



12, 2, 1999 4

The Journal of the Korean Society of Fractures
Vol.12, No.2, April, 1999

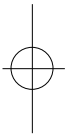
. . . .

= Abstract =

Fracture-Separation of the Distal Humeral Epiphysis in Young Children

Hyoun-Oh Cho, M.D., Kyoung-Duck Kwak, M.D., Byung-Yong Kim, M.D.,
Su-Min Sohn, M.D., Pill-Whan Oh, M.D.

Department of Orthopaedic Surgery, Dong Kang General Hospital, Ulsan, Korea



We have reviewed seven cases of fracture-separation of the distal humeral epiphysis, two of which were initially misdiagnosed as a fracture of the lateral condyle and one as a fracture of the supracondyle. The four cases were treated by closed reduction and cast immobilization, and three cases by open reduction and internal fixation. The one case with conservative treatment had cubitus varus, other were good result. To distinguish the fracture-separation from a fracture of lat. condyle and from a dislocated elbow is impossible using clinical signs alone. For reducing misdiagnosis, it is important to consider age and there could be need further evaluation such as arthrogram, USG, CT and MRI.

Key Words : Distal Humeral Epiphysis, Fracture-Separation

:

123-3 (681-320)

Tel : (052) 241-1733

*

1996



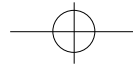


Table 1. Three groups based on roentgenographic appearance

Group A	Newborn to nine months old No ossification center present in the capitellum No metaphyseal fragment (Thurston-Holland sign)
Group B	Nine months to three years old Ossification center present in the capitellum Very small or no Thurston-Holland fragment
Group C	Three to seven years old Well developed ossification center present in the capitellum Large Thurston-Holland metaphyseal fragment

,
,
가 .1818 Stimson
1986 DeLee ⁸⁾ 가 16 , 1991
Jager Hoffman⁷⁾ 12 .
,
,
(Fig. 1-4). 1992 1 1996 12
5 7 ,

. DeLee ⁸⁾ Group A, B, C가
0, 5, 2 (Table 1). 7 가 5 , 가
1 , 7 3 , 4
7 3
(2) (1)
(Table 2).

1992 1 1996 12
7
13 4 25.5
(Fig. 1-4). 4

Table 2. Analysis of cases

Case	Sex/Age	Cause of trauma	Initial diagnosis	Final diagnosis	Tx	ROM [§]	Carrying angle
1	F/22mo	slip down	at. condyle Fx.	S-H type II	CR [†]	5°-135°	20° varus
2	F/16mo	fall down	S-H* type I	S-H type I	OR/IF [‡]	full	5° varus
3	M/22mo	fall down	S-H type II	S-H type II	OR/IF	full	3° varus
4	M/4yr	fall down	lat. condyle Fx.	S-H type II	CR	full	5° varus
5	M/4yr	slip down	S-H type I	S-H type I	CR	full	5° varus
6	M/13mo	fall down	S-H type I	S-H type I	CR	full	5° varus
7	M/33mo	slip down	supracondylar Fx.	S-H type II	OR/IF	full	3° varus

* Salter-Harris

† Closed reduction

‡ Open reduction and internal fixation

§ Range of motion



Fig 1. Arthrogram of fracture-separation of the lower humeral epiphysis.

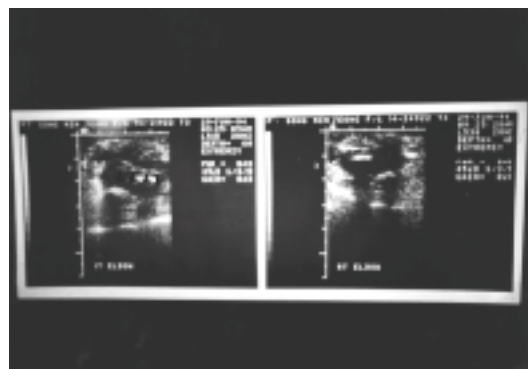


Fig 2. USG of fracture-separation of the lower humeral epiphysis. USG shows high echoic line (arrows) on epiphyseal area.

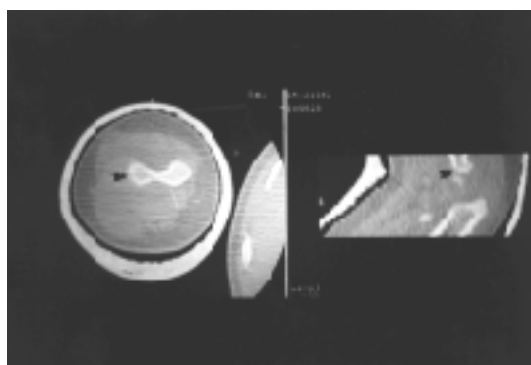


Fig 3. CT shows slightly displaced fracture-separation of the lower humeral epiphysis.



Fig 4. MRI of fracture-separation of the lower humeral epiphysis. T1 weighted coronal image shows epiphyseal plate and displaced epiphysis

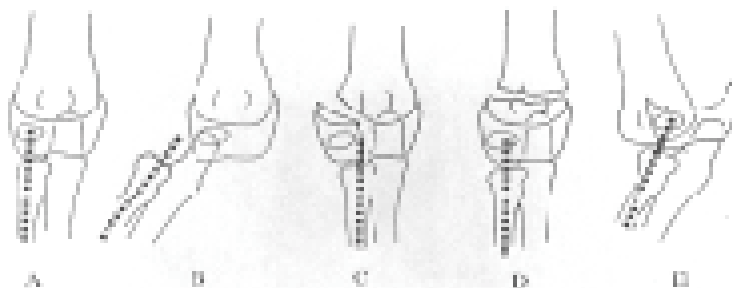
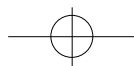


Fig 5. Diagrams of the elbow
A. normal elbow
B. dislocation of the elbow
C. fracture of the lateral condyle
D. supracondylar fracture
E. fracture separation of the lower humeral epiphysis.



3 3 3 2 6 5°
 K- . 135°
 20° (Fig. 6-A,B,C).
 2
 16
 7
 18 (12-36) , 1 3 K-
 5o 135°
 20° 15
 6 (Fig. 7-A,B,C).
 (Table 2).

1
 22
 Salter-Harris type I, II
 2
 Salter-Harris type II
 1967 Macafee¹³⁾ 3

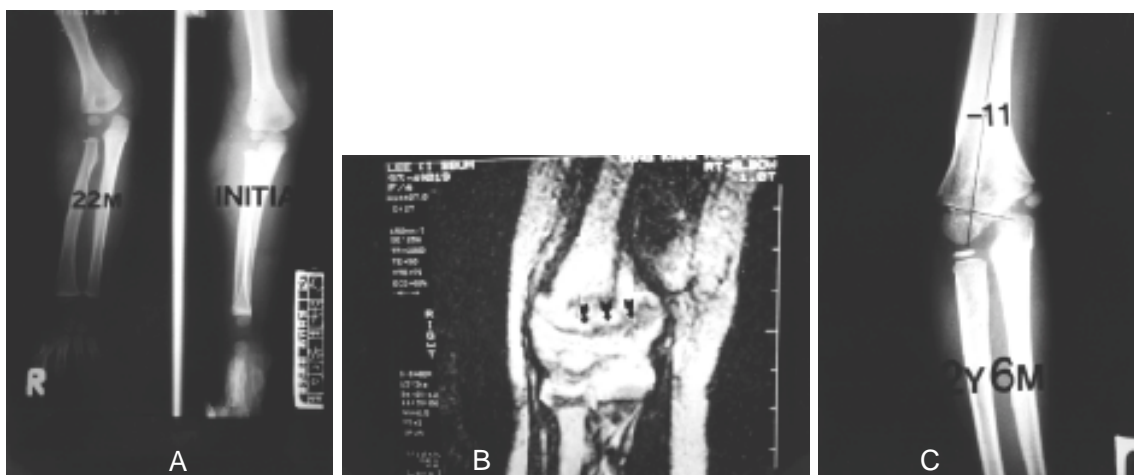


Fig 6. A 22-month-old girl with epiphyseal fracture-separation of distal humerus.

A. Initial roentgenogram of the Rt. elbow.

B. MRI after 3 month showing epiphyseal injury.

C. Anteroposterior roentgenogram after 30 months showing cubitus varus deformity

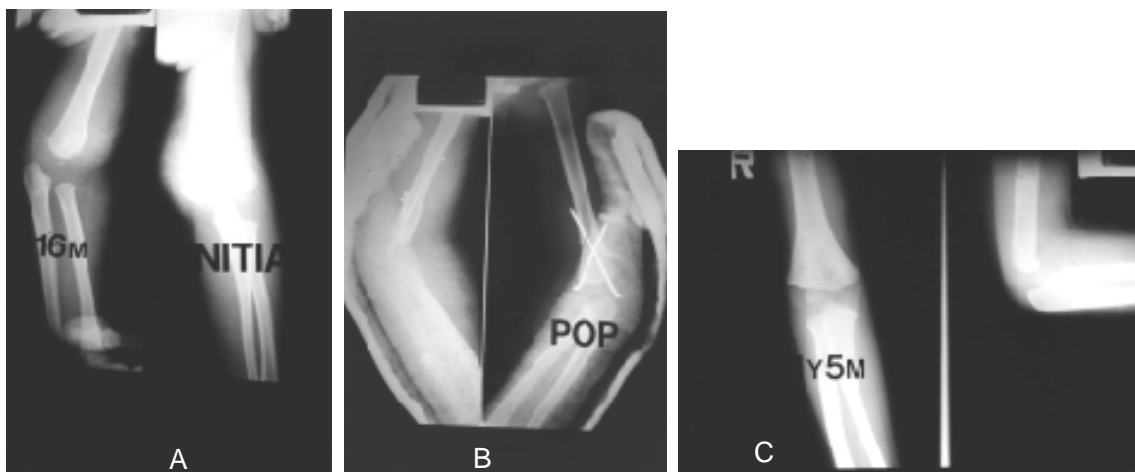
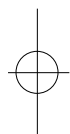


Fig 7. A 16-month-old girl with epiphyseal fracture-separation of distal humerus.

A. Initial roentgenogram of the Rt. elbow.

B. Roentgenogram after open reduction and internal fixation.

C. Roentgenogram after 15 months showing good result.



, DeLee ⁸⁾ 가 5 7
8 10
11 12

Bright ⁵⁾ 가
(Rotatory shear force) Salter-Harris type I
Salter-Harris type II
13,16),
가 4,11,12,15)
2).
가
28.8, Salter-Harris type I, II가 3, 4 (Table 2).
(Fig. 5).
(Fig. 1)
3,4,6,10,15) 가
6 8



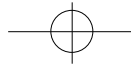


370 •

/ 12 2

REFERENCES

- 8) 가 (Fig. 2).
- 가 (Fig. 3,4). 3 (1) (2) 248-254, 1988
- Salter-Harris type II (Table 2).
- 6,7,8,11,12,15,16) DeLee, Holda 8,11,12,15)
- Wrobel¹⁷⁾ 가 가 (Table 2).
- Mizuno ¹⁵⁾ 3 1 가 . Holda ¹¹⁾ 7 5 10°-15° 가 1 15° 1 .
- 25.5 , 4 3 7 3 3 1 (Table 2).
- 가 , 가 .
- 1) , , : Salter-Harris type I, II , 23(1) : 248-254, 1988
- 2) , : , 7(1) : 72-78, 1994
- 3) Akbarnia B.A., Siberstein M.J., Rende R.J. : Arthrography in the diagnosis of fractures of the distal end of the humerus in infants. *J Bone Joint Surg*, 68A : 599-620, 1986.
- 4) Barrett W.P., Almquist I.A., Staheli L.T. : Fracture separation of the distal humeral physis in the newborn. *J Pediatric Orthop* 4 : 617-619, 1984.
- 5) Bright R.W. : Epiphyseal plate cartilage : a biomechanical and histological analysis of failure modes. *J Bone Joint Surg*, 56 : 688-703, 1974.
- 6) Chand K. : Epiphyseal separation of distal humeral epiphysis in an infant : a case report and review of literature. *J Trauma*, 14(6) : 521-526, 1974.
- 7) De Jager L.T., Hoffman E.B. : Fractures separation of the distal humeral epiphysis. *J Bone Joint Surg*, 73B(1) : 143-146, 1991.
- 8) DeLee J.C., Wilkins K.E., Rogers L.F., Rockwood C.A. : Fracture separation of the distal humeral epiphysis. *J Bone Joint Surg*, 62A(1) : 46-51, 1980.
- 9) Dias J.J., Lamont A. C., Jones J.M. : Ultrasonic diagnosis of neonatal separation of the distal humeral epiphysis. *J Bone Joint Surg*, 70B : 825-828, 1988.
- 10) Hansen P.E., Barnes D.A., Tullos H.S. : case report arthrographic diagnosis of an injury pattern in the distal humerus of an infant. *J Pediatric Orthop*, 2 : 569-572, 1982.
- 11) Holda M.E., Manoli A. Jr., LaMont R.L. : Epiphyseal separation of the distal end of the humerus with medial displacement. *J Bone Joint Surg*, 62A(1) : 52-57, 1980.
- 12) Kaplan S.S., Reckling F.W. : Fracture separation of the lower humeral epiphysis with medial displacement. *J Bone Joint Surg*, 53A(6) : 1105-



- 1108, 1971.
- 13) **Macafee, A.L.** : Infantile supracondylar fracture. *J Bone Joint Surg*, 49B : 768-770, 1967.
- 14) **Marmor J., Bechtol C.O.** : Fracture separation of the lower humeral epiphysis : report of a case. *J Bone Joint Surg*, 42A(2) : 323-326, 1960.
- 15) **Mizuno K., Hirohata K., Kashiwagi D.** : Fracture separation of the distal humeral epiphysis in young child. *J Bone Joint Surg*, 61A(4) : 569-573, 1979.
- 16) **Siffer R.S.** : Displacement of the distal humeral epiphysis in the newborn infant. *J Bone Joint Surg*, 45A(1) : 165-169, 1963.
- 17) **Sutherland D.H., Wrobel L.** : Displacement of entire distal humeral epiphysis, In proceedings of the Western Orthopedic Association. *J Bone Joint Surg*, 56A : 206-210, 1974.

