of research studies**

Not applicable.

**Guarantor**

Yousef Alrashidi.

**Provenance and peer review**

Not commissioned, externally peer-reviewed.

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