

- -

* . .

*

< >
:

: 1997 3 2001 12 14

18 , 9

. American Shoulder and Elbow Surgeon's (ASES) shoulder score 가
, visual analogue scales (zero : no pain ~ 10 : extreme pain) 가

: 14 12 (85.7%)
13.2 . 18
17 (94.4%) 12.4 . ASES shoulder score

44 , 1.8,
47 . 1.4 .

: 가 가
가

: , , , , , ,

:

5 () 442-721

Tel : 031-219-5227
Fax : 031-219-5229
E-mail : handkjhan@yahoo.com

3
 4 , 6
 22 5
 (Table 1).
 2,4,12,18,24)
 9 American Shoulder and Elbow Surgeon's
 가 3,4,12,15) (ASES) shoulder score(Table 2)¹⁶⁾
 가 visual analogue scales
 (zero : no pain ~ 10 : extreme pain) 가
 3,6,8)
 가
 5,7,15,22,25)
 가
 1997 3 2001 12
 14
 18 9
 가 11:3 40.6 (21-62)
 가 9:9
 37.1 (18-60)
 9 ,
 4 () 1
 12 ,
 3 , () 2 1
 4

Table 1. Patients profile

	Nail	Plate
Number	18	14
Open Fracture	3/18	2/14
Comminuted Fracture	17/18	5/14
Oblique Fracture	1/18	5/14
Transverse Fracture	0/18	4/14
Age Average (years)	40.6	37.1
Sex (male : female)	9 : 9	11 : 3
Combined Radial Nerve Injury	3	4
Surgical Time Average (minutes)	96	92

Table 2. Details of the American Shoulder and Elbow Surgeons (ASES) score (4=normal; 3=mild compromise; 2=difficulty; 1=with aid; 0=unable)

Back pocket	Perineal care
Wash opposite axilla	Eat with utensil
Comb hair	Use arm at shoulder level
Carry 10 lb at side	Dress
Sleep on affected side	Pull
Use hand overhead	Throw
Lift	

Titanium LC-DCP

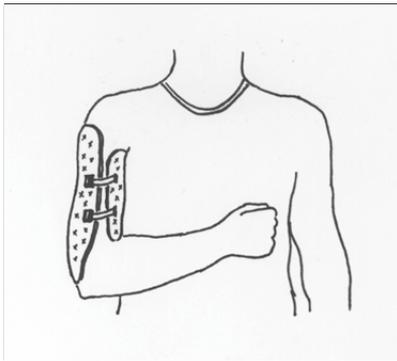


Fig. 1 : Drawing of the functional coaptation brace.

92 . 3
 1) (coaptation brace)(Fig
 Titanium
 (AO unreamed humeral
 AO-
 nail)

bone clamp towel clip

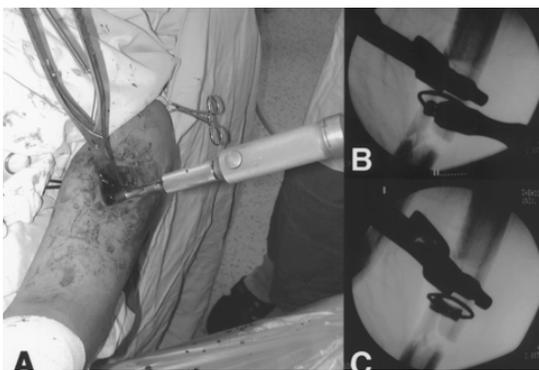


Fig. 2-A : Photograph of the surgical procedure and,
2-B, C : Photographs of the fluoroscopic images
 of humeral fracture reduction and
 immobilization with the bone clamp and
 cable wire.

1-2 cable wire
 (Fig 2A-C).
 1 cm 가
 1-2
 (Fig 3A-C).
 96 1 Velpeau sling
 3

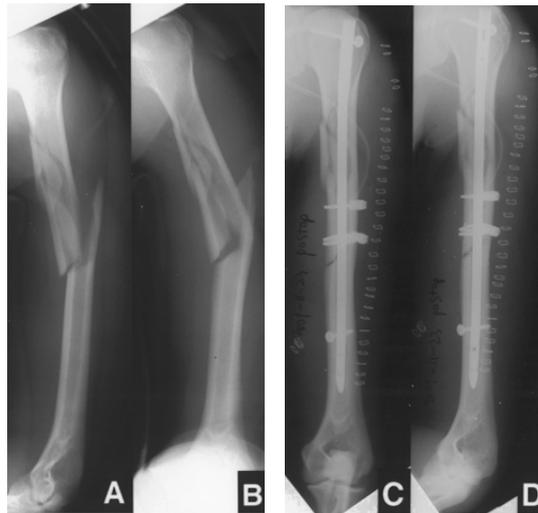
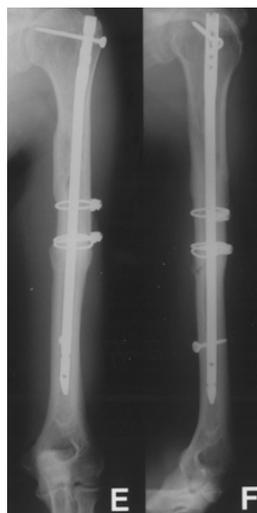


Fig. 3-A, B : 50-years-old man with comminuted
 fracture of the left humeral shaft.
3-C, D : minimal open reduction and
 interlocking IM nail was performed.



3-E, F : 9 months after IM
 nailing .

가 14
7 5 4
2 6
13.2
7.6
18 17 (94.4%)
7.3
12.4 3
9 가
5 1 cm

(Table 3). ASES shoulder score(Total 52 points)
44
47
visual analoue scales
1.8
1.4 (Table 4).

Table 3. Bone union

	Nail	Plate
ASES Score (52 points)	47	44
Pain Scale (0 to 10)	1.4	1.8
Recovery of Raidal nerve function	3/3	2/4

Table 4. Functional Results

	Nail	Plate
Clinical Union (weeks)	7.3	7.6
Radiological Union (weeks)	12.4	13.2
Union Rate	17/18 (94.4%)	12/14 (85.7%)

가 14
7 5 4
2 6
가
가 1
(Fig 4A-C).



Fig. 4-A, B : 28-years-old man with comminuted fracture of the right humeral shaft.
4-C, D : minimal open reduction and interlocking IM nail was performed.



4-E, F : 10 months after IM nailing.

가
가
가

가 ,

, ,

, ,

가 . 가 , 가 가

11,15,20,21,23)

가

가

가

가

2-3

가

11,20,21)

가

가

가

towel clip bone clamp

가

가

,

가

가 가

가

5,7,15,17,22,25)

, 가

가

1,13,14,19)

cable wire

가 1 (5.6%)

가

가

가

9,10,15,17)

3,6,8)

REFERENCE

1. **Ajmal M, O'Sullivan M, McCabe J and Curtin W** : Antegrade locked intramedullary nailing in humeral shaft fracture. *Injury* 32:692-694, 2001.
2. **Balfour GW, Mooney V and Ashby ME** : Diaphyseal fractures of the humerus treated with a ready-made fracture brace. *J Bone Joint Surg*, 64-A:11-13, 1982.
3. **Bell MJ, Beauchamp CG, Kellam JK and McMurty RY** : The results of plating humeral shaft fractures in patients with multiple injuries : the Sunnybrook experience. *J Bone Joint Surg*, 67-B:293-6, 1985.
4. **Brumback RJ, Bosse MJ, Poka A and Burgess AR** : Intramedullary stabilization of humerus shaft fractures in patients with multiple trauma. *J Bone Joint Surg*, 68-A:960-70, 1986.
5. **Crolla RMPH, de Vries LS and Clevers GJ** : Locked intramedullary nailing of humeral fractures. *Injury*, 24:403-55, 1993.
6. **Dabezies EJ, Banta CJ, Murphy CP and d' Ambrosia RD** : Plate fixation of the humeral shaft for acute fractures with and without radial nerve injuries. *J Ortho Trauma*, 6:10-3, 1992.
7. **Habernek H and Orthner E** : A locking nail for fractures of the humerus. *J Bone Joint Surg*, 73-B:651-3, 1991.
8. **Heim D, Herkert F, Hess P and Regazzoni P** : Surgical treatment of humeral shaft fracture : the Basel experience, *J Trauma*, 35:226-32, 1993.
9. **Hems TE and Bhullar TP** : Interlocking nailing of humeral shaft fractures: the Oxford experience 1991 to 1994, *Injury*, 27:485-9, 1996.
10. **Ingman AM and Waters DA** : Locked intramedullary nailing of humeral shaft fractures. *J Bone Joint Surg*, 76-B23-4, 1994.
11. **Kim SJ, Kim TS, Lee KH, Lee DG and Kim BS** : A clinical study of the radial nerve palsy associated with humeral shaft fractures. *J Korean Orthop Assoc*, 27:181-187, 1992.
12. **Mast JW, Spiegel PG, Harvey JP and Harrison C** : Fractures of the humeral shaft. *Clin Orthop*, 12:254-62, 1975.
13. **McCormack RG, Brien D, Buckley RE and Mckee MD** : Fixation of fractures of the shaft of the humerus by dynamic compression plate or intramedullary nail. *J Bone Joint Surg*, 82-B:336-339, 2000.
14. **McKee MD, Pedlow FX, Cheney PJ and**

- Schemitsch EH** : Fractures below the end of locking humeral nails: a report of three cases. *J Orth Taruma*, 10:500-13, 1996.
15. **Robinson CM, Bell KM, Court-Brown CM and McQueen MM** : Locked nailing of humeral shaft fractures. Experience in Edinburgh over a two-year period. *J Bone Joint Surg*, 74(4)-B:558-562, 1992.
 16. **Rockwood CA and Matsen FA III** : *The Shoulder*. Philadelphia: WB Saunders, 161, 1990.
 17. **Rommens PM, Verbruggen J and Broos PL** : Retrograde locked nailing of humeral shaft fractures: a review of 39 patients. *J Bone Joint Surg*, 77-B:84-9, 1995.
 18. **Sarmiento A, Kinman PB, Galvin EG, Schmitt RH and Phillips JG** : Functional bracing of fractures of the shaft of the humerus. *J Bone Joint Surg*, 59-A:596-601, 1977.
 19. **Scheerlinck T and Handelberg F** : Functional outcome after intramedullary nailing of humeral shaft fractures: Comparison between retrograde Marchetti-Vincenzi and unreamed AO antegrade nailing. *Trauma* 52:60-71, 2002.
 20. **Stern PJ, Mattingly DA, Pomeroy DL, Zenni EJ Jr and Kreig JK** : Intramedullary fixation of humeral shaft fractures. *J Bone Joint Surg*, 66-A:639-646, 1984.
 21. **Stewart MJ and Hundley JM** : Fractures of the humerus, a comparative study in method of treatment. *J Bone Joint Surg*, 37-A:681-692, 1995., *World J Surg*, 7(1):80-87, 1983.
 22. **Ward EF, Savoie FH and Hughes JL** : Fractures of the diaphyseal humerus. In Browner BD, Jupiter JB, Levine AM, Trafton PG, eds. *Skeletal taruma*, Vol. 2. Philadelphia, WB Saunders Co, 1177-1193, 1992.
 23. **Ward EF and White JL** : Interlocked intramedullary nailing of the humerus. *Orthopedics*, 12(1):135-41, 1989.
 24. **Zagorski JB, Latta LL, Zych GA and Finnieston AR** : Diaphyseal fractures of the humerus: treatment with prefabricated braces. *J Bone Joint Surg*, 70-A:607-610, 1988.
 25. **Zuckerman JD and Koval KJ** : Fractures of the shaft of the humerus. In: Rockwood CA Jr, Bucholz RW, Green DP, Heckman JD, eds, *Rockwood and Greens 's fractures in adults*. Fourth ed. Vol. 1. Philadelphia, etc: Lippincott-Raven, 1025-37, 1996.

Abstract

Minimal Open Reduction and Interlocking IM Nailing of Comminuted Humeral Shaft Fracture : Comparison between Plate Internal Fixation.

Kyeong-Jin Han, M.D., Soo-Ik Awe, M.D*., Tae-Young Kim, M.D.,
Shin Young Khang, M.D.

Department of Orthopaedic Surgery, Ajou University School of Medicine Suwon, Korea

*Department of Orthopaedic Surgery, Sungkyunkwan University School of
Medicine Suwon, Korea**

Purpose : We compared the functional and radiological results after the minimal open reduction and interlocking IM nailing and LC-DCP plate internal fixation for the comminuted humeral shaft fractures.

Materials and Methods : Fourteen plates(LC-DCP) and eighteen interlocking IM nail(AO unreamed IM nail) were applied after open reduction for 32 comminuted fractures of the humeral shaft between March 1997 and December 2001. They were followed up for a minimum 9 months after surgery and the radiological and functional results were evaluated.

Results : The average fracture healing time was 13.2 weeks and union rate was 85.7% for plate internal fixation. The average fracture healing time was 12.4 weeks and union rate was 94.4% for interlocking IM nail. The average functional scores according to American Shoulder and Elbow Surgeon's (ASES) shoulder score(Total 52 points) was 44 points for plate internal fixation and 47 points for interlocking IM nailing respectively.

Conclusion : Minimal open reduction and interlocking IM nailing is better method with good functional and radiological results than plate internal fixation for the comminuted humeral shaft fractures.

Key Words : Humerus, Comminuted shaft fracture, Minimal open reduction, Interlocking IM nail, Plate internal fixation