

Case Report

A novel variant of type-II Monteggia equivalent in an adult: A case report with a 6-year follow-up

Zackariya Mohamed^{a,*}, Owais Ahmed^a, Devendra Agraharam^a,
Jafri Sayyadshadab Shahidali^a, Muthukumar Soundararajan^a,
Dheenadhyalan Jayaramaraju^a, Shanmuganathan Rajasekaran^b

^a Department of Orthopaedics and Trauma Surgery, Ganga Medical Center & Hospital, Coimbatore, India

^b Department of Orthopaedics and Spine Surgery, Ganga Medical Center & Hospital, Coimbatore, India

ARTICLE INFO

Keywords:

Monteggia fracture dislocation
Capitellum fracture
Type 2 Monteggia fracture
Monteggia equivalent
Monteggia variant
Elbow injury

ABSTRACT

Case: An 18-year-old right-handed male student presented after a road-traffic-accident; he had type-II Monteggia fracture dislocation associated with ipsilateral type-I capitellum fracture and comminuted lateral condyle avulsion fracture. He underwent open reduction and fixation of ulna with 3.5 DCP with autologous olecranon bone grafting and fixation of capitellum using Herbert screw along with lateral collateral ligament (LCL) repair using fiber wire. At 6-years follow-up good outcome was seen without functional restrictions despite 15 degrees of restriction in pronation.

Conclusion: Monteggia type-II variant with type-I capitellum fracture and LCL avulsion is a unique combination that represents a novel variant of type-II Monteggia equivalent, which adds to the existing classification of Monteggia equivalents.

Introduction

A Monteggia fracture is a fracture of the ulna with ligamentous failure of the proximal radius and dislocation of the radial head [1–3]. Monteggia fracture-dislocation is an extremely rare entity in adults, the incidence of which has been reported to be 1–2 % in children and even less in adults [1–4]. In 1967, Dr. Jose Luis Bado [1] published a study and described them as “true Monteggia lesions” and certain radiographic patterns as “Monteggia equivalents”. In 1991, Jupiter et al. [2,4] further classified Type II Bado into four subtypes. Since then, many variants and types of Monteggia fractures have been described in the literature. A Monteggia injury represents a fracture of the proximal ulna with associated proximal radio-ulnar joint dissociation, and generally involves a combination of bony and soft tissue structures. Early recognition, anatomical reduction, and stable internal fixation are crucial in the management of Monteggia fractures [3].

Fractures of the capitellum humeri represent a distinct subset of coronal plane articular injuries and account for only 1 % of all fractures and 6 % of fractures around the elbow [5]. Capitellum fractures are classified based on the Bryan and Morrey classification (modified by McKee) [6,7] (Table 1).

The Monteggia variant with involvement of the distal humerus is rare. A literature search revealed no previous descriptions of the

* Corresponding author at: Department of Orthopaedics and Trauma Surgery, Ganga Medical Center & Hospital Pvt LTD, 313, Mettupalayam Road, Coimbatore 641043, Tamil Nadu, India.

E-mail address: dr.mdzack@gmail.com (Z. Mohamed).

<https://doi.org/10.1016/j.tcr.2024.101061>

Accepted 4 June 2024

Available online 6 June 2024

2352-6440/© 2024 Published by Elsevier Ltd.

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

This is an open access article under the CC BY-NC-ND license

combination of Monteggia type-II with capitellar fracture. However, we report an unusual case of concomitant Bado type-II Monteggia fracture dislocation and type-I capitellum fracture in an adult who was treated with rigid internal fixation of the bony injuries. Despite the severity of the injuries, the patient had a good functional outcome.

Case report

An 18-year-old right-handed male student presented after a road traffic accident (2-wheeler vs. 4-wheeler) and was brought to our emergency room, and on arrival, his vitals were stable. He had a right foot open injury with metatarsal fractures, a closed right-sided shaft of femur fracture, and a closed right-sided Monteggia fracture (Bado type-II) with capitellum fracture (type-I Bryan and Morrey) (Fig. 1A–D). He also had comminuted lateral collateral ligament (LCL) avulsion (This was identified intra-operatively under C-arm fluoroscopy (Fig. 2B).) Initially he was taken for emergency open wound debridement in the foot and k-wire fixation for metatarsal fracture, and in the same setting, ipsilateral femur nailing was done. The right upper limb was immobilised in the above elbow slab. However, on Day 3, after admission, he was taken for management of his elbow injury.

An ulna fracture was addressed with an ulnar subcutaneous approach and was found to be highly comminuted. Small fragments that did not have any soft tissue attachments were removed, and fixation was done using an 8-holed dynamic compression plate (DCP) to ensure a minimum of six cortices of fixation. Intra-operatively, there was a void in the anterior cortex due to bone loss; hence, an ipsilateral olecranon cancellous bone graft was harvested by making a 2 × 2 cm bone window, and cancellous bone was impacted in the ulna shaft, where a bone void was noted (Figs. 1B, 2A). We noticed an LCL avulsion under fluoroscopic imaging (C-arm), which had comminution. Through the Kaplan approach, the first capitellum fracture was reduced, held with k-wire, and compression was achieved using 3.5 cortical screw and then additional fixation done with 42-mm Herbert screw. Cortical screw was removed and the avulsed LCL was then repaired using fiber wire (Figs. 2A–E, 3A, B).

Post-operatively, the elbow was immobilised for 3 weeks in an above-elbow splint. Supervised physiotherapy for the lower limb and shoulder was started. After a 3-week follow-up period, the splint was removed, and radiographs were taken that showed good fracture alignment and fixation. Clinically, the patient lacked 15 degrees of extension at the elbow and restricted pronation, for which rehabilitation and physiotherapy were started. During the 3rd month, the fracture showed signs of good union, and the patient had a full range of movements. The patient had regular follow-ups, and the final follow-up at 6 years showed good fracture consolidation, and the patient can perform all his regular activities without any restrictions (full extension, 135 degrees of flexion, 90 degrees of supination, and 15 degrees of restricted pronation) (Figs. 3C, D, and 4A–F).

Discussion

Monteggia fracture-dislocation is an uncommon injury, accounting for about 2–5 % of all forearm fractures [1–4]. Similarly, capitellum fractures are rare, accounting for 1 % of all fractures [5–7], and the combination of these two injuries makes them an exceptional occurrence. Our patient had a Bado type II Monteggia fracture dislocation with a capitellum fracture and lateral collateral ligament mid-substance tear, representing an unstable fracture pattern. This injury pattern represents a scarce Monteggia variant in adults and children that has not been described in the literature to the best of our knowledge. One of the most widely accepted theories is that Monteggia fracture dislocation is caused by direct blows and hyper-pronation injuries. However, Thompkin claimed hyper-extension of the elbow played a major role in causing this injury [8]. In our case, this kind of injury most probably occurred due to a combination of hyper-pronation, hyper-extension, axial loading, and varus forces at the elbow.

On review of the literature, we found that there is not even a single reported case of type-II Monteggia fracture-dislocation in association with an ipsilateral capitellum fracture, neither in adults nor in children. However, the literature revealed four articles reporting six cases of Monteggia fracture dislocation with ipsilateral distal humerus intercondylar fractures in adult [9–12].

We had not taken a CT scan and the comminuted LCL avulsion was noted intra-operatively under fluoroscopic imaging. Monteggia variant lesion poses a challenge even to the experienced surgeon; the outcome is dictated by the direction of dislocation, comminution, and associated injuries. Our case had comminution at ulna fracture site, for which autologous olecranon cancellous bone grafting was done. The capitellum was fixed using a Herbert screw and an LCL tear was repaired using fiber wire.

Our case represents an extension of Bado Type II equivalent where there is involvement of an ipsilateral type-I capitellum fracture and comminuted LCL avulsion. Monteggia fracture-dislocation represents complex elbow injuries that require meticulous surgical planning and fixation with early rehabilitation for desired functional recovery.

Table 1
Capitellum fracture classification given by Bryan and Morrey and further classified by McKee.

Type	Description
I	Large osseous piece of capitellum, can involve trochlea
II	Kocher-Lorenz fracture
III	Shear fracture of articular cartilage, articular cartilage separation with little subchondral bone attached.
	Broberg-Morrey fracture
IV (McKee)	Severely comminuted, multi-fragmentary
	Coronal shear fracture that includes capitellum and trochlea

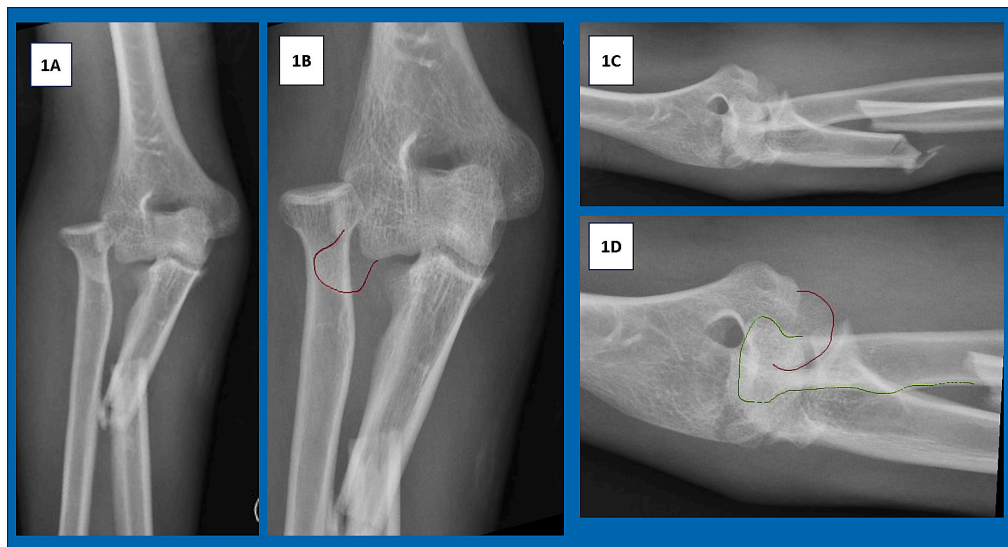


Fig. 1. Pre-operative X-ray image showing Monteggia fracture dislocation AP view and Lateral view. A and B: In AP view there is a double shadow of capitellum fragment at the level of radial neck which has been highlighted (red outline marking). Figure C and D: In lateral view radial head appears to be posterior to capitellum which has been outlined in D with red line showing capitellum and green line showing radial head.

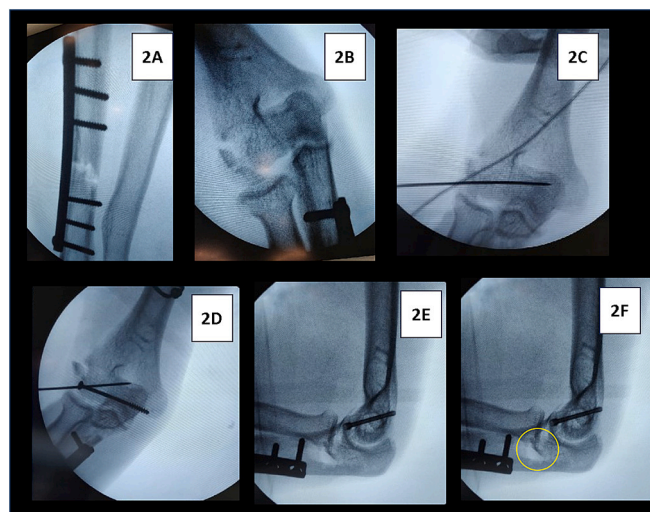


Fig. 2. Intraoperative C-arm images (A: Proximal ulna fracture with bone gap due to comminution which needed primary autologous olecranon bone grafting, B: Image showing capitellum fracture, D–E: Capitellum fixation, E: Yellow circle-representing site of olecranon bone graft window).

Conclusion

The Monteggia type II variant with type-I capitellum fracture and LCL avulsion is a unique combination that represents a novel variant of type-II Monteggia equivalent, which adds to the existing classification of Monteggia equivalents.

Funding

We, the authors declare that no source of funding, grant or support was received for the study.

CRediT authorship contribution statement

Zackariya Mohamed: Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Owais Ahmed:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Devendra**

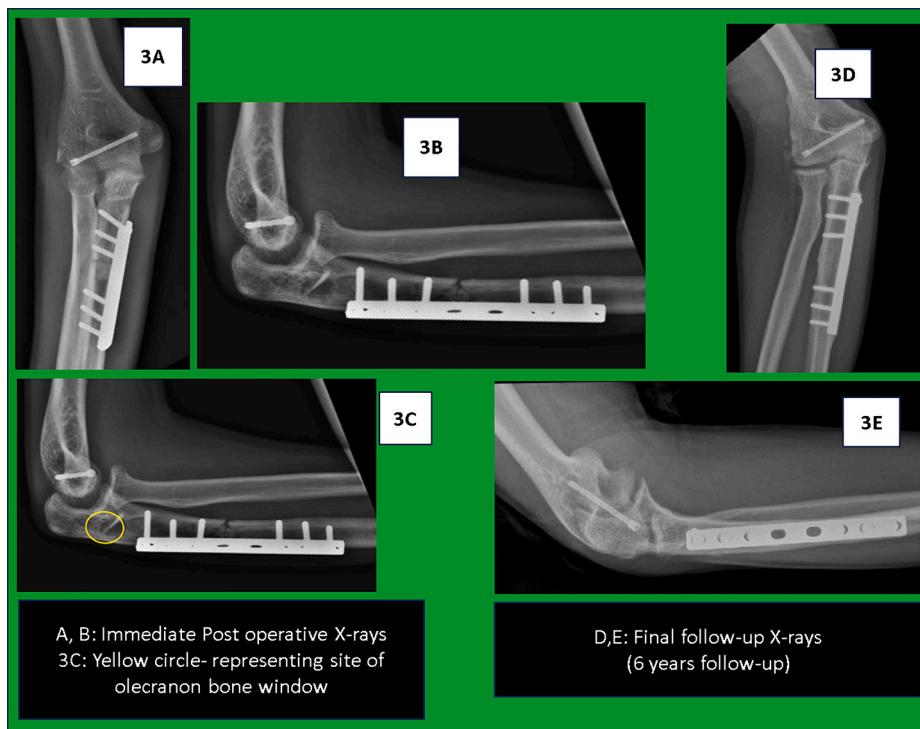


Fig. 3. Postoperative X-rays (A–C: Immediate postoperative x-rays showing fixation of proximal ulna with dynamic compression plate and autologous olecranon cancellous bone graft and Herbert screw fixation for capitellum, D, E: 6 years follow-up X-rays, yellow circle-representing site of olecranon bone graft window).

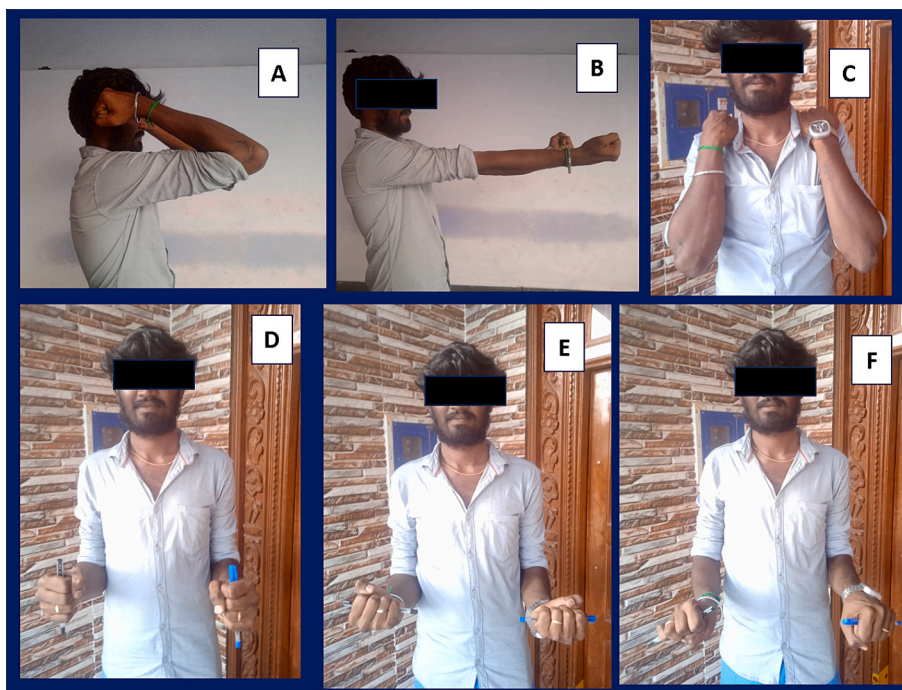


Fig. 4. Clinical images of patient at 6 years postoperative period (A–F: Demonstrating range of movements at elbow joint at final follow-up). Patient able to perform all his routine activities even though there is 15 degrees of restriction in pronation.

Agraharam: Writing – review & editing. **Jafri Sayyadshadab Shahidali:** Formal analysis. **Muthukumar Soundararajan:** Validation, Supervision. **Dheenadhyalan Jayaramaraju:** Validation, Supervision. **Shanmuganathan Rajasekaran:** Writing – review & editing, Validation.

Declaration of competing interest

All authors have no conflicts of interest.

References

- [1] J.L. Bado, The Monteggia lesion, *Clin. Orthop.* 50 (1967) 71–86.
- [2] D. Ring, J.B. Jupiter, N.S. Simpson, Monteggia fractures in adults, *J Bone Jt Surg* 80 (1998) 1733–1744, <https://doi.org/10.2106/00004623-199812000-00003>.
- [3] D. Ring, J.B. Jupiter, P.M. Waters, Monteggia fractures in children and adults, *J. Am. Acad. Orthop. Surg.* 6 (1998) 215–224, <https://doi.org/10.5435/00124635-199807000-00003>.
- [4] J.B. Jupiter, S.J. Leibovic, W. Ribbans, R.M. Wilk, The posterior monteggia lesion: *J Orthop Trauma* 5 (1991) 395–402, <https://doi.org/10.1097/00005131-199112000-00003>.
- [5] M.D. McKee, J.B. Jupiter, H.B. Bamberger, Coronal shear fractures of the distal end of the humerus, *J Bone Jt Surg* 78 (1996) 49–54, <https://doi.org/10.2106/00004623-199601000-00007>.
- [6] H. Mehdian, M.D. McKee, Fractures of capitellum and trochlea, *Orthop. Clin. North Am.* 31 (2000) 115–127, [https://doi.org/10.1016/S0030-5898\(05\)70132-2](https://doi.org/10.1016/S0030-5898(05)70132-2).
- [7] V. Rausch, M. Königshausen, T.A. Schildhauer, J. Gessmann, D. Seybold, Fractures of the capitellum humeri and their associated injuries, *Oberer Extremität* 13 (2018) 33–37, <https://doi.org/10.1007/s11678-018-0441-9>.
- [8] D.G. Tompkins, The anterior Monteggia fracture: observations on etiology and treatment, *JBJS* 53 (1971) 1109.
- [9] Beredjiklian PK, Bozentka DJ, Ramsey ML. Ipsilateral intercondylar distal humerus fracture and monteggia fracture–dislocation in adults: *J. Orthop. Trauma* 2002;16:438–40. doi:<https://doi.org/10.1097/00005131-200207000-00015>.
- [10] Y. Wang, Q. Han, R. Tao, F. Sun, Ipsilateral intercondylar distal humeral fracture and Bado type II Monteggia lesion in an adult: a case report: humeral fracture and Monteggia lesion, *Orthop. Surg.* 2 (2010) 161–164, <https://doi.org/10.1111/j.1757-7861.2010.00079.x>.
- [11] A. Pankaj, R. Malhotra, S. Bhan, Monteggia fracture–dislocation with intercondylar fracture of the ipsilateral humerus: an unusual Monteggia variant, *Inj Extra* 36 (2005) 51–54, <https://doi.org/10.1016/j.injury.2004.05.035>.
- [12] S B., Ipsilateral distal humerus intercondylar fracture with radial nerve palsy and Monteggia fracture dislocation in adult. *MOJ Orthop, Rheumatol* (2017) 9, <https://doi.org/10.15406/mojor.2017.09.00368>.