

12, 2, 1999 4

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

Ender

.

= Abstract =

Treatment of Two-part, Displaced Surgical Neck Fracture of the Proximal Humerus with Modified Ender Nail and Tension Band Technique

Kwang-Won Lee, M.D., In-Sung Hwang, M.D., Seung-Hun Lee, M.D.,
Tae-Gyoo Ahn, M.D., Ha-Yong Kim, M.D., Whoan-Jeang Kim, M.D., Won-Sik Choy, M.D.

Department of Orthopaedic Surgery, Eul-Ji Medical College, Taejon, Korea

Operative treatment of two-part, displaced surgical neck fractures of the proximal humerus is used when satisfactory closed reduction cannot be achieved or maintained. Recently, we modified the Ender nails by making an additional hole above the slot for wire incorporation. The purpose of this study was to assess the effects of stabilization of displaced and unstable surgical neck fractures of the humerus by Ender nailing and tension band technique. We reviewed the data of fourteen consecutive patients (10 women and 4 men) who had been treated with Ender nailing and tension band wiring between from Aug 1996 and Oct 1997 at Eulji Medical College Hospital. The average age of patients was 54 years (range, 38 to 79 years), and the average follow-up period was 18 months (range, 12 to 24 months). Bone union was observed at 6.3 weeks (range, 5.5 to 10 weeks), except one case of delayed union. There were no infections and nonunions. The average ranges of shoulder elevation and abduction were 140°(100° to 170°) and

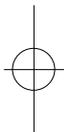
:

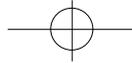
24 (301-726)

Tel: (042) 259-1286 Fax: (042) 252-5498

*

1998

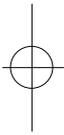




126°(100° to 160°), respectively. The median value of the thumb to vertebral distance was L1, with a range of T6 to L5 for internal rotation, external rotation was 48° (30° to 70°). Radiography revealed one case of medial shift greater than 5mm, and 4 cases of lateral shift greater than 5mm of the humeral shaft. The average varus angulation of the humeral neck was 8.5°(0° to 34°). Four patients (28.6%) were excellent (34 to 35), six patients (42.8%) were good (28 to 33), four patients (28.6%) were fair (21 to 27) in UCLA shoulder rating scale. In conclusion, Ender nailing and incorporation of the tension band wire loops provided additionally rotational and longitudinal stability in two-part displaced surgical neck fracture of the proximal humerus associated with osteoporosis.

Key Words : Proximal humerus, Two-part fracture, Ender nailing and tension band technique

가 , 1996 8 1997 10
 가 , Neer¹⁸⁾ ,
 가 2,6,9,12,19) ,
 가 4) Ender 14 ,
 가 가 20) Ender Ender 가 ,
 가 가 Ender (Fig. 1). ,
 가 , , 1 2 1
 4,8,11,22) (Pendulum exercises) 6
 가 10 , , 가 4 , 54 (, 38 79)
 4,12,19,20) , 9 , 5 .
 가 가 가 5 ,
 Ender 가 6 , 가 2 , 2 ,
 1 . 3 , 2 , 1
 , 1 , 1 ,
 1 . 18 (,
 12 24) .



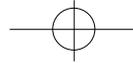
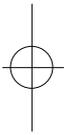


Table 1. Data of patients with two-part, displaced fractures of the proximal humerus

Case	Age (years)	Sex	Active shoulder ROM		Postoperative radiographic figures		UCLA shoulder rating scale	Comments
			Foward Elevation	Ext. rotation	shift of distal fragment(cm)	Angulation varus		
2	41	F	170	50	0	0	34	Excellent
3	79	F	170	55	0	22	34	Excellent
4	67	F	165	55	0.9	0	34	Excellent
5	40	M	150	60	0.5	0	33	Good
6	47	M	170	70	0	0	35	Excellent
7	38	F	120	40	0.5	22	23	Fair
8	68	M	130	50	0	20	28	Good
9	48	F	130	45	0	0	32	Good
10	47	M	160	50	0	0	33	Good
11	50	F	130	30	0.8	34	26	Fair
12	70	F	100	30	0	0	21	Fair
13	51	F	110	40	0	20	22	Fair
14	69	F	100	45	0	0	25	Good



Ender 5mm 3

가

(Table 1). 140°(100° 170°)

(Correlation Analysis) L1(T6 L5), 126°(100° 160°), 48°(30° 70°)

가 UCLA 가³⁾ 가1, 가4, 8.5°(0° 34°)

가 5mm

가4 (28.6%), 가6 (42.8%), 4 (28.6%) (Fig. 2-A, B, C). UCLA

가 7,20), 1, 6, 1, 8.7, 10, 6, 8, 7, 7.7, 10

13 6.3 (5.5 10) 5, 8, 6, 4, 2, 2, 1, 4.3, 5, 7, 4

5 4, 3, 3, 4.1, 5, 5, 4, 6, 3, 3

Ender



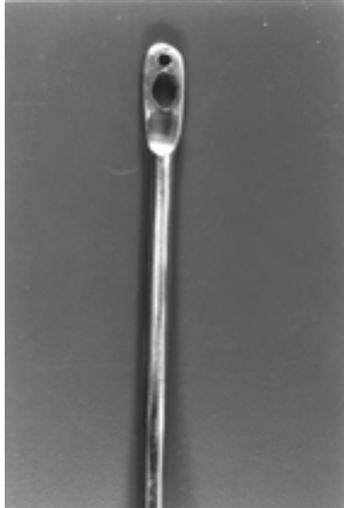
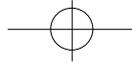


Fig. 1. Modified Ender nails with an additional hole above slot.

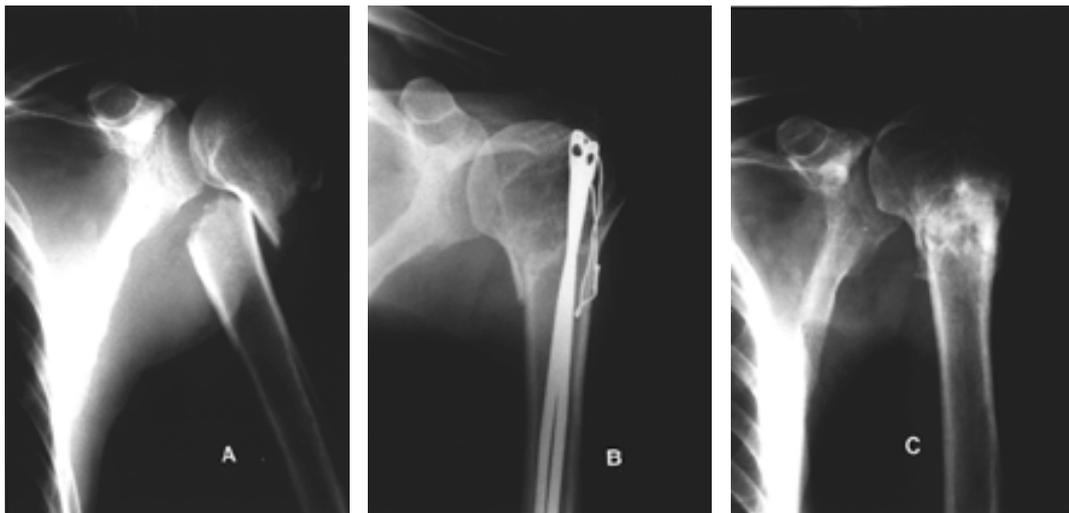
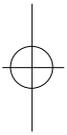
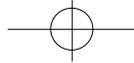


Fig. 2-A. A 68-year-old man with two-part, displaced surgical neck fracture of the proximal humerus.
B. Postoperative radiograph showing stable reduction of the fracture with Ender nailing and tension band technique.
C. The radiograph shows good union of the fracture 1 year and 6 months after the operation. He was graded as good according to the HSS shoulder rating scale.

가 , > 0.05),
 r=-0.1329
 가 (P > 0.05).
 가 , r=-0.209
 가 (P > 0.05).
 가 r=-0.3043
 가 (P > 0.05).





Kristiansen¹³⁾ Kofoed^{14,15)} 가

10,19,21,22,23) . 1970 Neer¹⁸⁾ , Jaberg¹⁰⁾
4 , ,

, , 가 ,

Neer 가 1,8,15,17,19) 가 , ,

45

4) , 4,5,8,11,16,22) ,
가 .

19) . Cuomo¹⁾

45

10) 가 , 가 Ender 가 ,

(cavitation)

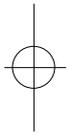
12) 가 4,7,20) Koval 가
T (p < 0.005), Ender

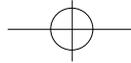
45

가 10mm 가 Ender 가

1,4,7,10,13,15,20) , Ender⁴⁾ 65
, staple (loops) UCLA

, Ender 가 1 4
rush 2 , 2 .

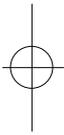


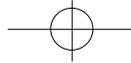


REFERENCES

가
2,20).
r=-0.209
r=-0.1329
r=-0.3043
가 UCLA
가
가 4
가
가
가
Ender
가
Ender
가
Ender

- 1) **Cuomo F, Flatow EL, and Maday MG**: Open reduction and internal fixation of two-and three-part displaced surgical neck fractures of the proximal humerus. *J Shoulder Elbow Surg*, 1:287-295, 1992.
- 2) **DePalma AF and Cautilli RA**: Fractures of the upper end of the humerus. *Clin Orthop*, 20:73-93, 1961.
- 3) **Ellman H**: Arthroscopic subacromial decompression: analysis of one to three year results. *Arthroscopy*, 3:173-181,1987
- 4) **Flatow EL, Pollock RG and Bigliani LU**: Operative treatment of two-part, displaced surgical neck fractures of the proximal humerus. *Operative Techniques in Orthopaedics*, 4:2-8, 1994.
- 5) **Gerber C, Schneeberger AG and Vinh TS**: The arterial vascularization of the humeral head: An anatomical study. *J Bone Joint Surg*, 72-A:1486-1494, 1990.
- 6) **Hall MC and Rosser M**: The structure of the upper end of the humerus with reference to osteoporotic changes in senescence leading to fracture. *Can Med Assoc J*, 88:290-298, 1963.
- 7) **Hall RF and Pankovich AM**: Ender nailing of acute fracture of the humerus. *J Bone Joint Surg*, 69-A:558-567, 1987.
- 8) **Hawkins RJ, Bell RH and Gurr K**: The three-part fracture of the proximal part of the humerus. *J Bone Joint Surg*, 68-A:1410-1414, 1986.
- 9) **Horak J and Nilsson BE**: Epidemiology of fracture of the upper end of the humerus. *Clin Orthop*, 112:250-259, 1975.
- 10) **Jaberg H, Warner JJP and Jakob RP**: Percutaneous stabilization of unstable fractures of the humerus. *J Bone Joint Surg*, 74-A:508-515,1992.
- 11) **Ko JY and Yamamoto R**: Surgical treatment of complex fracture of the proximal humerus. *Clin Orthop* 327:225-237, 1996.
- 12) **Koval KJ, Blair B, Takei R, Jummer FJ and Zuckerman JD**: Surgical neck fractures of the





- proximal humerus: A laboratory evaluation of ten fixation techniques, *The Journal of Trauma*, 40:778-783, 1996.
- 13) **Kristiansen B**: External fixation of proximal humeral fracture: Clinical and cadaver study of pinning technique. *Acta Orthop Scand*, 58:645-648, 1987.
- 14) **Kristiansen B and Kofoed H**: External fixation of displaced fracture of the proximal humerus: Technique and preliminary results. *J Bone Joint Surg*, 69-B:643-646, 1987.
- 15) **Kristiansen B and Kofoed H**: Transcutaneous reduction and external fixation of displaced fractures of the proximal humerus. *J Bone Joint Surg*, 70-B:821-824, 1988.
- 16) **Laing PG**: The arterial supply of the adult humerus. *J Bone Joint Surg*, 38-A: 1105-1116, 1956.
- 17) **Leyshon RL**: Closed treatment of fractures of the proximal humerus. *Acta Orthop Scand*, 55:48-51, 1984.
- 18) **Ogiwara N, Aoki M, Okamura K and Fukushima S**: Ender nailing for unstable surgical neck fractures of the humerus in elderly patients. *Clin Orthop*, 330:173-180, 1996.
- 19) **Neer II CS**: Displaced proximal humeral fractures. Part I. Classification and evaluation. *J Bone Joint Surg*, 52:1077-1089, 1970.
- 20) **Neer II CS**: Displaced proximal humeral fractures. Part II. Treatment of three-part and four-part displacement. *J Bone Joint Surg*, 52-A:1090-1103, 1970.
- 21) **Paavolainen P, Bjorkenheim JM, Slati P and Pauku P**: Operative treatment of severe proximal humeral fractures. *Acta Orthop Scand*, 54:374-379, 1983.
- 22) **Savoie FH, Geissler WB and Vander Griend RA**: Open reduction and internal fixation of three-part fractures of the proximal humerus. *Orthopedics*, 12:65-70, 1989.
- 23) **Stableforth PG**: Four-part fractures of the neck of the humerus. *J Bone Joint Surg*, 66-B:104-108, 1984.

