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= Abstract =

Treatment of Femoral Neck Fracture with Multiple Pinning

Sang-Won Park, M.D and Jong-Ryoon Baek, M.D., Sang-Seok Han, M.D

Department of Orthopaedic Surgery, Korea University Hospital, Seoul, Korea

The incidence of femoral neck fracture is increasing because of the lengthening of human life span and a rising incidence of industrial trauma. Despite of the advance in treatment, femoral neck fracture presents poor prognosis and high rate of complications such as avascular necrosis or non-union due to anatomical consideration. It still remains one of the unsolved fracture as far as treatments and results are concerned.

The purpose of this paper is to study the clinical results and factors predisposing to complication after multiple pin fixation of femoral neck fracture.

The authors reviewed 50 cases of femoral neck fracture treated by multiple pin fixation at the Department of Orthopedic Surgery, Korea University Hospital from January 1989 to December 1996 with followed up period of more than 1 year and analyzed the relationship between the clinical results and age, degree of displacement, degree of osteoporosis, interval between onset of injury and operation, reducibility and complications.

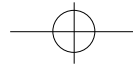
The results obtained were as follows:

1. The functional results by Luncford criteria were excellent in 15 cases (30%), good in 13 cases(26%), fair in 9 cases(18%), and poor in 13 cases(26%).

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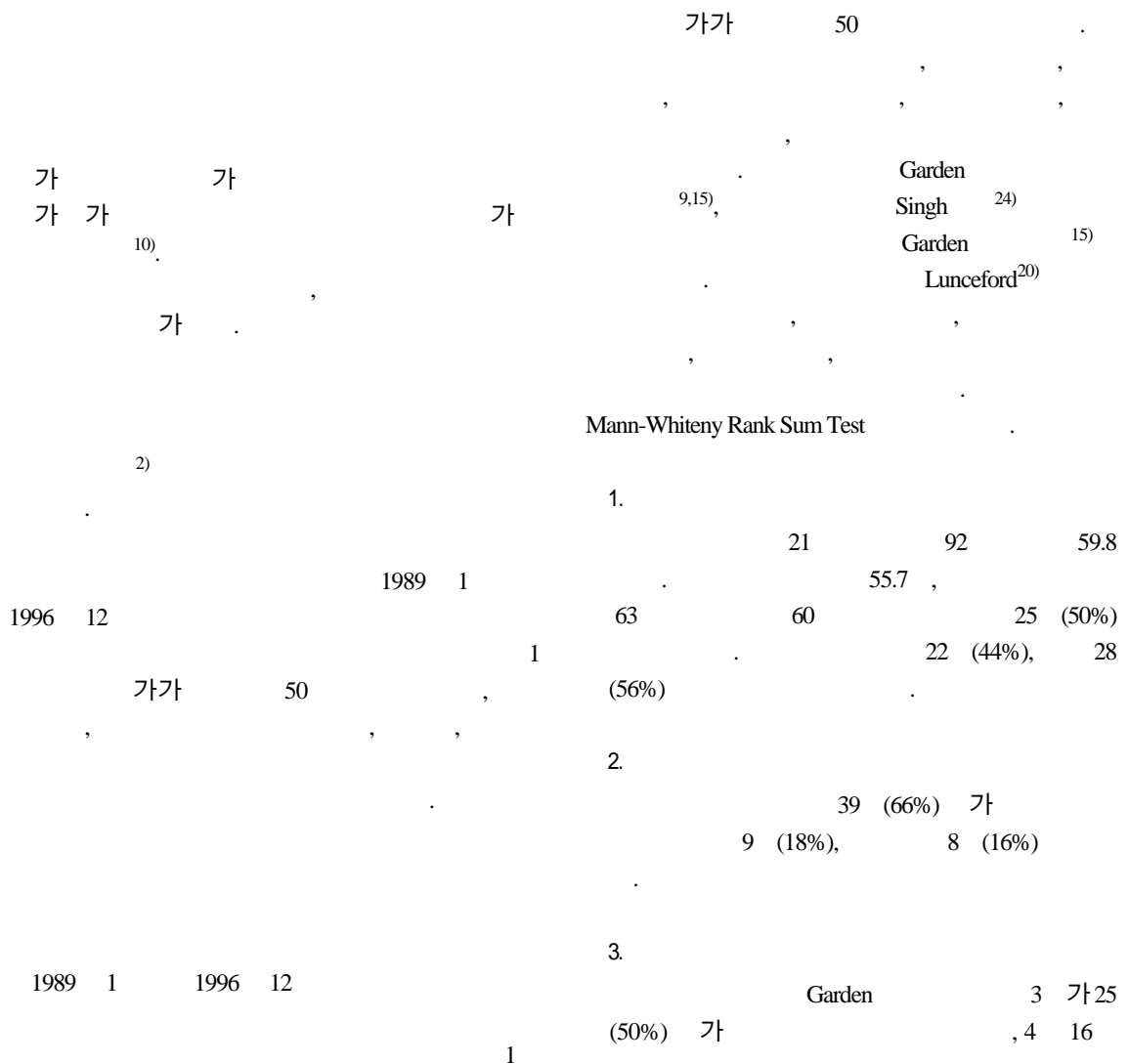
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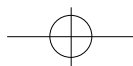


2. Union occurred in 36 cases (72%) and the mean duration of union was 6.1 months.
3. There were 12 cases (24%) of avascular necrosis, 2 cases(4%) of non- union, 2 cases (4%) of malunion and 1 case of traumatic osteoarthritis.
4. Poor results were noted in cases of displaced fracture, osteoporotic bone under the Singh index 3, reduced in varus or valgus.

Above results suggest that there was a relationship between the prognosis and bone density, degree of displacement and type of reduction, but the interval between the onset and operation within one month, and age distribution did not influence the end result.

Key Words : Femur neck fracture, Multiple pinning





222 •

/ 12 2

(32%), 2 6 (12%), 1 3 (6%)

C-arm

Whitman

4.

가

6

Knowles

Knowles

1 ,

1 ,

3

가 13 , 4

가

37 .

1 ,

,

8.

1 ,

,

Garden

(Garden 's alignment index)

1 ,

1

50

39 (78%), 8

(Cushing)

1 ,

1 ,

1 ,

(16%), 3 (6%) .

1 ,

2 ,

2 ,

1 .

5.

Singh

3

가 20 (40%), 4

30

(60%) .

1.

가

가 Luncford²⁰⁾

가

6.

50

가 15 (30%),

가 13 (26%),

3

가

9 (18%),

13 (26%)

28 (56%)

19 , 7

가 14 , 1

1

가 14

1

3

2.

가

12

2

7.

36 (72%)

4

6

가 25 (50%) 가

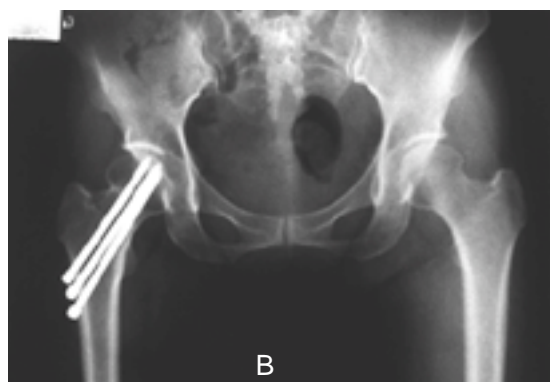


Fig 1-A. Pre-operative X-ray of 43 years old female patient showing right femur neck fracture of Garden stage 3.

B. Postoperative 2 year 's X-ray showing union of fracture site.

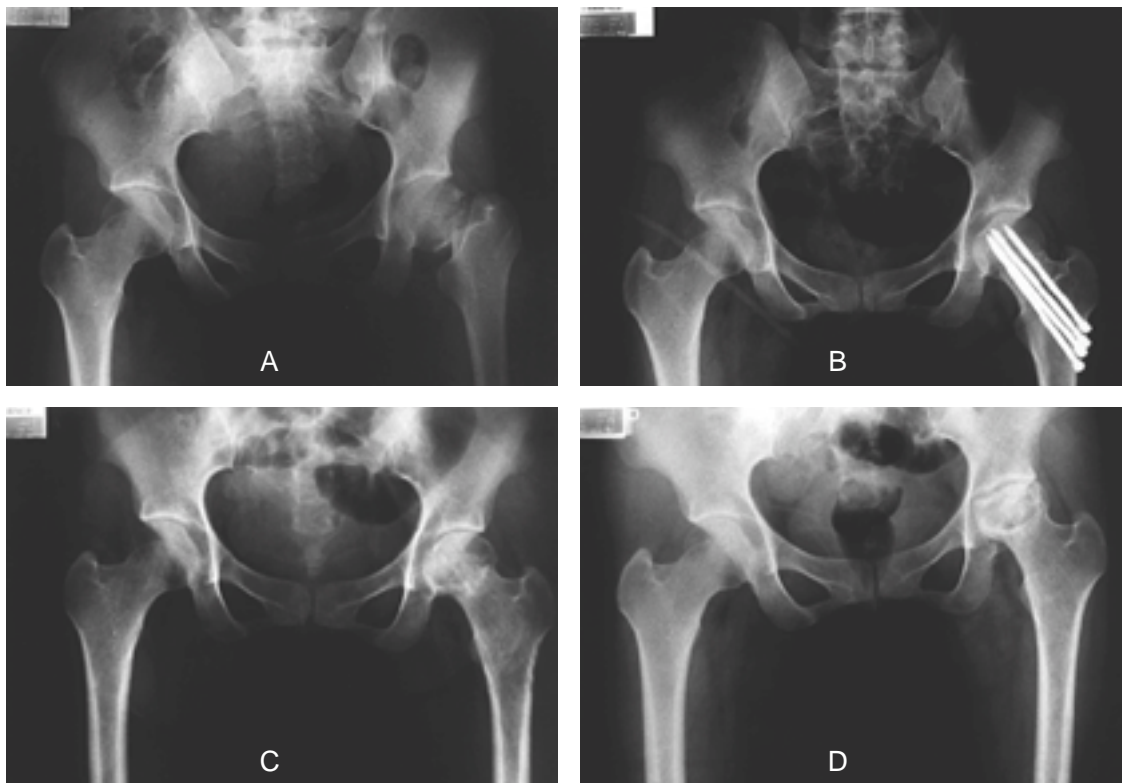
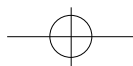


Fig 2-A. Pre-operative X-ray of 26 years old female patient showing left femur neck fracture of Garden stage 4.

B. Immediate postoperative X-ray showing anatomic reduction and four Knowles pin fixation

C. Postoperative 1 year 's X-ray, the implant was removed and avascular necrosis was noted.

D. Postoperative 2 year 's X-ray, avascular necrosis and collapse of left femur head was progressed.

6.1	(Fig 1-A,B).	14 (56%), 60	25
14 (56%)			
3.		(P>0.05)(Table 1A).	
17 (34%)		20 2 (50%), 30	0 (0%), 40
가 12 (24%)	가 (Fig 2-A,B,C,D)	3 (44%), 50	3 (30%), 60
2 (4%)(Fig 3-A,B,C),	2 (4%),	(33%), 70	3 (33%), 80
1 (2%)			2 (28%)
			(P>0.05)(Table 1B).
4.		5.	
		Garden ¹⁵⁾	
20	2	1 3	
(50%), 30	2 (100%), 40	2 (66%), 2 6	4 (66%),
6 (60%), 60	5 (55%), 70	3 25	12 (48%), 4 16
(55%), 80	4 (57%) 60	(37%)가	6
	25		

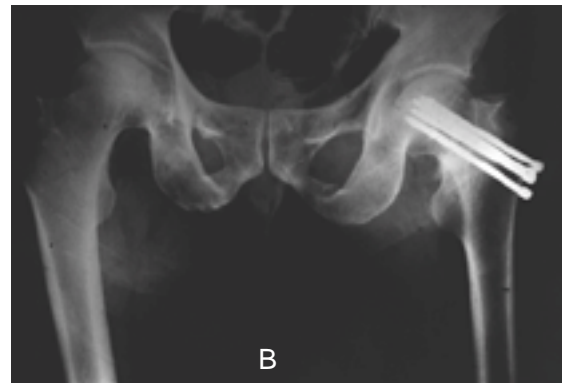
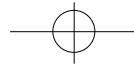
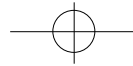


Fig 3-A. Pre-operative X-ray of 63 years old male patient showing left femur neck fracture of Garden stage 4.

B. Immediate postoperative X-ray showing varus reduction.

C. Postoperative 1 year 's X-ray, nonunion with failure of internal fixation was noted.

Group	Number	Percentage	Significance
Group 1	3	(3%)	(P<0.05)(Table 3-A,B).
Group 2	6	(16%)	
Group 3	25	(37%)	
Group 4	16	(24%)	
Group 5	6	(6%)	(P<0.05)(Table 2-A,B).
Group 6	19	(57%)	
Group 7	11	(78%)	
Group 8	14	(42%)	
Group 9	3	(30%)	(P>0.05)
Group 10	4	(14%)	
Group 11	2	(10%)	
Group 12	1	(5%)	
Group 13	7	(35%)	(P<0.05)(Table 4-A,B).
Group 14	2	(16%)	
Group 15	4	(28%)	
Group 16	1	(1%)	

**Table 1-A.** Clinical results according to age distribution.

Age\Results	Excellent	Good	Fair	Poor	Total
21 - 30 years	0	2	0	2	4
31 - 40 years	1	1	0	0	2
41 - 50 years	3	1	2	3	9
51 - 60 years	5	1	3	1	10
61 - 70 years	4	1	1	3	9
71 - 80 years	2	3	1	3	9
over 81 years	0	4	2	1	7
Total	15	13	9	13	50

Table 1-B. Relationship between complications and age distribution.

Age\Complications	AVN	Malunion	Nonunion	Traumatic OA	Complication rate
21 - 30 years	2	0	0	0	50 %
31 - 40 years	0	0	0	0	0 %
41 - 50 years	2	1	0	1	44 %
51 - 60 years	2	1	0	0	30 %
61 - 70 years	3	0	0	0	33 %
71 - 80 years	3	0	0	0	33 %
over 81 years	0	0	2	0	28 %
Total	12	2	2	1	

AVN ; Avascular necrosis

OA ; Osteoarthritis

Table 2-A. Clinical results according to Garden 's stage.

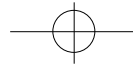
Stage\Results	Excellent	Good	Fair	Poor	Total
1	2	0	1	0	3
2	3	1	2	0	6
3	7	9	2	7	25
4	3	3	4	6	16
Total	15	13	9	13	50

Table 2-B. Relationship between complications and Garden 's stage.

Stage\Complications	AVN	Malunion	Nonunion	Traumatic OA	Complication rate
1	0	0	0	0	0 %
2	0	0	1	0	16 %
3	6	0	0	1	28 %
4	6	2	1	0	56 %
Total	12	2	2	1	

AVN ; Avascular necrosis

OA ; Osteoarthritis

**Table 3-A.** Clinical results according to degree osteoporosis.

Singh index\Results	Excellent	Good	Fair	Poor	Total
Under 3	4	2	7	7	20
Over 4	11	11	2	6	30
Total	15	13	9	13	50

Table 3-B. Relationship between complications and osteoporosis.

Singh index\Complications	AVN	Malunion	Nonunion	Traumatic OA	Complication rate
Under 3	7	1	2	0	50 %
Over 4	5	1	0	1	23 %
Total	12	2	2	1	

AVN ; Avascular necrosis

OA ; Osteoarthritis

Table 4-A. Clinical results according to operation interval.

Interval\Results	Excellent	Good	Fair	Poor	Total
0 - 3 days	7	4	1	7	19
4 - 7 days	4	7	1	2	14
1 week - 1 month	4	2	7	1	14
over 1 month	0	0	0	3	3
Total	15	13	9	13	50

Table 4-B. Relationship between complications and operation interval.

Interval\Complications	AVN	Malunion	Nonunion	Traumatic OA	Complication rate
0 - 3 days	7	0	1	0	42 %
4 - 7 days	2	0	0	0	14 %
1 week - 1 month	2	2	0	0	28 %
over 1 month	1	0	1	1	100 %
Total	12	2	2	1	

AVN ; Avascular necrosis

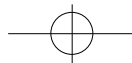
OA : Osteoarthritis

(P<0.05).

8. 39 26 5 (45%), 2 (18%), 11 (66%), 2 (18%) .

7 (17%), (2%), 1 (9%)

39 11

**Table 5-A.** Clinical results according to reduction type.

Reduction type\Results	Excellent	Good	Fair	Poor	Total
Anatomic	14	12	2	11	39
Valgus	1	1	1	0	3
Varus	0	0	6	1	8
Total	15	13	9	12	50

Table 5-B. Relationship between complications and reduction type.

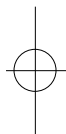
Reduction type\Complications	AVN	Malunion	Nonunion	Traumatic OA	Complication rate
Anatomic	7	0	1	1	23 %
Valgus	1	0	0	0	33 %
Varus	4	2	1	0	87 %
Total	12	2	2	1	

AVN ; Avascular necrosis

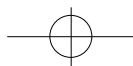
OA ; Osteoarthritis

(P<0.05)(Table 5-A,B).

6,17,21,25)



가 3,5) , 3 , 12) , 12) , Knowles pin, can-
 nulated screw, compression hip screw ,
 Van Andekercke 26) 3-4 Knowles
 Knowles
 thread , Clark 13) 3
 가
 Arnold 7) 가
 14) 3 - 4 Knowles pin



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가 18,19,25) .

가 3 가 57%

가 42% 4 7 78% 14%, 7 1

가 . Protzman Burkhalter²³⁾ 42%, 28% Graham¹⁶⁾

20 40 가 Holomberg¹⁷⁾ 1

86.4%, 59% , Askin 1

Bryan⁸⁾ 15 40 가 3

가 18.7% , 4)

. 60 25 14 89% 1)

(56%), 6 (24%), , 가

2 (8%), 1 (4%) , 60

25 14 (56%), 26 (66%), 7 (17%),

6 (24%), 2 (8%) 가 1 (2%)

Garden 2 (18%),

3 , 4 5 (45%), 2 (18%), 1

24%, 37% 1 , 2 (9%) 가

0%, 16% 가

18,19,25) ,

Askin Bryan⁸⁾ 가 1 가

가 ,

, Patrick Nelson²²⁾ 가

가 Singh 3 Lunceford²⁰⁾ 가

30%, 가 35% ,

Singh 4 73%, 1989 1

가 16% Singh 가 가 1996 12

가 50

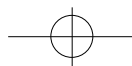
Brown Abrami¹¹⁾, Woodhouse²⁷⁾ 가

1. Lunceford 가

, Massie¹³⁾ 7 100% 15 (30%), 13 (26%), 9 (18%),

가 , Graham¹⁶⁾, 13 (26%) 28 (56%)

Holomberg¹⁷⁾ 2. 36 (72%)

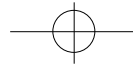


6.1 .
 3. 17 (34%)
 가 12 (24%) 가 2
 (4%), 2 (4%), 1
 (2%) .
 4. Garden 3 4 , Singh
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