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= Abstract =

A Comparison of Using Closed Interlocking Nailing versus Plate Fixation in Humeral Shaft Comminuted Fractures

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The purpose of this paper is to compare the results, complication, advantages and disadvantages of treatment with closed interlocking intramedullary nail with those with plate in humeral shaft comminuted fractures.

The authors have reviewed 25 cases of humeral shaft comminuted fractures, which were treated with closed interlocking intramedullary nail in 14 cases and plate in 11 cases, from November 1992 to May 1996.

The results were as follows:

1. The average time of operation in closed interlocking nailing was 72 minutes and that of plate fixation was 104 minutes.
2. The average time for bone union was 14.7 weeks in closed interlocking nailing and 14.9 weeks in plate fixation.
3. The complications of closed interlocking nailing were 2 cases of delayed union, 1 case of nonunion, 1 case of postoperative radial nerve palsy and 3 cases of pain and stiffness of

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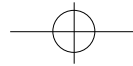
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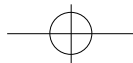
shoulder.

4. The complications of plate fixation were 1 case of delayed union, 2 cases of nonunion, 1 case of postoperative radial nerve palsy, 1 case of stiffness of shoulder.
5. Excellent and good functional results rated by Stewart and Hundley were 12(85%) cases in closed interlocking nailing and 8(73%) cases in plate fixation.

We concluded that closed interlocking nailing is one of the better useful method of treatment in humeral shaft comminuted fractures but, the procedures should be performed exactly.

Key Word : Humerus, Comminuted fracture, Closed interlocking nailing, Plate fixation

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OTA (major fragment)
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18 63 34.4
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11 14
(Table 1).
2)
1/3 7 , 1/3 11 ,
1/3 가 (Table 2).
3)
가
7 , 8
가 가 3 (Table 3).



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Table 1. Age and sex distribution.

Age/Sex	Interlocking		Plate		Total
	Male	Female	Male	Female	
10-19		1		1	2
20-29	4	1	3	1	9
30-39	4	1	2	1	8
40-49	1		1	1	3
50-59		1			1
>60	1		1		2
Total	10	4	8	3	25

Table 2. Fracture site.

Site	Interlocking	Plate	Total
Upper 1/3	5	2	7
Middle 1/3	6	5	11
Lower 1/3	3	4	7
Total	14	11	25

Table 3. Causes of Injury.

Cause	Interlocking	Plate	Total
Traffic accident	8	7	15
Fall down	2	1	3
Slip down	1	1	2
Refracture	1		1
Machinery injury		1	1
Others	2	1	3
Total	14	11	25

Table 4. Associated injuries.

	Interlocking	Plate	Total
Head injury			
skull fx.	1	2	3
facial fx.	2	1	3
intracranial bleeding	2		2
Chest injury			
lung contusion	1	1	2
rib fx.	2	1	3
pneumothorax	1	2	3
Other fracture			
spine fx.	1		1
pelvis fx.	3	2	5
femur fx.	1	1	2
tibia fx.	2	1	3
contralat. forearm fx.	1	1	2
contralat. elbow fx.	1	1	2
contralat. wrist fx.	1		1
Not combined	1	1	2

4)

6 ,

15

3

7 ,

5 ,

9

(Table 4).

2.

1)

1/3,

1/3

(anterolateral approach),

1/3

(posterior approach)

4.5mm

(dynamic compression plate)

6

(6 cortices)

Russel-

Taylor

30

(short deltoid-

splitting approach)

(image identifier)

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1cm

2)

1

5-

7

2

. U

(sugartong splint)

1

3

10-14

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2

4

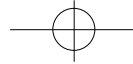


Table 5. Stewart and Hundley classification of results.

Excellent	No pain or impairment of function and no roentgenographic evidence of deformity
Good	No pain and no impairment of function ordinary purposes, but with limitation of motion in the elbow or shoulder of 20% or less, and with solid bony union and angulation of not more than 10 degree.
Fair	Solid bony union with occasional mild pain, angulation of more than 10 degree, or limitation of motion in adjacent joints of more than 20%, but with satisfactory function for light duties.
Poor	Persistent pain, limitation of motion in an adjacent joint of 40%, and with nonunion or malposition and impairment of function.

Table 6. Operating time.

Time(min)	Interlocking	Plate
40-60	2	
60-80	8	2
80-100	3	4
100-120	1	3
120-140		2
Mean(min)	72	104

Table 7. Bone union time.

Time(week)	Interlocking	Plate
6-8	1	1
8-12	1	1
12-16	5	3
16-20	4	3
>20	2	1
Mean(weeks)	14.7	14.9

3) 가

Stewart Hundley¹⁹⁾,
(Table 5).

Rosen(90)
20 28 , 28

16)

7 24 14.9
8

1. 26 14.7

(p>0.05)(Table 7).

70 140 3.
104

40 110 72 1 (9%),

t-test 2 (14%)

가 (p<0.05)(Table 6). 2 (18%),

1 (7%) 가 1

2.

가 1 (9%),

, 3/4 3 (21%) (Table 8).



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Table 8. Postoperative complication.

Complication	Interlocking(%)	Plate(%)
Delayed union	2(14)	1(9)
Non-union	1(7)	2(18)
Radial N. palsy	1(7)	1(9)
Shoulder pain	1(7)	
Shoulder LOM*	2(14)	1(9)

* limitation of motion

Table 9. Clinical results.

Result	Interlocking(%)	Plate(%)
Excellent	9(64)	6(55)
Good	3(21)	2(18)
Fair	1(7)	1(9)
Poor	1(7)	2(18)

4.

Stewart Hundley

73%

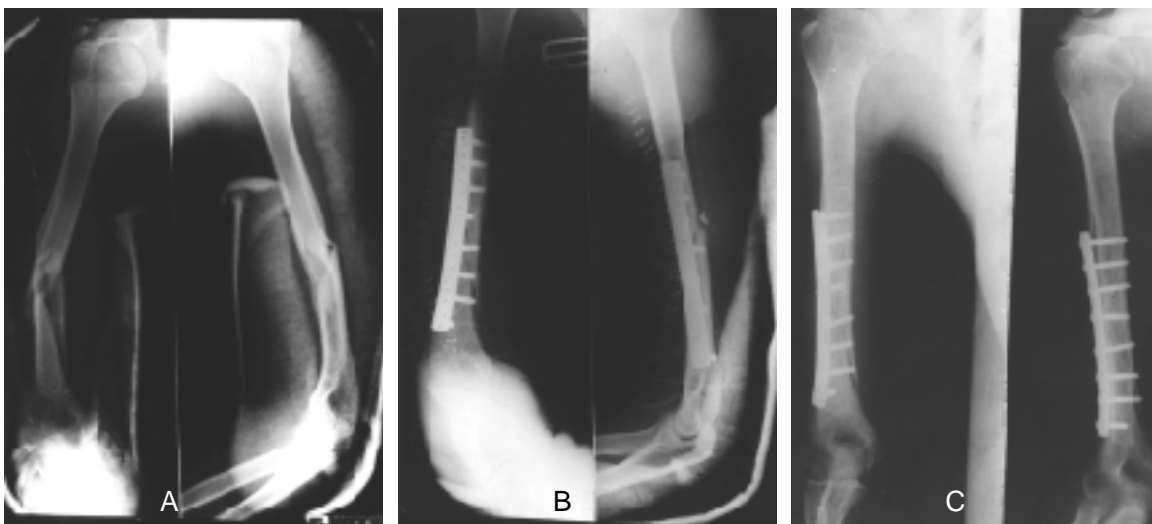
85% (Table 9).

1.

49

8

(Fig 1-A, B, C).

**Fig 1-A.** 49 years old man with distal one-third comminuted fracture of humerus**B.** Open reduction and internal fixation with plate**C.** At postoperative 8 weeks, radiologic bone union was seen

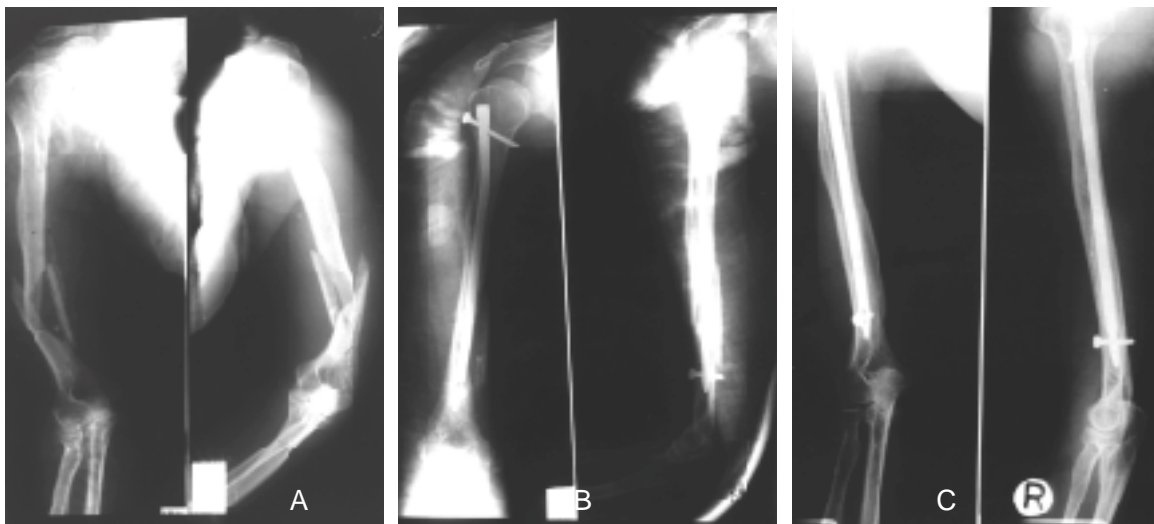
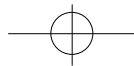
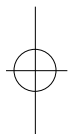


Fig 2-A. 52 years old woman with distal one-third comminuted fracture of humerus

B. Closed reduction and internal fixation with closed interlocking nail

C. At postoperative 14weeks, radiologic bone union was seen



2.

52

, U

, Velpeau bandage,

14

, Holstein Lewis¹⁰⁾

(Fig 2-A, B, C).

4,8,10)

Sarmiento¹⁷⁾

1%

1,12,13)

Rush pin, Ender ,

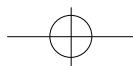
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Seidel ,

Watson-Jones²¹⁾

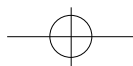
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6,15) . 가
2
가 (gap)
가
가 hole (sliding)
가 nonsliding type
, (distal interlocking hole)
, sliding hole DCP dynamic hole
eccentric point .
가 Russel-Taylor
(proximal screw)가 bicortical fixating screw
25 (retrospective study)
,
가
104 ,
72 Shah Bhatti¹⁸⁾
가 ($p<0.05$).
Foster⁹⁾
45 43 (96%)
Kuntscher 가 가
26 19 (73%)
1 (9%),
1 (7%)
11 8 2 6
(73%)
14 11 (79%)
14.9
14.7 1 (9%) ,
($p>0.05$), 3 (21%) 61
6 ,
4 (muscle atrophy)
63 3 (21%) 48
가 .
1 (9%),
2 (14%) 1 arm control C-





1. .

blind

technique

2. , , , .

Stewart Hundley

6 (55%), 2

3. 3 (21%)

(18%)

9 (64%), 3 (21%)

($p<0.05$).

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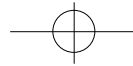
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