— Abstract —

**Shoulder Function after antegrade intramedullary interlocking
nailing for humeral shaft fracture**

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Antegrade interlocking intramedullary nailing (AIIN) for the humeral shaft fracture can induce shoulder pain and decrease of shoulder function postoperatively. The purpose of this study was to estimate the outcome of the shoulder functions after AIIN through the rotator interval between the subscapularis and the supraspinatus to decrease the shoulder pain.

Out of consecutive 43 cases that underwent AIIN 42 had been followed for two years or more. Among them we analyzed 40 cases of 39 patients excluding two cases of pathologic fractures. The average age was 47 years. There were 17 men and 23 women. The average follow-up was 34 months. Open nailing was performed in 26 fractures and closed nailing in 14. Bone graft was done in 7 fractures with open nailing.

With a single operation, all but two patients achieved osseous union. Average pain score with visual analog scale was one (range; 0~4) postoperatively. By the Neer 's score 37 patients received a excellent or satisfactory results while 3 patients 'unsatisfactory or failed results. By the functional score of ASES (American Shoulder and Elbow Society) 6 cases received the fair or poor results. Except three cases with persistent nerve palsy and one case of technique failure with protruded nail over humeral head, all patients could achieved satisfactory results with Neer 's score and 35 cases (94%) satisfactory results with functional score of ASES.

An insertion of antegrade nail to the rotator interval was recommended for better shoulder functions and less pain postoperatively.

Key Words: Fracture, Humerus, Antegrade Intramedullary nailing, Rotator interval, Shoulder

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16-5

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Table 2. AO

	A	B	C
1	4	3	4
2	5	3	3
3	14	0	4

3 ,
가 2 ,
가 2 .
4 , 1
가
(Table 1). AO A 23 , B 6
, C 11 (Table 2).
가 17 , 1
가 9 , 2 가 6 , 3
가 10 .
21
16 , 2 , 1 ,
1 , 1 .
6 가 , 2 2/3 1/3
3.5 cm

가 Neer 가 (Table
(American Shoulder
and Elbow Society, ASES)
가 (, ASES 가)³²⁾
100 (50
50) ,
가 ASES 100 ~ 91
(excellent), 90 ~ 81 (good), 80 ~ 71
(fair), 70 (poor)
(satis-
factory group) 가

Fig. 2.

Table 3. Neer 's score for the evaluation of shoulder function

1. Pain (35 units)									
- None, ignores									
									35
- Slight, occasional, no compromise in activity									
									30
- Mild, no effect on ordinary activity									
									25
- Moderate, tolerable, makes concessions, use aspirin									
									15
- Marked, serious limitations									
									5
- totally disabled									
									0
2-1. Function - strength (10 units)									
- Normal									
									10
- Good									
									8
- Fair									
									6
- Poor									
									4
- Trace									
									2
- Zero									
									0
2-2. Function - reaching (10 units)									
- Top of head									
									2
- Mouth									
									2
- Belt buckle									
									2
- Opposite axilla									
									2
- Brassiere hook									
									2
2-3. Function - stability(10 units)									
- Lifting									
									2
- Throwing									
									2
- Pounding									
									2
- Pushing									
									2
- Hold overhead									
									2
3. Range of motion (25 units)									
Flexion		Extension		Abduction		External rotation		Internal rotation	
180 °	6	45	3	180 °	6	60 °	5	T6	5
170 °	5	30	2	170 °	5	30 °	3	T12	4
130 °	4	15	1	140 °	4	10 °	1	L5	3
100 °	2	less	0	100 °	2	less	0	gluteal	2
80 °	1			80 °	1			less	0
less	0			less	0				
4. Anatomy (rotation/ angulation/joint incongruity/ retracted tuberosity/metal failure/myositis ossifans/nonunion/avascular necrosis)									
- none									
									10
- mild									
									8
- moderate									
									4
- marked									
									zero to 2
Total points									100 units

* Evaluation

Excellent	above 89
Satisfactory	above 80
Unsatisfactory	above 70
Failure	below 70

4). 3.5 cm

(Fig. 2).

()

mm 5). 8 mm, 3

가
가
(Fig. 3).
가

#5 (Ethibond, Ethicon, Somerville, U.S.A.)

(Fig. 4). 11

reaming 9

2

Fig. 3.

Fig. 4.

#5

가

가

(backstrike technique)

²⁴⁾

1

2

S

2

6

가 7

⁴³⁾ 1

2

40

38

가

가

1

1

16 mm

5 mm

38

50%

1

2

3 mm 1 mm

8 mm

6.7 mm 2 ,

5 mm

50%

7.5 mm 1 , 8 mm 31 , 9 mm 6

229.7 mm (, 180 mm~260 mm)

(Fig. 5).

Neer

가

30 ,

7 ,

2.6 mm (, 0 mm~5 mm)

2 ,

1

2

3.4 (,

2~4), 1.7 (, 1~2)가

,

1

3

Uniflex humeral nail (Biomet inc., War-

saw, In, U.S.A.) 36 ,

Unreamed humeral

nail (Mathys, Bettlach, Switzerland) 3

, Polarus 1 (Acumed. Beaverton, Ore-

gon, U.S.A.)

mm

VAS 1.4 (

ASES 가

84.1 (, 36.7~100)

16 ,

18 ,

2 ,

4

1

1

mm (, 3 ~ -18 mm) . 2

9,19), 10,16,36),
10,17,26,36), 36)

3 mm 1 ASES
1

가
mm가 1 ,

가 . 2)

17,18,21,23,36,41) Riemer 34)

Swiontkowski 40) 가 가

가 .

. 1)

3) . 2)

22) Reimer D 'Ambrosia³³⁾

. 3)

가

(Fig. 2). 3)

18,22)

. 4)

가 .

(Fig. 2)⁵⁾ . Lin

22)

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- backstrike
- 24)
- 4.6
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