



13, 4, 2000 10

The Journal of the Korean Society of Fractures
Vol.13, No.4, October, 2000

. . . .

< >

:

: 1 가 가 49

: 49 19 (38%) (11.8%) (60%)
(51.9%) . AO A ,B ,C 32.4%, 55.6%, 66.7%
16 7 (43.8%), 14 4 (28.6%), 7 1 (14.3%)
가

:

가

가

가

가

: Hwa Jae Jeong.
108, Pyeng-Dong, Jongro-Gu, Seoul Korea. 110-102
Department of Orthopaedic Surgery, Sungkyunkwan University School of Medicine,
Kangbuk Samsung Hospital.
Tel : 02)2001-2001
Fax : ((02)723-4880
E-mail ; jocdoc@samsung.co.kr





906 • / 13 4

1.

, , 가 ³₁₄, 가₅, 가₁₇, 가₂₇

가

2.

, , 5 가 ^{5,12}_{1,4,11} AO ¹⁴. A
가 가 37 (A1 16, A2 14, A3
7), B 9 (B1 2, B2 6, B3 1), C
3 (C2)

3.

가 42 (85.7%)
1/3(,)
18 (42.9%), 가 8 (19%), 1/3(
) 9 (21.4%), 7
(16.7%),
(14.3%)

4.

1994 1 1997 12 6 (12.3%)
1 가가 2
48, 49 , 4
Russel-Taylor (Smith and Ilizarov Orthofix
Nephew Richards, Memphis, Tennessee) 20, AO
(Synthes, Paoli, Pennsylvania) 15, ACE (Dupuy, Los
Angeles, California) 14
42.9 (19-74), 가 32, 가 16
가
25,
24
49
5°
4)

5.

가

SPSS ANOVA(Analysis of Variance)
0.05



B1 2 1 (50%), B2 6 3 (50%),
B3 1 1 , C2 3 2 (66.7%) 5 °

.
(p<0.05)
42 (85.7%)
49 18 (42.9%) 5 °
30 (62%) 5 ° (, 7 1 (14.3%) 5 °
) , 5 °
19 (38%), 1 , (p<0.05).
7 , 6 , 8 , 43 17 (39.5%) ,
가 6 2 (33.3%) 5 °
가 5 , 10 ° 2 ()
(Fig 1). 가
5 3 (60%),
17 2 (11.8%), 27 14 5 °
(51.9%) 5 ° 50.3%
51.9%, 5 °
(p<0.05).
AO 32.4%,
A, B, C 41.2% 5 °
55.6%, 66.7% , A 36.8%, 5 °
(A1) 16 7 (43.8%), (A2
) 14 4 (28.6%), (A3) 7 1
(14.3%) 1 3
가 (Table 1).
(Table 2).

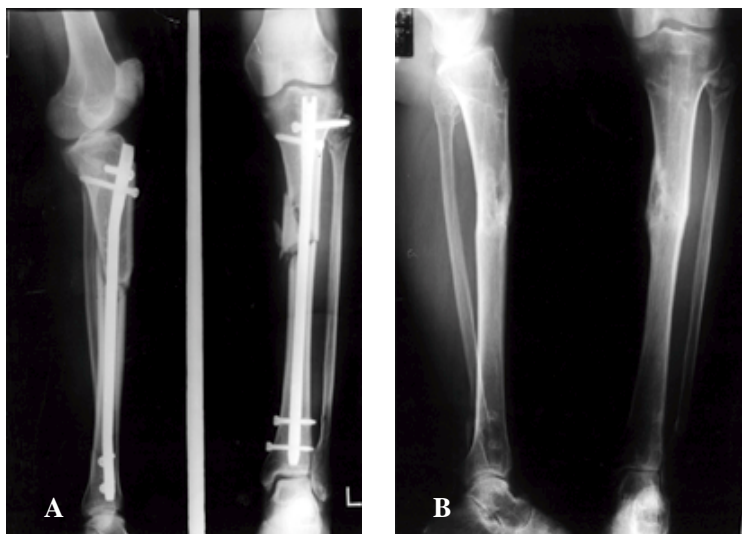


Fig 1A. Immediate postoperative radiographs show a comminuted fracture of tibial shaft. Note that nail insertion site is in a position of 58% in anterior radiograph and 36% in lateral radiograph

1B. Radiographs showing 6 ° varus angulation and 10 ° anterior deformity at follow up evaluation

Table 1. Several factors related to angular deformity

	Factors	Number of cases	Angular deformity	
			Number	Percentage(%)
Location	proximal 1/3	5	3	60
	middle 1/3	17	2	11.8
	distal 1/3	27	14	51.9
Type*	A1	16	7	43.8
	A2	14	4	28.6
	A3	7	1	14.3
	B1	2	1	50
	B2	6	3	50
	B3	1	1	100
	C2	3	2	66.7
Wound	open	6	2	33.3
	closed	43	17	39.5
Fibula	fractured	42	18	42.9
	intact	7	1	14.3

* Classification of tibial shaft fracture by AO-ASIF group.

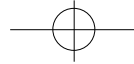
Table 2. Statistical significance of nail insertion site affecting angular deformity

Site(NIS)	Acceptable	Angulatory
Transverse*	50.3%	51.9%
Longitudinal [†]	41.2%	36.8%

* Nail insertion site(NIS) in frontal plane, defined as the ratio of the distance from the medial tibial cortex to the middle of the nail divided by width of the tibial plateau

† Nail insertion site(NIS) in sagittal plane, defined as the ratio of the distance from knee joint line to the nail divided by length of tibial plateau to tibial tuberosity

[illegible]



1/3 , .

가 가 가

1 3

16 7 (43.8%), 14 4 (28.6%),

가 .⁷⁾ 7 1 (14.7%)

1/3

($p < 0.05$).

Teitz⁸⁾ 가

가

. Tornetta⁹⁾ . Sarmiento¹³⁾

가

가 Benirschke³⁾

Freemann⁴⁾

가

가 . Lang⁷⁾

AO A(),

B(wedge), C()

32.4%, 55.6%, 66.7%

가

. Benischke³⁾

가 가

가 A1 16 7 (43.8%),

A2 14 4 (28.6%), A3 7 1

(14.3%), B1 2 1 (50%), B2 6 3

(50%), B3 1 1 , C2 3 2 (66.7%)

5 ° 가 가

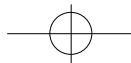


가

가

REFERENCE

- 1) **Alho A, Ekeland A, Stromsoe K, Folas G and Toresen BO** : Locked intramedullary nailing for displaced tibial shaft fractures. *J Bone Joint Surg*, 72-B:805-809, 1990.
- 2) **Anderson LD, Hutchins WC, Wright PE and Disney JM** : Fractures of the tibia and fibular treated by casts and transfixing pins. *Clin Orthop*, 105:171-191, 1974.
- 3) **Benirschke SK, Henley MB and Ott JW** : Proximal one-third tibial fracture solutions. *Orthop Trans*, 18:1055-1056, 1995.
- 4) **Freeman EL and Johnson EE** : Radiographic analysis of tibial fracture malalignment following intramedullary nailing. *Clin Orthop*, 315:25-33, 1995.
- 5) **Karlstrom G and Olerud S** : Fractures of the tibial shaft. A critical evaluation of treatment alternatives. *Clin Orthop*, 105:82-115, 1974.
- 6) **Koval KJ, Clapper MF and Brumback RJ** : Complications of reamed intramedullary nailing of the tibia. *J Orthop Trauma*, 5:184-189, 1991.
- 7) **Lang GJ, Vohrn BE, Bosse MJ and Kellam JF** : Proximal third tibial shaft fractures. *Clin Orthop*, 315:64-74, 1995.
- 8) **Teitz CC, Carter DR and Frankel VH** : Problems associated with tibial fractures with intact fibulae. *J Bone Joint Surg*, 62-A:770-776, 1980.
- 9) **Tornetta P and Collins E** : Semiextended position for intramedullary nailing of the proximal tibia. *Clin Orthop*, 328:185-189, 1996.
- 10) **Trafton PG** : Closed unstable fractures of the tibia. *Clin Orthop*, 230:58-67, 1988.
- 11) **Whittle AP, Russell TA, Taylor JC and Lavelle DG** : Treatment of open fractures of the tibial shaft with the use of interlocking nailing without reaming. *J Bone Joint Surg*, 74-A:1162-1171, 1992.
- 12) **Karlstrom G and Olerud S** : Fractures of the tibial shaft. A critical evaluation of treatment alternatives. *Clin Orthop*, 105:82-115, 1974.
- 13) **Sarmiento A, Sharpe FE, Ebramzadeh E, Normand P and Shankwiler J** : Factors influencing the outcome of closed tibial fractures treated with functional bracing. *Clin Orthop*, 315:8-24, 1995.
- 14) **Johner R and Wruhs O** : Classification of tibial shaft fractures and correlation with results after rigid internal fixation. *Clin Orthop*, 178:7-25, 1983.
- 15) **Puno RM, Vaughan JJ, Stetten ML and Johnson JR** : Long-term effects of tibial angular malunion on the knee and ankle joints. *J Orthop Trauma*, 5:247-254, 1991.



Abstract

The Angular Deformity of Interlocking Nailing in Tibial Fractures

Hwa Jae Jeong, M.D., Kyung Chul Kim, M.D.,
Jae Yeul Choi, M.D., Bon Seop Koo, M.D., Jung Hee Oh, M.D.

*Department of Orthopaedic Surgery, Sungkyunkwan University School of Medicine,
Kangbuk Samsung Hospital, Seoul, Korea*

Purpose ; We studied the relationship between angular deformity and possibly contributing factors in the treatment of tibial fractures with interlocking nailing.

Materials and Methods : Intramedullary nailing of the tibia was performed on 49 cases and were followed for the minimum of 12 months. We analyzed relationship between angular deformity and postoperative tibial alignment, operative technique and other factors.

Results : Of the 49 cases, 19(38%) were angulated. Angular deformity was seen in 60%, 51.8% and 11.8% in the proximal, distal and middle third of tibial fractures respectively.

With AO classification, Group A,B,C were angulated in 32.4%, 55.6%, 66.7%. In group A, 43.8% of spiral fractures, 28.6% of oblique fractures and 14.3% of transverse fractures were angulated. The cases combined with fibular fracture showed higher incidence of angular deformity than the cases with intact fibula. The opening of fracture and the nail insertion site were not significant to angular deformity.

Conclusion : Angular deformity of interlocking nailing in tibial fractures were more common in proximal, comminuted and spiral fractures. Precise attentions to operative technique i. e. accurate anatomical reduction and centromedullary nail orientation are recommended to prevent angular deformity. In proximal third tibial shaft fractures where muscles and patellar tendon has deforming force on fracture fragment, authors believe that use of interlocking nailing must be limited with fracture pattern.

Key words : Tibial fractures, Interlocking nailing, Angular deformity

Address reprint requests to _____

Hwa Jae Jeong.

108, Pyeng-Dong, Jongro-Gu, Seoul Korea. 110-102

Department of Orthopaedic Surgery, Sungkyunkwan University School of Medicine,
Kangbuk Samsung Hospital.

Tel : 02)2001-2001

Fax : ((02)723-4880

E-mail ; jocdoc@samsung.co.kr