

: 1998 3 2002 3
 59 53 Kempf 12 가 가
 : 18.7 (12-28) Denker 가 가
 (Winstquist - Hansen 1, 2) 18.1 가 (3, 4) 20.3 가 가 18.1
 20.5 , 20.8 (p<0.05). 가 20.1 17.9
 (p<0.05), 가 가
 , 가 1 , 1 가 . 2 (1 , 1)
 : 5 가 가 가 가
 : , ,

Analysis of Prognostic Factors for Union Time after Unreamed Femoral Nailing

Oog Jin Shon, M.D., Won Je Lee, M.D.

Department of Orthopaedic Surgery Yeung Nam University Hospital, Daegu, Korea

Purpose: To assess the evaluation of prognostic factors according to union time after unreamed femoral nailing.

Materials & Methods: From Mar. 1998 to Mar. 2002, 53 cases of bone healing were analyzed among the fifty-nine femoral shaft fractures were treated with unreamed femoral nail (AO, UFN) and had been followed for more than 12 months. Clinical bone healing time was analyzed by Kempf's method and were evaluated prognostic factors according to union time.

Results: Mean duration of the bone healing time was 18.7 weeks. According to Denker's classification, functional results were seen over satisfactory at all cases. Bone healing time was more faster at the low communitation group than high communitation group at 18.1 weeks. At the middle portion, bone healing time was fastest. Closed reduction cases were more faster than open reduction cases at 17.9 weeks. Bone healing time was faster that fracture was more close distance from isthmic portion. Bone healing time was not influenced age, isthmic ratio, operation time, associated injury.

Conclusion: All cases were unioned within 5 months without severe complication. That was seen faster bone healing time, in that low communitation, more close distance of fracture from the isthmic portion, closed reduction method.

Key Words: Femur, Shaft fracture, Unreamed femoral nailing, Union period

:
 705-717
 Tel : 053-620-4679 · Fax : 053-628-4020
 E-mail : ossoj@med.yu.ac.kr

Address reprint requests to : Oog Jin Shon, M.D.
 Department of Orthopaedic Surgery, Yeungnam University Hospital,
 317-1, Daemyung-dong, Nam-Gu, Daegu, 705-717, Korea
 Tel : 053-620-4679 · Fax : 053-628-4020
 E-mail : ossoj@med.yu.ac.kr

1940

4,6,18)

가

가

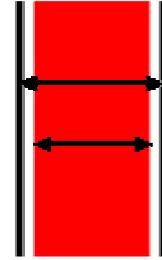


Fig. 1. Isthmic ratio: nail diameter/isthmus portion diameter (AP view)

가 5 , 1 .
Winqvist-Hansen¹⁶⁾

1 28 (52.8%) 가 , 2
9 , 3 11 , 4 5
가 6 (Gustilo-Anderson 1 4 , 2 2) .

1).

가

가 8 , 가 39 ,

가 6 .

53 31 (58.5%)

19)

가

Abbas 5 , 6 , 2 ,

1)

6 가 ,

5 가 .

가 .

. 80%

14 , 90% 26 , 91% 13
(Fig. 1).

4.7 cm (1~

11 cm) ,

1998 3 2002 3

90 90

(AO, UFN)

12 가 가

24 , 90 29 ,

59 53 53

1 2 , 3 12 (22.7%),

3 2 (3.7%) . 2

17 79 , 34.5

40 가 38 (71.7%)

가 39 , 가 14

가 (piriformis fossa)

36 , 7 ,

17

6 가 49 ,

2~3 가 (p>0.05) (Table 1).
 가
 가
 가
 Kempf³⁾
 Den-
 ker²⁾
 independent T-
 test, ANOVA, correlation analysis

18.3 22 19.1
 Winquist-Hnassen 1
 18.4 3 20.1
 20.6
 low group 1, 2 18.1 가
 high group 3, 4 20.3 (p<0.05)
 (Fig. 4).
 20.8 18.1 20.5
 가
 가 (p<0.05) (Table 2).

1.
 40 38 18.8
 , 41~60 7 17.7 , 61 8 90
 19.1 (p>0.05).
 2.
 31

4.
 90 18.3 ,
 90 19.1 90 (p>0.05).
 18.4 , 2 19.6 , 3 가
 19.5 (p>0.05).
 5. &

Table 1. Associated injury

| | N (%) | Unino time (wks) |
|----------------------|-----------|------------------|
| Fracture | 18 (34.1) | 18.8 |
| Facial bone fracture | 5 (9.4) | 17.8 |
| Chest injury | 6 (11.3) | 18.2 |
| Abdominal injury | 2 (3.7) | 18.5 |
| None | 22 (41.5) | 19.1 |
| Total | 53 (100) | 18.7 |

Table 2. Union time according to fracture location

| | N (%) | Unino time (wks) |
|----------|-----------|------------------|
| Proximal | 8 (15.1) | 20.8 |
| Middle | 39 (73.6) | 18.1* |
| Distal | 6 (11.3) | 20.5 |
| Total | 53 (100) | 18.7 |

* p<0.05

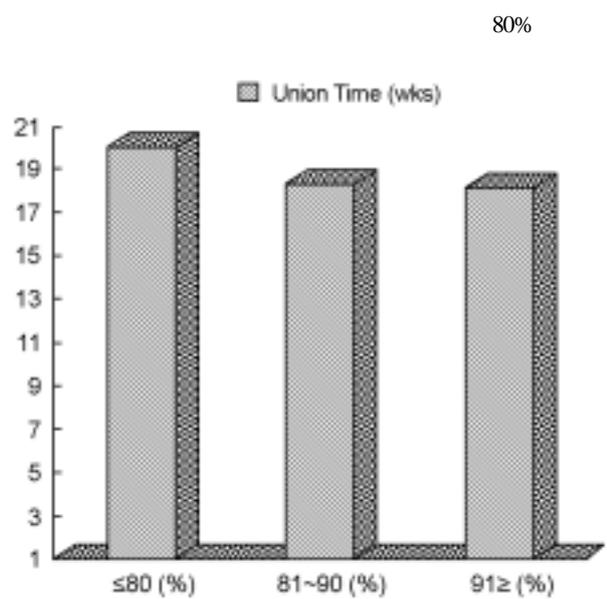


Fig. 2. Union time according to isthmic ratio

20 , 81~90% 18.3 , 91%
 18.2 , 80%

가 가
 (p<0.05).

(p>0.05) (Fig. 2).

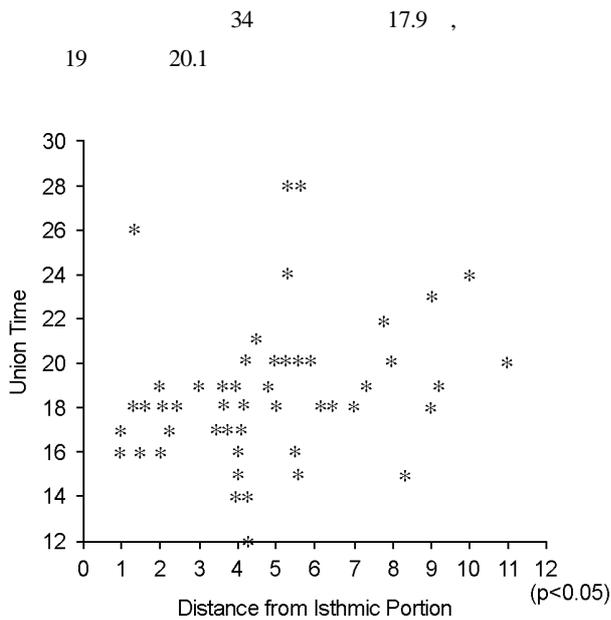
가 가
 (p<0.05) (Fig. 3).

7.

6.

Denker 가 ,
 (Table 3).

8.



53 4 . 2
 (1 , 1) 가 ,
 1 , 1 .

cast, brace

Table 3. Functional results - Denker's classification

| | N (%) |
|--------------|-----------|
| Excellent | 50 (94.3) |
| Satisfactory | 3 (5.7) |
| Poor | - |
| Very poor | - |
| Total | 53 (100) |

Fig. 3. Union time according to distance from isthmic portion (p<0.05)



Fig. 4A-D. (A) Winquist-Hansen type 1 fracture of a 20 year-old man
 (B) 12 months postoperative radiographs demonstrate good union for fracture, excellent Denker's result at last follow up. Isthmic ratio was 83.3%. Bone union was 17 weeks.
 (C) Winquist-Hansen type 1 fracture of a 20 year-old man
 (D) 18 months postoperative radiograph demonstrating good union for fracture, satisfactory Denker's result at last follow up. Isthmic ratio was 78.5%. Bone union was 21 weeks.

1940 Küntscher⁶⁾

가

4,14,18). 1950

6

가 20.5

1965

20.8

가

18.1

9)

2

Küntscher가

7,8)

Klemm

5)

가

3, 4

Abbas

1)

1~1.5 mm

가

가

1,5)

1962

Küntscher가

가

7),

Pratt

13)

가,

, 1979

Pfister

12)

40

18.8

, 41~60

17.7 , 61

19.1

11).

1

18.4 ,

19)

1

19.5

1

15.2 , 17.7

가

18.7

18.3 ,

19.1

17.9 ,

20.1

20)

, 1986

Wiss

17)

16.1 ,

20.5

3, 4

Winqvist-Hansen

, 1

18 ,

2

18.4 ,

3

20.1 ,

12.5%

, 2%

4 20.6

가

가

,

53

34

10)

2

(5°

Winqvist-Hansen

1, 2

1 , 4°

1)

가

3, 4

12 ,

가

19

가

가

(p<0.05).

9)

- 1) **Abbas D, Faisal M and Butt MS:** Unreamed femoral nailing. *Injury*, 711-717, 2000.
- 2) **Denker H:** Shaft fracture of the femur. *Acta Chir Scand*, 130: 173-181, 1965.
- 3) **Kempf I, Grosse A and Beck G:** Closed locked intramedullary nailing. *J Bone and Joint Surg*, 67A: 709-719, 1985.
- 4) **Kim JO and Koh YD:** Treatment of Femoral Shaft Fracture by Interlocking Intramedullary Nailing - Relative Analysis Between Closed Nailing and Open Nailing. *Journal of the Korean Society of Fractures*, 11(2): 328-336, 1998.
- 5) **Klemm K and Schellmann WD:** Dynamische und statische Verriegelung des Marknagels. *Monatschr Unfallheilk*, 75: 568-575, 1972.
- 6) **Küntscher G:** Die Marknaelungen Knochen brüchen. *Langenbechs Arch*, 200: 443-455, 1940.
- 7) **Küntscher G:** Praxis der Marknagelung. Schattauer, Stuttgart, 1962.
- 8) **Küntscher G:** Intramedullary surgical technique and its place in orthopedic surgery. *J Bone and Joint Surg*, 47A: 809, 1965.
- 9) **Lee SC and Song MH:** Nonunion of the Fracture of Distal One-third of Femoral Shaft treated by Interlocking Intramedullary Nailing. *Journal of the Korean Society of Fractures*, 12(2): 259-266, 1999.
- 10) **Lee SW, Kwon KW, Kim SK, Choi CH and Chang HS:** Closed Interlocking Nailing for Femoral Shaft Fracture - Comparison of results according to fracture comminution and site. *Journal of the Korean Society of Fractures*, 11(3): 528-532, 1998.
- 11) **Pape H, Aufm'Kolk M, Paffrath T, et al:** Primary intramedullary femur fixation in multiple trauma patients with associated lung contusion. A case of post-traumatic ARDS. *J Trauma*, 34-540, 1993.
- 12) **Pfister U, Rahn BA and Perren SM:** Vaskularität und Knochenumbau nach Marknagelung lange Röhrenknochen. *Akt Traumatologie*, 9: 191-195, 1979.
- 13) **Pratt DJ, Papagiannopoulos G, Rees PH, et al:** The effects of medullary reaming on the torsional strength of the femur. *Injury*, 18(3): 177-179, 1987.
- 14) **Rho YW, Lee DS and Lee KW:** Closed Intramedullary Nailing of Femoral Shaft Fractures. *J Korean Orthop Assoc*, 21(4): 646-650, 1986.
- 15) **Schneider M:** Closed intramedullary nailing of femoral shaft fracture using Küntscher method. *ICL*, vol28: 88-90, 1979.
- 16) **Winquist RA, Hansen ST JR and Clawson DK:** Closed intramedullary nailing of femoral fractures. A report of five hundred and twenty cases, *J. Bone Joint Surg*, 65A: 529-539, 1984.
- 17) **Wiss DA, Fleming CH, Matta JM, et al :** Communitated and rotationally unstable fractures of the femur treated with an interlocking nail. *Clin Orthop*, 212: 35-47, 1986.
- 18) **Yoo MC, Bae DK, Lee YG, Kim YS and Lee MH:** Treatment of Tibial Fractures by Interlocking Intramedullary Nailing. *J Korean Orthop Assoc*, 24: 1321-1329, 1989.
- 19) **Yoon HG, Jeon KP, Kang KH, Kim JI and Kim DS:** A Clinical Comparative Study of Reamed and Unreamed Nail of Femoral Shaft Fracture. *Journal of the Korean Society of Fractures*, 11(3): 495-500, 1998.
- 20) **Yoon SH, Lee GJ, Hwang DS, Byun GY and Yang JY:** Closed, Semiclosed, Open Intramedullary Nailing in Segmental Fractures of Femoral Shaft. *J Korean Orthop Assoc*, 28: 1684-1689, 1993.