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= Abstract =

Interlocking Intramedullary Nailing for the Treatment of Segmental Tibial Shaft Fractures

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The treatment of segmental tibial shaft fractures poses many problems because of the serious damage to the surrounding soft tissue that usually occurs from the high-energy trauma, and the results are often unsatisfactory following lots of complications like non-union, delayed union, malunion, and infection. We studied to evaluate the treatment results of interlocking intramedullary nailing for the segmental tibial shaft fractures.

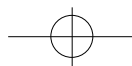
Twenty-two cases of segmental tibial shaft fractures were reviewed and we analyzed the results of surgical treatment in the viewpoint of bony union times, complication and its final outcome. The range of follow-up was 12 months to 68 months with mean 38 months follow-up. Most of the patients were between forty and sixty years, and average age was 47 years. Associated injury was incurred in nineteen cases with various musculoskeletal symptoms and

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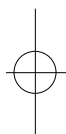
signs. According to Meils' classification, 8 were Type I, 1 was Type II and 3 were Type IV of the 12 closed fractures. Of the 10 open fractures, 4 were Type I, 2 were Type II, 3 were Type IV, and 1 demonstrated multisegmental fractures.

All of the closed fractures were united well except only one infected nonunion. The average time to union was 21.6 weeks with range from 16 to 26 weeks. The healing was slowest in Type IV and fastest in Type I fractures. There was no significant difference in the healing time between the distal and proximal fractures. Of the 10 open fractures, each one of open type I fracture and open type II fractures did not unite because of infected nonunion. The average time to union was 26.4 weeks with range from 16 to 38 weeks for the remaining 8 open fractures. The healing was slowest in Type IV and fastest in Type I fractures.

There were 3 cases of infected nonunion, 1 case of delayed union of the proximal fracture and 1 case of valgus deformity of distal fracture. The infection was controlled and bone union obtained with removal of the nail and reaming, curettage and antibiotic bead wire, and plating with bone graft.

We recommend that wherever possible, interlocking intramedullary nailing can be used for the closed or open type I and II segmental tibial shaft fractures. And a high rate of union and a low rate of complication can be expected with this treatment modality.

Key Words : Tibia segmental fractures, Interlocking intramedullary nailing



Tscheme²²⁾ 3~12% 4) 1991

1 1997 1 40

1 가가 22

가

1, 15)

2, 15, 23) 50% 22 62 46.8

17) 40 50 가 17 (77%),

13, 15, 23) 5 가 21 (95.5%)

가 13 (61.9%)

가 5 , 가 3 ,

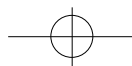
가 1 . 11 ,

11 . 19

21 , 11 3

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**Table 1.** Analysis of patients with segmental tibia shaft fractures.

	A	B	C	D	E	F	G	H	I
1	56/F	ped	I	R/C	-	7	16/16	-	-
2	28/M	car	I	R/C	Ankle. Lt & knee. Rt	19	18/20	-	-
3	54/M	ped	IV	R/C	-	5	24/24	-	-
4	40/F	ped	I	R/C	Brain injury	12	18/16	-	-
5	22/M	ped	IV	L/C	Radial & peroneal nerve injury	25	26/26	-	-
6	48/M	car	I	L/C	Ankle. both	20	18/16	-	-
7	58/M	ped	IV	R/O(I)	Ankle & IDK. Rt	1	24/28	-	-
8	36/M	ped	II	L/O(II)	Abdominal injury	1	20/24	-	-
9	55/F	ped	IV	R/O(I)	Both ankle & femur. Lt	40	38/30	25	delayed union
10	53/F	ped	I	R/O(I)	Femur & ankle. Rt	33	16/22	-	-
11	44/M	ped	I	L/C	Chest & abdomen injury	30	58/32	-	infected nonunion
12	32/M	car	IV	R/O(I)	Femur & tibia. Lt, both ankle	2	26/24	-	-
13	52/F	ped	I	L/C	Brain injury & pelvis. Lt	24	18/16	-	-
14	52/M	aut	M	R/O(II)	Multiple Fx. & knee crushing	26	36/40	-	infected nonunion
15	59/M	aut	IV	R/C	Talus & foot. Rt	10	26/26	-	-
16	54/M	car	II	L/C	-	6	20/22	-	-
17	49/M	ped	I	L/O(IIIa)	Humerus & ulna. Rt, hemothorax	31	28/28	-	-
18	62/M	cul	I	L/C	Pelvis. Lt	2	20/22	-	-
19	54/M	aut	I	R/O(I)	Humerus & ankle. Rt	27	38/42	-	infected nonunion
20	47/M	ped	I	L/C	Brain injury	4	22/26	-	-
21	35/M	car	I	L/O(I)	Both femur & wrist. Lt	1	24/24	-	-
22	62/M	ped	II	L/O(IIIa)	Brain injury	1	24/28	-	valgus angulation

A: age and sex (year/M-male, F-female)

B: cause of injury (ped-pedestrian, car-car passenger, aut-autobike, cul-cultivator)

C: Melis classification (M-multisegmental fracture)

D: fracture site and type (R-right, L-left / C-closed, O-open)

E: associated injury (fracture)

F: time from injury to operation(day)

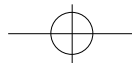
G: union time (proximal/distal-weeks)

H: dynamization (weeks)

I: complications

10
Melis 4 가 Gustilo and Anderson^{9, 10)} Grade
1, 15) Type I I, II, III Grade III Grade IIIa, IIIb,
1/3 1/3 , IIIc . 12 Type I 8
Type II 1/3 1/3 , Type II가 1 , Type IV가 3 , 10
, Type III 1/3 1/3 Type I 4 , Type II가 2 , Type IV가 3 ,
, Type IV 1 . 10
1/3 Grade I 6 , Grade II가 2 , Grade IIIa 가 2

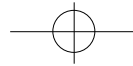




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test Type I Type IV
21.2 , 26 P-value
0.027(P<0.05)
가 11 , 1 21.6 , 23.1 P-
4 , 가 7 , 4 가 4 value 0.29
22.7%
3 (14%), 1 , 1 가
4 가
Grade I 6 Grade II 2
7 20
, Grade II 1 16)
, Grade III 2
10 ' 5 ' , 10 '
15mm 5)
Grade I Grade II Grade Type I
1 , Type I
Grade I 1 ,
Grade II 1
가
Type IV Grade I
1 25
dynamization
1 Type II
Grade IIIa
, 3
(16~26) , Type I 21.6
가 , Type IV 17.6 가
가 25.3 가
26.4 (16~38) , Type I 24.6 가
, Type IV 27 가
Johner Wrushs¹¹⁾
bumper
4-point bending
20.7 , 21.3 가
가 24 , force
, Soeur²¹⁾ 2
26.8 3 . Mann-Whitney u 1





Grade I
Grade II
Grade III

가 , 2 , Grade III

가 , 3 1

가 , 2 1

Melis¹⁵⁾ 20 , Chi Ching^{6,7)}

32 18=6 21.6 (16~26) , 26.4 (16~38)

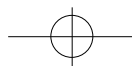
(cortex) . Crock⁸⁾ 가,

5.5cm 가 가 , Type IV 26 가 (P<0.05) Type I 21.2 가 Type IV

Rhineland¹⁸⁾가 가 ,

11, 21) car bumper 50% Melis¹⁵⁾ 10 , 45.5% car bumper 61.9% Zucman Langard^{13,} 23) 가 . 20.7 , 21.3 가 26.8 (P=0.29).

가가 가 3 bone dust가 Russell²⁰⁾ 가 Type IV



Grade I

1 가

, Blick

3)

가

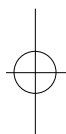
가 가

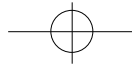
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Grade I, II

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