

Posteromedial Dislocation of the Elbow with Lateral Condyle Fracture in Children

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Posteromedial dislocation of the elbow with lateral condyle fracture is a rare injury, and only a few cases have been reported in the literature. We report 3 children who had posteromedial dislocation of the elbow with Milch type II lateral condylar fracture of the distal humerus. Major complications included malunion, nonunion of the fracture, heterotrophic calcification and elbow subluxation. From our experience and a review of the literature, open anatomical reduction and internal fixation of the lateral condyle fracture is the mainstay of treatment for these children. Poor reduction of the lateral condyle fracture results in incongruity of the joint surface and leads to poor results. [*J Chin Med Assoc* 2009; 72(2):103–107]

Key Words: children, elbow dislocation, lateral condyle fracture

Introduction

Posteromedial dislocation of the elbow associated with lateral condylar fracture of the humerus is a rare injury in children. There are only a few cases reported in the English language literature (Table 1).^{1–15} The typical roentgenograms of this type of injury show that the elbow joint is dislocated posteromedially while the fractured lateral condyle is aligned with the radial head. Here, we present 3 children with posteromedial dislocation of the elbow associated with a Milch type II fracture¹⁶ of the lateral condyle. The injury patterns, the treatments they received, and their clinical outcomes are reported, and the relevant literature is reviewed.

Case Reports

Case 1

A 9-year-old boy fell from his bicycle onto his left outstretched hand (Figures 1A and 1B). Emergent treatment was given under general anesthesia. The elbow dislocation was reduced, but the lateral condyle was

still displaced and the joint revealed instability to varus and valgus stress. Through a lateral approach, the lateral humeral condyle was anatomically reduced and fixed with three 1.6-mm smooth Kirschner wires (K-wires) (Figure 1C). A long arm cast was applied. At 4 weeks postoperatively, the long arm cast and pins were removed. Final follow-up at 36 months revealed good functional and radiologic results (Figures 1D and 1E). The elbow performance score (EPS)¹⁷ was 100 points and graded as excellent (Table 2).

Case 2

A 4-year-8-month-old girl sustained a fall injury from a slide (Figures 2A and 2B). She received open reduction through a lateral incision at another hospital immediately. Two K-wires were used to fix the lateral condyle fracture, but the fracture was not adequately reduced. The postoperative immobilization period was 4 weeks (Figure 2C). We saw her 4 months after the injury. At latest follow-up 28 months postoperatively, malunion, heterotopic ossification and poor range of motion (ROM) of 10–75° were noted (Figures 2D and 2E). EPS was 65 points and graded as fair (Table 2).



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Table 1. Articles on children's elbow dislocation with lateral condyle fracture

Author(s)	Year of publication	Cases (n)	Age (yr)/sex/side	Mechanism of injury	Treatment	Results	Comments
McLearie & Merson ¹	1954	1	-	-	CR	-	1 case in 23 lateral condyle fractures
Wheeler & Linscheid ²	1967	1	12/M/-	-	CR	-	1 case in 37 fracture dislocations of the elbow with delayed diagnosis
Roberts ³	1969	1	12/M/L	-	ORIF	Good	1 case in 60 elbow dislocations
Pollen ⁴	1973	1	13/M/-	Fall	-	-	Open reduction is necessary due to difficult to reduce and maintain
Morrey ⁵	1985	1	-	-	-	-	The radial head maintains its relationship with the displaced capitellum
Hendel et al ⁶	1985	1	14/F/R	Fall from horse	CR + excised lateral condyle	Excellent	Milch type I
Badelon et al ⁷	1988	2	-	-	-	-	2 cases in 47 lateral condyle fractures
Tachdjian ⁸	1990	1	-	-	-	-	Lateral condyle fracture extends medially, the elbow may be unstable and dislocate
van Haaren et al ⁹	1994	1	6/F/L	Fall from monkey bars	CR + ORIF	Good	Oblique, heterolateral and varus stress films or even arthrogram to aid in diagnosis
Rovinsky et al ¹⁰	1999	1	12/M/R	Fall while playing soccer	CR + ORIF	Good	Posterior dislocation with a Milch type I lateral condyle fracture, elbow is unstable after CR
Murnaghan et al ¹¹	2002	3	8/M/R 6/M/R 9/M/R	Fall from height of 10 feet Fall from bicycle Fall out of tree	CR + ORIF CR + CRIF CR + ORIF	Good Good Excellent	Recommend stability assessment in all dislocated elbows under general anesthesia to R/O Milch I fracture of the lateral condyle in children
Pouliart & De Boeck ¹²	2002	1	15/F/-	Fall from horse	CR + ORIF	Excellent	Milch type I
Kirkos et al ¹³	2003	4	11/M/R 6/M/R 12/M/R 9/M/R	Fall from a height Fall from a height Fall from a roll bar Fall from bicycle	CR + ORIF CR + ORIF CR + ORIF CR + ORIF	Excellent Excellent Good Excellent	Reduction of the elbow by closed method and stabilization of the lateral condyle fracture by open anatomic reduction are appropriate treatment
Rasool ¹⁴	2004	4	-	-	CRIF	-	4 cases in 33 elbow dislocations; 1 has complication with radial nerve injury
Eksioglu et al ¹⁵	2008	1	5/M/L	Fall from a wall	CR + ORIF	Excellent	
Present study	2009	3	9/M/R 5/F/L	Fall from bicycle Fall from slide	CR + ORIF CR + ORIF	Excellent Poor	Malunion, heterotopic ossification, medial subluxed elbow
			10/M/R	Fall with folded arm under body	CR + CRIF	Poor	Nonunion, elbow subluxed and cubitus varus deformity

CR = closed reduction of elbow dislocation; ORIF = open reduction of lateral condyle fracture, internal fixation with Kirschner wires; CRIF = closed reduction of lateral condyle fracture, percutaneous fixation with Kirschner wires; M = male; F = female; L = left; R = right.

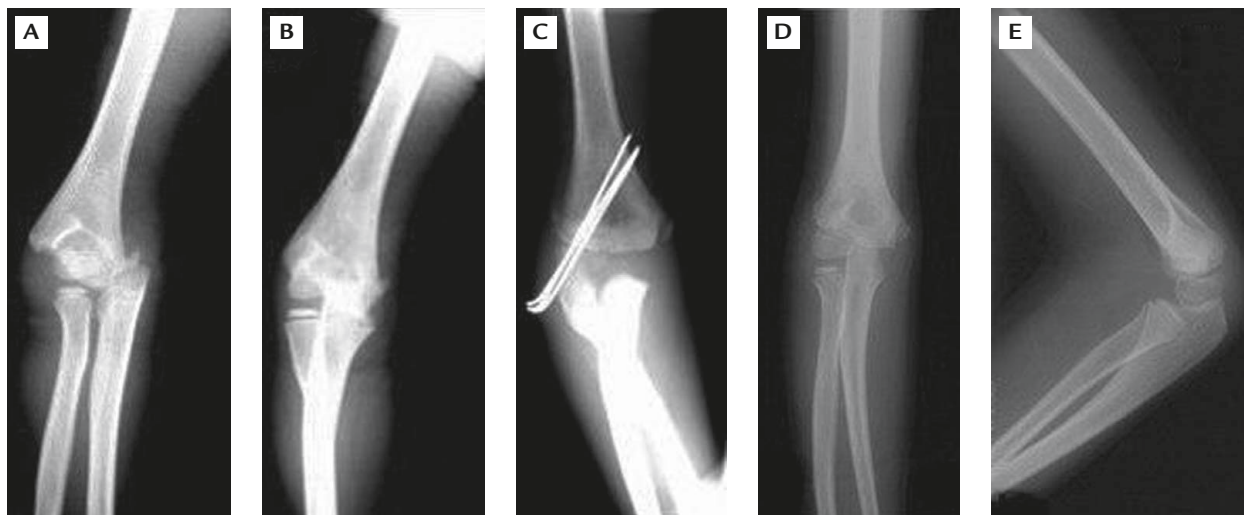


Figure 1. Case 1: (A, B) preoperative X-rays; (C) postoperative X-ray; (D, E) X-rays at 36 months' follow-up showed good reduction and good union, and normal elbow development was noted.

Table 2. Clinical summary and results

Age	Sex	Involved side	Mechanism of injury	Treatment	Follow-up (mo)	Elbow ROM (°)	EPS ²	Radiograms
9 yr	Male	Left	Fall from bicycle onto outstretched left hand	CR + ORIF + cast fixation	36	0–135	100 (excellent)	Fragmentation over medial condyle
4 yr 8 mo	Female	Left	Fall from a slide	CR + ORIF + splint fixation	28	10–75	65 (fair)	Malunion, heterotopic ossification, shallow and deformation of olecranon fossa, medial subluxation of elbow
9 yr 10 mo	Male	Right	Fall, with right arm folded under his body	CR + CRIF + splint fixation	24	10–70	65 (fair)	Nonunion of lateral condyle, medial subluxation of elbow

ROM = range of motion; EPS = elbow performance score; CR = closed reduction of elbow dislocation; ORIF = open reduction of lateral condyle fracture, internal fixation with Kirschner wires; CRIF = closed reduction of lateral condyle fracture, percutaneous fixation with Kirschner wires.

Case 3

A 9-year-10-month-old boy fell and landed on his back with his right arm folded under his body (Figures 3A and 3B). Both dislocation and lateral condyle fracture were treated by a closed method at another hospital immediately. Reviewing the X-ray films, the lateral condyle fracture was fixed with 2 percutaneous K-wires (Figure 3C), followed by 6 weeks of long arm cast. We saw the patient 4 months post injury. At 24 months after the injury, his elbow was stiff (ROM, 10–70°) and cubitus varus deformity was evident (Figures 3D and 3E). EPS was 65 points and graded as fair functional result (Table 2).

Discussion

The elbow is the most commonly dislocated joint in children, usually associated with avulsed medial epicondyle fracture.¹⁸ The dislocations are often posterior or posterolateral in direction. Lateral condyle fractures are common in children,^{19,20} but dislocation of the elbow with lateral condyle fracture is very rare.^{5,8,9,13} Such cases are characteristically dislocated in posteromedial position.

The mechanism of this injury is a direct fall on an outstretched hand⁵ while a direct adducting force is exerted on the partially flexed elbow. These injuries

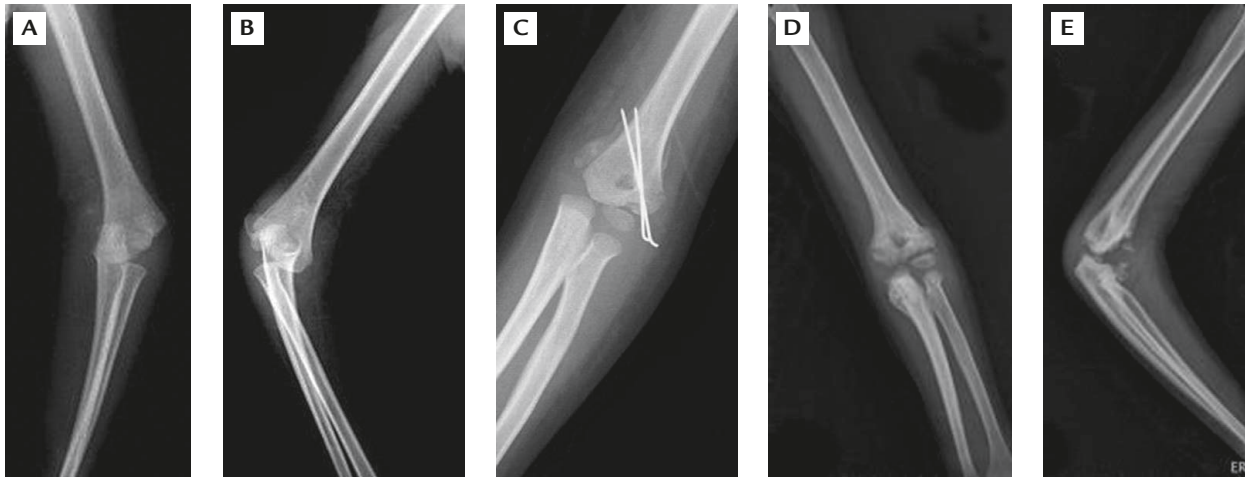


Figure 2. Case 2: (A, B) preoperative X-rays; (C) X-ray 4 weeks after operation; (D, E) X-rays at 28 months' follow-up showed poor reduction of the lateral condyle with malunion, and heterotopic calcification around the elbow joint.

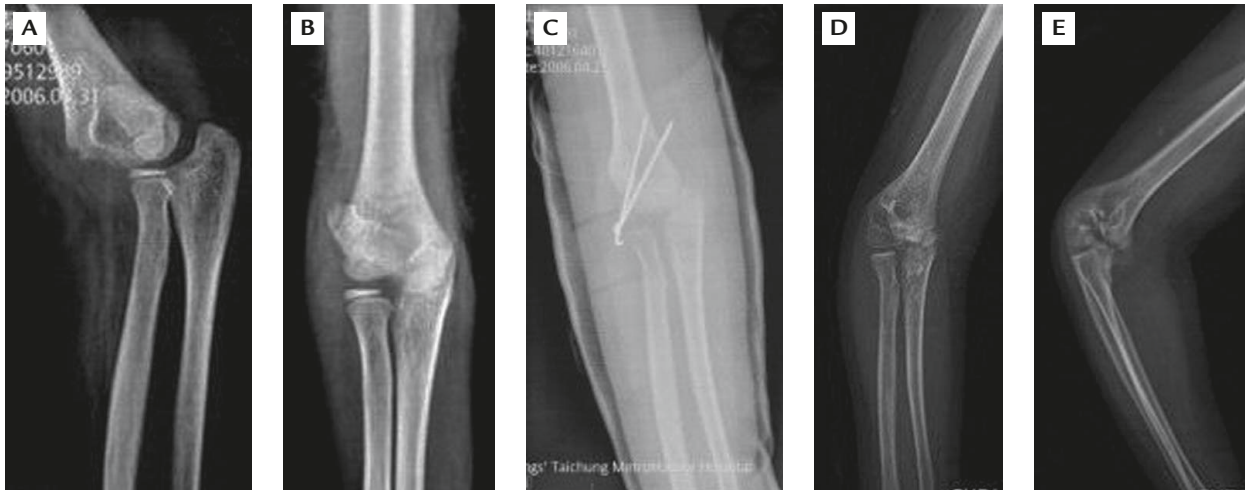


Figure 3. Case 3: (A, B) preoperative X-rays; (C) X-ray in cast after operation showed malreduction of the lateral condyle; (D, E) X-rays at 24 months' follow-up showed malunion and cubitus varus deformity.

usually present as a clinical dislocation. If the elbow is manipulated before radiographic imaging, the fracture line can be difficult to see on the post-reduction films. Physical examination, oblique, heterolateral and varus stress films or even elbow stability assessment or arthrogram under general anesthesia are recommended to aid in diagnosis.⁹

According to the Milch classification, Milch type II injuries that traverse the trochlear groove are significantly more common than Milch type I.¹⁰ In our 3 cases, Milch type II lateral condyle fractures displaced completely from the distal humerus and still aligned with the radial head. They are unstable injuries. The elbow joint in Milch type I lateral condyle fracture is thought to be stable because the lateral trochlear rim is preserved. The intact capitellotrochlear groove serves

as a lateral buttress for the coronoid-olecranon ridge of the ulna. However, Rovinsky et al¹⁰ and Murnaghan et al,¹¹ reporting Milch type I lateral condyle fracture associated with elbow dislocation, found that the elbows were unstable after closed reduction. Prompt open reduction and internal fixation of the lateral condyle fragment stabilized the elbow. Recognition of this injury and prompt treatment is essential to ensure a good result.

Pouliart and De Boeck¹² reported a rare posteromedial dislocation of the elbow with associated intraarticular entrapment of the lateral epicondyle in a 15-year-old girl. They recommended removing possible osteochondral fragments and restoring the bony anatomy for stability.

From our experience and a review of the literature, in cases of posteromedial dislocation of the elbow with

lateral condyle fracture in children, prompt closed reduction of the dislocation could be performed without difficulty, except if there is intraarticular entrapment of the lateral epicondyle. Through a standard lateral approach, anatomical reduction and internal fixation is the mainstay of treatment for the displaced lateral condyle fracture,¹³ either Milch type I or II. After this procedure, joint congruency is restored and the elbow stabilized. In Case 2, the lateral condyle and medial epicondyle fractures were not well reduced despite open surgery having been performed. Because of the medial subluxation of the elbow joint due to malunion and joint incongruity, her functional result was poor. In Case 3, the lateral condyle fracture was treated by a closed method, with failed anatomic reduction. Follow-up roentgenogram showed nonunion of the elbow joint. The functional result was also poor. Failed reduction of the lateral condyle fracture by either open or closed methods resulted in malunion or nonunion of the fracture. Furthermore, subluxation of the elbow joint due to joint incongruence will result in poor functional outcome. The immediate postoperative radiographic study might not offer a satisfactory recognition of anatomic reduction due to plaster immobilization, and multidetector computed tomography²¹ could provide rapid accurate detections of the fracture displacement and articular or epiphyseal cartilage in children.

In conclusion, elbow dislocation with concomitant lateral condylar fracture in children is a rare injury. Based on our own experience and a literature review, we recommend reduction of the elbow by a closed method and stabilization of the lateral condyle fracture by open reduction. Appropriate treatment will achieve a better outcome and result in fewer complications. Open reduction with direct visualization of the fracture could achieve an anatomic reduction, while poor reduction, by either open or closed method, resulted in malunion or nonunion of the fracture. If the elbow is subluxated and the joint is incongruent, a poor functional result is unavoidable.

References

- McLearie M, Merson RD. Injuries to the lateral condyle epiphysis of the humerus in children. *J Bone Joint Surg* 1954;36:84-9.
- Wheeler DK, Linscheid RL. Fracture-dislocation of the elbow. *Clin Orthop* 1967;50:95-106.
- Roberts PH. Dislocation of the elbow. *Br J Surg* 1969;56:806-15.
- Pollen AG. *Fracture and Dislocation in Children*. Baltimore: William & Willkins, 1973:42-4.
- Morrey BF. *Conditions Affecting the Child's Elbow: The Elbow and its Disorders*. Philadelphia, PA: WB Saunders, 1985:276-80, 323-4.
- Hendel D, Aghasi M, Hslperin N. Unusual fracture dislocation of the elbow joint. *Arch Orthop Trauma Surg* 1985;104:187-8.
- Badelon O, Bensahel H, Mazda K, Vie P. Lateral humeral condylar fractures in children: a report of 47 cases. *J Pediatr Orthop* 1988;8:31-4.
- Tachdjian MO. *Fractures and Dislocations: Pediatric Orthopedics*, 2nd edition. Philadelphia, PA: WB Saunders, 1990:3124-31.
- van Haaren ER, van Vugt AB, Bode PJ. Posterolateral dislocation of the elbow with concomitant fracture of the lateral humeral condyle: case report. *J Trauma* 1994;36:288-90.
- Rovinsky D, Ferguson C, Younis A, Otsuka NY. Pediatric elbow dislocation associated with a Milch type I lateral condyle fracture of the humerus. *J Orthop Trauma* 1999;13:458-60.
- Murnaghan JM, Thompson NS, Taylor TC, Cosgrove AP, Ballard J. Fracture lateral epicondyle with associated elbow dislocation. *Int J Clin Pract* 2002;56:475-7.
- Pouliart N, De Boeck H. Posteromedial dislocation of the elbow with associated intraarticular entrapment of the lateral epicondyle. *J Orthop Trauma* 2002;16:53-6.
- Kirkos JM, Beslikas TA, Papavasiliou VA. Posteromedial dislocation of the elbow with lateral condyle fracture in children. *Clin Orthop* 2003;408:232-6.
- Rasool MN. Dislocation of the elbow in children. *J Bone Joint Surg* 2004;86:1050-8.
- Eksioglu B, Uslu M, Gudemez E, Cetik O. Medial elbow dislocation associated with a fracture of the lateral humeral condyle in a child. *Orthopedics* 2008;31:93-7.
- Milch H. Fractures and fracture dislocations of the humeral condyles. *J Trauma* 1964;4:592-607.
- Kim HT, Park BG, Suh JT, Yoo CT. Chronic radial head dislocation in children. Part 2: results of open treatment and factors affecting final outcome. *J Pediatr Orthop* 2002;22:591-7.
- Wilkins KE. Fractures and dislocations of the elbow region. In: Rockwood CA, Wilkins KE, King RE, eds. *Fractures in Children*. Philadelphia, PA: Lippincott Williams & Wilkins, 1996:618-54.
- Flynn JC, Richards JF, Saltzman RI. Prevention and treatment of non-union of slightly displaced fractures of the lateral humeral condyle in children: an end-result study. *J Bone Joint Surg* 1975;57:1087-92.
- Jakob R, Fowles JV, Rang M, Kassab MT. Observations concerning fractures of the lateral humeral condyle in children. *J Bone Joint Surg* 1975;57:430-6.
- Chapman VM, Grottkau BE, Albright M, Salamipour H, Jaramillo D. Multidetector computed tomography of pediatric lateral condylar fractures. *J Comput Assist Tomogr* 2005;29:842-6.