

Case Report

Posteromedial dislocation of the elbow with lateral condyle fracture: The fractured lateral condyle adheres to the radial head

Pen-Gang Cheng^a, Chang-Chin Chen^a, Shyi-Kuen Wu^b, Matthew N. Wang^{a,b,*}^a Department of Orthopedic Surgery, Kuang-Tien General Hospital, Taichung, Taiwan^b Department of Physical Therapy, Hung Kuang University, Taichung, Taiwan

ARTICLE INFO

Article history:

Received 31 August 2011

Received in revised form

7 November 2011

Accepted 30 January 2012

Available online 11 May 2012

Keywords:

children

elbow dislocation

lateral condyle fracture

ABSTRACT

Posteromedial dislocation of elbow with lateral condyle fracture is a rare with only a few reported cases. This study describes two children who presented with posteromedial dislocation of elbow with lateral condylar fracture of the distal humerus in which the fractured lateral condyle adhered to the radial head through the intact posterior capsule and lateral collateral ligament. These cases demonstrate the mechanism of this type of injury: during a direct fall onto an outstretched hand, varus force is exerted, resulting in an avulsed lateral condyle while the radial head maintains its relationship with the displaced capitellum through the intact posterior capsule and lateral collateral ligament.

Copyright © 2012, Taiwan Orthopaedic Association. Published by Elsevier Taiwan LLC. All rights reserved.

1. Introduction

Posteromedial dislocation of the elbow in association with lateral condylar fracture of the humerus is a rare injury in children. Roentgenograms of this type of injury typically reveal that the elbow joint is dissociated from the joint and that the fractured lateral condyle, which aligns with the radial head, is posteromedially displaced so that the radiocapitellar joint remains radiographically aligned. Only a few cases have been reported in the literature.^{1–6} Here, we report the surgical findings of two children with posteromedial dislocation of the elbow in association with Milch type II fracture⁷ of the lateral condyle. The mechanism of this injury is discussed in light of the reported observations in these two cases.

2. Case reports

2.1. Case 1

A 9-year, 8-month-old boy fell from a bicycle with his right arm outstretched. Roentgenograms were taken and revealed a lateral condylar fracture with concomitant posteromedial dislocation of

the elbow, but the lateral condyle did align with the radial head (Fig. 1A,B). He underwent closed reduction of the dislocated elbow and open reduction and immediate internal fixation of the lateral condyle fracture using three 1.6-mm Kirschner wires (K-wires) (Fig. 1C). At surgery, the radiocapitellar joint remained intact along with the posterior capsule and lateral collateral ligament; the periosteum was completely torn and repaired. The posterior capsule and lateral collateral ligament were attached to the radial head and lateral condyle (Fig. 1D). The lateral condyle fragment was not free to move because the posterior capsule was intact with a solid link between the radial head and lateral condyle. The lateral humeral condyle was anatomically reduced and fixed using three 1.6-mm K-wires. A long arm cast was applied. The long arm cast and pins were removed at 4 weeks postoperation. At the final follow-up examination at 28 months, the patient's Mayo elbow performance score⁸ was 100 points, indicating excellent functional and radiological results (Fig. 1E).

2.2. Case 2

A 5-year, 10-month-old girl suffered from right elbow pain after falling off a motorcycle. Roentgenograms were taken and revealed a lateral condylar fracture with concomitant posteromedial dislocation of the elbow, but the lateral condyle did not align with the radial head (Fig. 2A,B). Under general anesthesia and C-arm check up (Fig. 2C), her left elbow dislocation was immediately reduced using the closed method (Fig. 2D). Due to the displaced lateral

* Corresponding author. Department of Orthopedic Surgery, Kuang-Tien General Hospital, 321 Chin-Kuo Road, Tachia, Taichung 437, Taiwan. Tel.: +886 4 26888989; fax: +886 4 26888080.

E-mail address: admin_tachia@ktgh.com.tw (M.N. Wang).

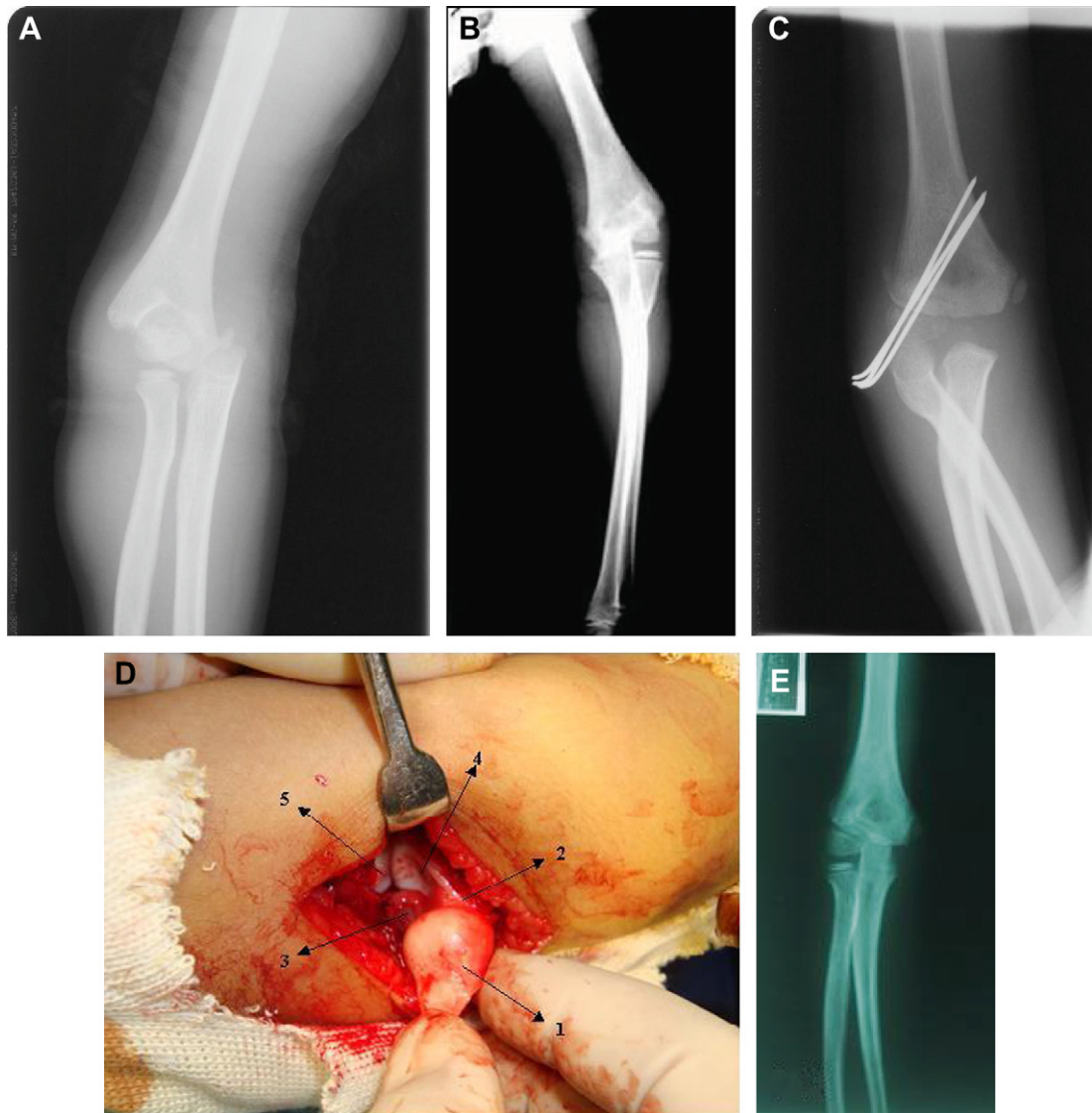


Fig. 1. Case 1. Images taken preoperatively (A, B), postoperatively (C), and during the operation (D). The lateral condyle fragment (arrow 1) was connected to the radial head (arrow 4) by the intact posterior capsule (arrow 3) and the lateral collateral ligament (arrow 2). The olecranon (arrow 5) is connected to the radial head by the interosseous membrane. Image obtained at a follow-up examination 28 months later (E).

condyle and unstable elbow joint with an easy dislocated condition in the posteromedial direction, the lateral humeral condyle was reduced using the open method through a lateral approach and was fixed using two 1.6-mm smooth K-wires (Fig. 2E). Observations regarding the fracture to the lateral humeral condyle during the operation revealed that the relationship between the lateral condyle fragment and radial head remained intact, but the lateral condyle still did not align with the radial head and was laterally rotated and was blocked by the distal humerus. The posterior capsule and lateral collateral ligament established a soft but firm link between the radial head and lateral condyle (Fig. 2F). Several tests were performed on the lateral condyle, which demonstrated that the lateral condyle was flexible but not free to move. A long arm cast was applied. The long arm cast and pins were removed at 4 weeks postoperation. Final follow-up examination at 24 months revealed a good functional outcome. The elbow performance score (EPS)⁸ score was 100 points, indicating excellent functional and radiological results (Fig. 2G,H).

3. Discussion

Isolated elbow dislocation is rare in children, constituting 3–6% of all elbow injuries,⁹ but it may be associated with avulsion fracture of the medial epicondyle. The direction of these dislocations is often posterior or posterolateral. On the other hand, lateral condyle fractures are estimated to occur in approximately 15–20% of all elbow fractures in children.¹⁰ However, elbow dislocation when accompanied by lateral condyle fracture is very rare^{1–6} and is characteristically dislocated at the posteromedial position.

In cases of elbow fracture/dislocation, previous studies³ generally agree that prompt reduction of the elbow dislocation is essential. Open reduction and internal fixation is the mainstay of treatment for lateral condyle fracture, but anatomic reduction and fixation of the fractured fragment can provide elbow stability and improve the functional results. The posterior capsule and lateral collateral ligament established a link between the radial head and lateral condyle, so poor reduction of the

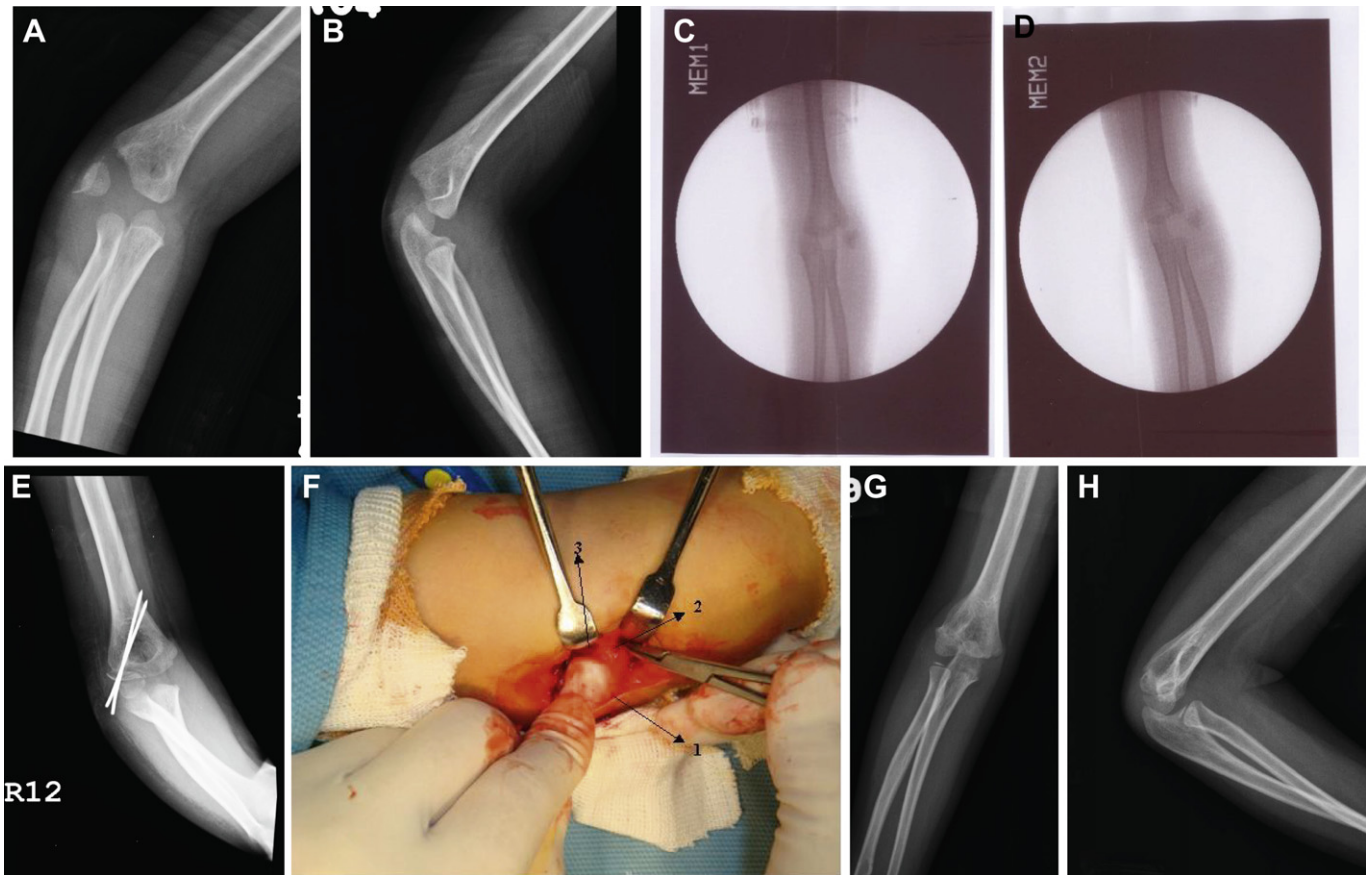


Fig. 2. Case 2. Images taken preoperatively (A, B) and during the C-arm check up (C). Her dislocated left elbow was immediately reduced using the closed method (D). Images taken postoperatively (E) and during the operation (F) reveal that the posterior capsule adhered to the lateral collateral ligament between the lateral condyle and radial head. The posterior capsule (arrow 3) and lateral collateral ligament (arrow 2) were intact and connected to the radial head and lateral condyle (arrow 1). Image obtained at a follow-up examination 28 months later (G, H).

lateral condyle fracture results in incongruity at the joint surface and also induces nonanatomic reduction of the elbow joint and poor clinical results. Major complications include fragmentation, hypertrophic dysplasia, malunion, nonunion of the fracture, osteonecrosis, heterotopic ossification, and elbow subluxation.¹¹

Alignment between the radial head and capitellum is an important guideline for diagnosing different types of elbow injuries in children. Displaced lateral condylar fractures and elbow dislocations will disrupt the relationship between the radial head and the capitellum, while other types of injuries, including supracondylar fracture of the distal humerus and separation of the entire distal humerus epiphysis, will not.^{12–15}

Morrey¹⁶ advocates that the traumatic dislocation of the elbow with lateral condyle fracture is induced by the body falling over the elbow medially, rather than laterally, with the application of a varus force. The lateral condyle is avulsed, while the radial head maintains its relationship with the displaced capitellum. However, he did not explain the reason for the latter. Previous studies¹⁷ advocate that the mechanism of this injury is a direct fall onto the outstretched hand, causing a lateral condylar fracture to occur when varus stress is applied to the extended elbow when the forearm is supinated.

Observations regarding the fracture of the lateral humeral condyle during these two cases indicate that the lateral condyle is

avulsed by the long extensor muscle of the forearm and that the intact posterior capsule and lateral collateral ligament causes the radial head to maintain its relationship with the displaced capitellum.

Reviews of roentgenograms of elbow dislocations with concomitant lateral condyle fractures^{1–6} that were published during the last decade showed that the radial head always retains its relationship with the fractured condyle. This scenario is the same as our observations in the first reported case: Although the elbow was dislocated and the lateral condyle was avulsed, the posterior capsule and lateral collateral ligament did not tear and the link between the lateral condyle and radial head remained intact (Fig. 3). The second reported case revealed that the lateral condyle was not aligned with the radial head. The observation of the fractured lateral condyle confirmed that it was laterally rotated and blocked by the distal humerus, so that the lateral condyle was not aligned with the radial head and was laterally displaced; however, the posterior capsule and lateral collateral ligament still establish a link between the radial head and lateral condyle (Fig. 2F).

The fractured lateral condyle adhered to the radial head in these two cases, as advocated by Morrey¹⁶: when a varus force is exerted, the lateral condyle is avulsed by the long extensor muscle of the forearm. The fractured lateral condyle adheres to the radial head through the intact posterior capsule and lateral collateral

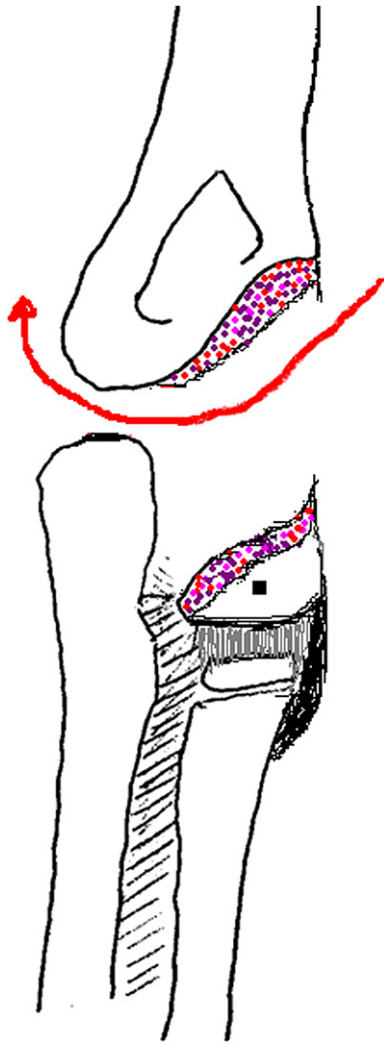


Fig. 3. Posteromedial dislocation of elbow with a lateral condyle fracture demonstrating a Milch type II typical pattern. The elbow was dislocated between the joint and the lateral condyle belonging to the distal part, and the lateral condyle is aligned with the radial head.

ligament, maintaining the relationship between the displaced capitellum and the adhered lateral collateral ligament via the posterior capsule.

References

1. B. Eksioglu, M. Uslu, E. Gudemez, O. Cetik. Medial elbow dislocation associated with a fracture of lateral humeral condyle in a child. *Orthopedics* 31 (2008) 93.
2. E.R. van Haaren, A.B. van Vugt, P.J. Bode. Posterolateral dislocation of the elbow with concomitant fracture of the lateral humeral condyle: case report. *J Trauma* 36 (1994) 288–290.
3. J.M. Kirkos, T.A. Beslikas, V.A. Papavasiliou. Posteromedial dislocation of the elbow with lateral condyle fracture in children. *Clin Orthop Relat Res* 408 (2003) 232–236.
4. D. Rovinsky, C. Ferguson, A. Younis, N.Y. Otsuka. Pediatric elbow dislocation associated with a Milch type I lateral condyle fracture of the humerus. *J Orthop Trauma* 13 (1999) 458–460.
5. J.M. Murnaghan, N.S. Thompson, T.C. Taylor, A. Cosgrove, J. Ballard. Fracture lateral epicondyle with associated elbow dislocation. *Int J Clin Pract* 56 (2002) 475–477.
6. N. Pouliart, H. De Boeck. Posteromedial dislocation of the elbow with associated intraarticular entrapment of the lateral epicondyle. *J Orthop Trauma* 16 (2002) 53–56.
7. H. Milch. Fracture of the external humeral condyle. *JAMA* 25 (1956) 641–646.
8. H.T. Kim, B.G. Park, J.T. Suh, C.I. Yoo. Chronic radial head dislocation in children, part 2: results of open treatment and factors affecting final outcome. *J Pediatr Orthop* 22 (2002) 591–597.
9. H. Sharma, R. Ayer, G.R. Taylor. Complex pediatric elbow injury: an uncommon case. *BMC Musculoskel. Disord* 6 (2005) 1–7.
10. J.C. Flynn, J.F. Richards, R.I. Saltzman. 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 Am* 57 (1975) 1087–1092.
11. P.G. Cheng, W.N. Chang, M.N. Wang. Posteromedial dislocation of the elbow with lateral condyle fracture in children. *J Chin Med Assoc* 72 (2009) 103–107.
12. R. Jakob, J.V. Fowles, M. Rang, M.T. Kassab. Observations concerning fractures of the lateral humeral condyle in children. *J Bone Joint Surg Br* 57 (1975) 430–436.
13. B.D. Horn, M.J. Herman, K. Crisci, P.D. Pizzutillo, G.D. Macewen. Fractures of the lateral humeral condyle: role of the cartilage hinge in fracture stability. *J Pediatr Orthop* 22 (2002) 8–11.
14. D.E. Foster, J.A. Sullivan, R.H. Gross. Lateral humeral condylar fractures in children. *J Pediatr Orthop* 5 (1985) 16–22.
15. J.A. Ogden. *Humerus: Skeletal Injury in the Child*, W.B. Saunders, Philadelphia, PA, 1990, pp. 399–411.
16. B.F. Morrey. *Conditions Affecting the Child's Elbow: The Elbow and Its Disorders*, W.B. Saunders, Philadelphia, PA, 2000, pp. 276–280, pp. 323–324.
17. J.F. Sarwark, W. Warner. *Elbow and forearm: pediatric aspects*, In: J.R. Kasser (Ed.). *Orthopaedic Knowledge Update 5*, American Academy of Orthopaedic Surgeons Rosemont, IL, 1996, pp. 259–267.