

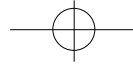


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The Journal of the Korean Society of Fractures
Vol.13, No.3, July, 2000

<		>	
:		:	
7		72	
1		2	
65		25.3	
Mann-Whitney U test		Chi-square test	
:		6	
, 1		2	
1		20	
2		31	
1		3	
4		2	
1		69.6kg	
2		62.0kg	
25		40	
Winqvist & Hansen		1	
1		2	
2		16	
31		17	
1		10mm가 4	
11mm가 2		12mm가 1	
10mm가 8		11mm가 13	
12mm가 25		13mm가 13	
14mm가 6		(p<0.05)가	
(p>0.05).		S-pin	
:		가	
:		:	
:		:	

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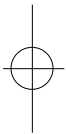
가

, 1918 Hey Groves
, 1940K ntscher¹⁾

. K ntscher, Klemm,

Groses, Kemp²⁾

Fig 1A. AIM femoral nail(ACE, California, U. S. A)



3-5)

1994 1 1998 6

29

3 ,

72

7

72 titanium

AIM nail(ACE, California, U. S. A)(Fig. 1)

1 6.5mm

2

12mm 4.5mm, 13mm

6.5mm

(Scanogram)

1994 1 1998 6

가 가

72

14

36

25.3

72

1/6

1 cm

가 가

0.5mm

1

2

가

(2)

6

10



(dynamization)

2, 4

1

65

2

7

1

Winquist

Hansen

Mann-Whitney U test

Chi-square test

driver

가

S-pin

. C-Arm

(Fig. 2).

Table 1. Age distribution

Age	Group	Group
11 20	4	13
21 30	3	27
31 40		13
41 50		5
51 60		2
61 70		4
71 80		1
Total	7	65

Table 2. Weight distribution

Weight	Group	Group
41 45	4	
46 50		6
51 55		10
56 60		9
61 65	3	15
66 70	2	11
71 75	2	8
96 100		2
Total	7	65

1.

1 17 22
 20, 2 17 73
 31 (Table 1) 1
 ($p < 0.05$).

2.

1 65Kg 74.0Kg
 69.6Kg, 2 42.0Kg
 100.0Kg 62.0Kg 1
 ($p < 0.05$)(Table 2).

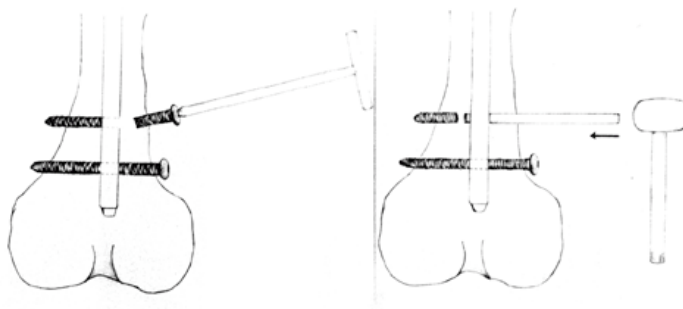


Fig 2. Removal of broken screw
 The screw head is removed with driver and broken shaft is push out with S pin medially.



3. 1 7 , 2
1 3 가 , 4
가 , 2 가 25 , (Fig. 3), 1
가 40 가 (3 4) 5
($p>0.05$).
Winqvist-Hansen 1 (8.5)
1 2 , 2 2 , 3 1 , 4 (Fig. 4).
2 , 2 1 16 , 2 31 2 9
, 3 17 , 4 1 , 1 1 , 4
($p>0.05$). 4.5) , 4
(8) .
4. 1 10mm
가 4 , 11mm가 2 , 12mm가 1 , 2
10mm가 8 , 11mm가 13 , 12mm가 25 , 13mm가
13 , 14mm가 6 1
($p<0.05$). 가가 ,
가가 가
5. 4 14 1/3
, 6 2 가 ,
1 Kntscher⁷⁾가
2 (interlocking) , Klemm

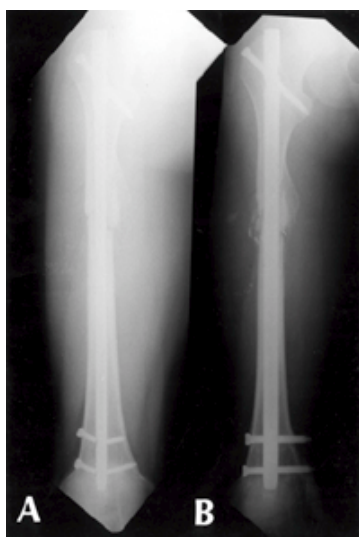


Fig 3

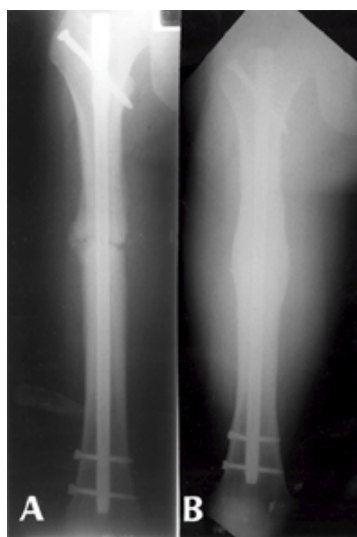
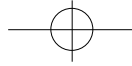


Fig 4

Fig 3. A. X ray taken 6 month after operation reveals breakage of both distal screws
B. Screw removal and IM nail change with bone graft were performed

Fig 4. A. Breakage of upper distal screw at 3months after operation.
At POD 8 months. bony union was completed.



Gross, Kempf⁸⁾

¹⁰⁾ Russel-Taylor, Brooker

Wills⁶⁾, Huckstep

2

가

(fatigue failure)

가

가

가

(Hole)

가가

13mm

6.5mm

10mm

12mm

4.5mm ,

, Bucholz

가 5cm

Hajek

가 50%

(torsional rigidity)

가

가

¹³⁾,

, X-ray

¹⁰⁾

가

2

1

11),

가

¹²⁾

8-30%

가 ,

. Boenish

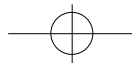
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REFERENCES

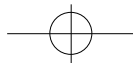
- 1) **Küntschner, G** : Die Marknagelung von Knochen
bruchen. Tierexperimenteller Teil, Klin, *Wschr.* 19:6,

가



- 1940
- 2) **Kempf L., Grosse A., Beck G. and Strasbourg :**
Closed locked intramedullary nailing. *J. Bone and Joint Surg.*, 67-A:709-719, 1985.
 - 3) **Renner N, Regazzoni P, Babst R and Rosso R :**
Initial experiences with the unreamed tibial nail. *Helv Chir Acta* 59:663, 1993.
 - 4) **Krettek C, Haas N, Schandelmayer P, Frigg R and Tscheme H :** Unreamed tibial nail in tibial shaft fractures with severe soft tissue damage, Initial experiences. *Unfallchirurgie* 94:579, 1991.
 - 5) **Melcher GA, Ryf Ch, Leutenegger A and Rueede Th :** Tibial fractures treated with the AO unreamed tibial nail. *Injury*. 24:407, 1993.
 - 6) **Healy WL, White GM, Brumack RJ, and Burgess AR, Brooker AF :** The treatment of fracture of the femoral shaft with the Brooke-Willis distal locking intramedullary nail. *J Bone and Joint surg.*, 68-A:865-876, 1986.
 - 7) **Küntschner G :** Intramedullary surgical technique and its place in orthopedic surgery, *J. Bone and Joint Surg.*, 47-A:809-818, 1965.
 - 8) **Kempf L, Grosse A, Beck G. and Strasbourg :**
Closed locked intramedullary nailing. *J. Bone and Joint Surg.*, 67-A:709-719, 1985.
 - 9) **Yoo MC, Lee YG, An Js, Kem BG :** Conventional Kuntscher IM Nailing and Interlocking IM Nailing of femoral shaft fracture. *J of Korean Orthop Surg.* 24-3:741-749. 1989.
 - 10) **Bucholz RW, Ross SE, Lawrence KL :** Fatigue fracture of the interlocking nail in the treatment of fracture of the distal part of the femoral shaft. *J. Bone and Joint Surg.*, 69A:1391-1399, 1987.
 - 11) **Krettek C, Schandermaier P and Tscheme H :** Removal of a broken solid femoral nail; a simple push-out technique. *J. Bone and Joint Surg.*, 79A:247-250, 1997.
 - 12) **Franklin JL, Winkquist. RA, Bernischke SK and Hansen ST Jr :** Broken intramedullary nail. 70-A:1463-1471, 1988.
 - 13) **Hajek P, Bicknell H, Bronson W, Albryht J, Suha S :** The use of one compared with two distal screw in the treatment of femoral shaft fracture with interlocking IM nail. A clinical & Biomechanical analysis. *J. Bone and Joint Surg.*, 75A:519-525, 1993.





Abstract

Breakage of Interlocking Screw after Intramedullary Nailing of Femoral Shaft Fracture

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Purpose : We analysed risk factors for failure of interlocking screws after femoral intramedullary nailing, and introduce tips for removing broken screw.

Materials and methods : Seventy-two closed femoral shaft fractures were treated with interlocking nail. We compared 7 patients in whom interlocking screw breakage occurred (Group I) with 65 patients without breakage of interlocking screw (Group II). Analytic parameters were age, weight, level of fracture, degree of comminution, nail diameter. We used Mann-Whitney U test & Chi-square test for statistical analysis.

Result : Upper one of distal interlocking screws was broken in 6 patients, both of distal screws were broken in one patient. All of the patients with broken screws had associated delayed union. The mean age of patients were 20 years in group I, 31 years in group II. The mean weight were 69.6 Kg in group I, 62.02kg in group II. Three patients had fractures in proximal half and four patients had fractures in distal half in group I. In group II, there were 25 proximal fractures and 40 distal fractures. There were 2 type I, 2 type II, 1 type III, 2 type IV fractures in group I, and 16 type I, 31 type II, 17 type III, 1 type IV fractures according to Winquist and Hansen classification.

Nail diameters were 10mm in 4 patients, 11mm in 2 patients, 12mm in 1 patient for group I and 10mm in 8 patients, 11mm in 13 patients, 12mm in 25 patients, 13mm in 13 patients, and 14mm in 6 patients for group II. Age, weight, degree of comminution, nail diameter had statistically significant relation to the breakage of interlocking screw ($p < 0.05$), but the level of fracture didn't ($p > 0.05$). Broken screws were easily removed by advancing screw to medial compartment with S-pin and making short medial incision.

Conclusion : It is suggested from our study that combination of parameters may have contributed to the failure of interlocking screw ; narrower diameter nail for comminuted fracture in young, active patients with more body weight. Inserting two screws have advantage over one screw.

Key Words : femoral shaft fracture, intramedullary nailing, interlocking screw, breakage