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= Abstract =

Treatment of Tibial Shaft Fracture with Butterfly Fragment using Interlocking Intramedullary Nailing

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Purpose : We evaluated the result of tibial fracture with butterfly fragment treated with interlocking intramedullary nailing and union of butterfly fragment.

Material and Method : The thirty tibial fractures with butterfly fragment treated with interlocking intramedullary nailing from 1994 February to 1997 January were followed up more than 12 months. They were classified by Henley's classification based on the size of fragment and Johner and Wruhs' classification based on the comminution and accident mechanism. We evaluated the bone union of tibial fracture and butterfly fragment itself.

Results : The time for bone union was B1-14.5, B2-16.2, B3-18.8 weeks and Type I-15.2, Type II-17.1, Type III-18.3 weeks. In proximal and distal part of butterfly fragment, the time for bone union was 8.6 and 7.2 weeks in type I, 10.5 and 9.3 weeks in type II, and 11.8 and 10.2 weeks in type III. As the displacement of fragment were classified into 0-5, 5-10, and more than

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10mm, the time for bone union was 15.3, 15.0 weeks in type I (no case in more than 10mm), 16.4, 17.5, 18.2 weeks in type II, and 17.7, 18.4, 20.3 weeks in type III.

Conclusion : As the size and comminution of butterfly fragment increased, bony union was delayed. The union of spiral fracture in distal tibia was earlier than others, unrelated to the size of butterfly fragment. For the union of butterfly fragment, the distal part had earlier union than the proximal part. As the displacement of fragment was increased bone union was delayed.

Key Words : Tibia, Butterfly fragment, Intramedullary nailing.

가 가

1994 2

1997 6

가

1

가

30

1)

18 70

37.4 30

가 가

30

가 17 (57%),

가 13 (43%)

(Table 1).

2)

26 (87%)

가 15

(50%) 가

(Slip down),

3 , 1

3)

Henley ⁶⁾ (Figure 1)

Johner Wruhs

⁷⁾ (Figure 2)

가 21 (70%) 가

2 ,

7

(Table 2). Henley

⁶⁾

I, II, III

I 6 , II

12 , III 12

Johner Wruhs ⁷⁾

B1, B2, B3

B1 3 , B2

12

, B3 15

(Table 2).

4)

, Henley

I,

Table 1. Age & Sex distribution.

Age/Sex	Male	Female	Total
10-19		1	1
20-29	3	3	6
30-39	6	3	9
40-49	5		5
50-59	2	6	8
60-	1		1
Total	17	13	30

**Table 2.** Data concerning injury, treatment and complications.

	B1	B2	B3	Type	Type	Type
No. of fractures	3	12	15	6	12	12
Average Age(yrs)	48	37	37	34	41	37
Accident						
Traffic						
pedestrian	1	6	8	3	5	7
passenger		5	6	2	5	4
Slip down	2		1		2	1
other		1		1		
Localization						
proximal		1	1	1		1
middle		10	11	4	9	8
distal	3	1	3	1	3	3
Open fx.		1	7		5	3
Complication						
fat embolism			1			1
superficial infection		1	2		2	1
delayed union		1	2		1	2
nonunion						
Union time (wk)	14.5	16.2	18.8	15.2	17.1	18.3

Table 3. Union time(weeks) of butterfly fragment in tibial middle fracture (21 case).

	Type I	Type II	Type III
proximal part of fragment	8.6	10.5	11.8
distal part of fragment	7.2	9.3	10.2

II, III 0 5, 5 10, 10mm

(Table 4).

5)

30 14 (47%)

6)

1

28

Type II 4.5

Type III 1

Henley

I

0

5, 5

10mm

15.3

, 15.0

, II

0

5, 5 10, 10mm

16.4

가 가

Henley 6)

I 15.2 , II

17.1 , III

18.3

. Johnen Wruhs 7)

B1

14.5

, B2

가 16.2 , B3가 18.8

(Table 2).

Henley

I

8.6

7.2 , II

10.5

9.3 , III

11.8

10.2

(Table 3).

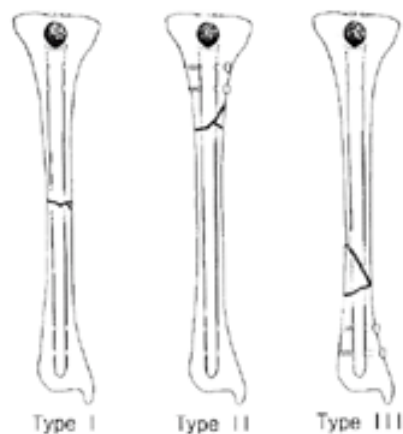
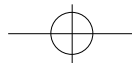


Fig 1. Classification of tibial shaft fractures according to size of butterfly fragment (by Henley's classification).

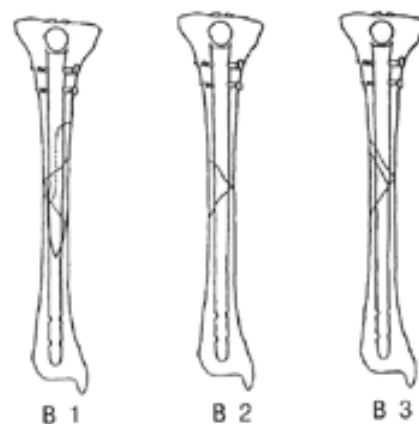


Fig 2. Classification of tibial shaft fractures according to butterfly fragment and etiology (by Johner and Bruhs' classification).

Table 4. Union time(weeks) of tibial shaft fracture by displacement of fragment.

Displacement(mm)	Type I(6)	Type II(12)	Type III(12)
0 5	15.3(4)	16.4(6)	17.7(7)
5 10	15.0(2)	17.5(4)	18.4(3)
10		18.2(2)	20.3(2)
	15.2	17.1	18.3

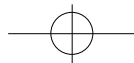
17.5, 18.2, III, 0 5, 5 10, 10mm
17.7, 18.4, 20.3

(Table 4).

, 3, 3 가
1

가 1,4,10,11,13)

1/3 가
13), Melis⁸⁾ 10cm
5cm
Segal¹⁴⁾, D'Aubigne²⁾
7.5cm
5cm
가 8.0cm, 5cm
Winqvist et al¹⁵⁾



Henley⁶⁾

Type , , . Type
 25%
 , Type 50% , Type 50%
 B1
 B2,B3 가
 가 Type ,
 가 B1
 가 B2,B3
 가
 가
 B1, B2, B3 . (torsion) 가
 B1, (bending force)
 B2, , B1, Type
 B3 B3 Russel¹²⁾
 1 (primary)
 Type , , (delayed closure)
 , B1,B2,B3 B1 closure)
 B2, B3 (48)
 B1 (Slip down) Gustilo Anderson⁵⁾ Type 1
 가 , Type b
 . B1
 . Johner Wruhs B1 B1

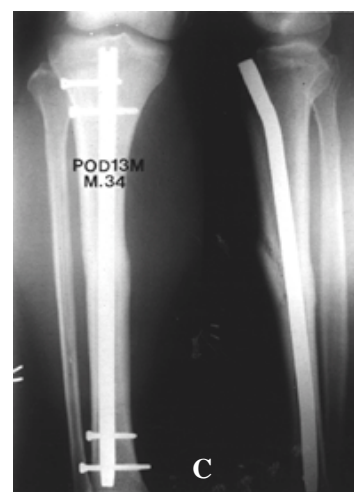
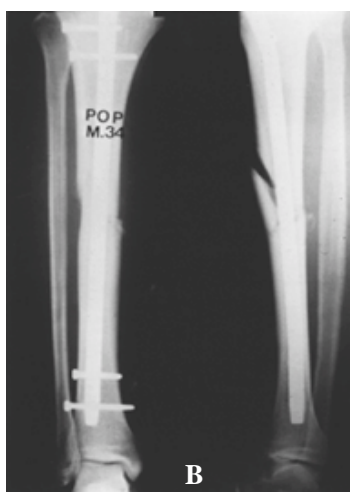
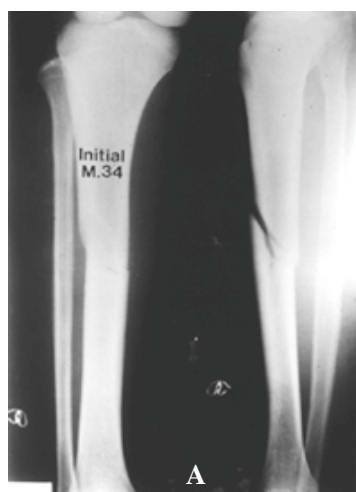


Fig 3. A 34-year-old male fractured the middle 1/3 of tibia due to pedestrian traffic accident and the type of fracture was type , B2. A. Initial B. Postoperation C. Postoperation 13 Months

14.5 B2 가 16.2 B3 가 18.8 Type (Table 4).
15.2 , Type 가 17.1 , Type 가 18.3 . B3, Type 1
Nicoll¹⁰⁾ , Type 1 , B3, Type III 2 B2,
Type B1,
Type .
2 , (Dynamization)1
. Merianos⁹⁾
가 ,
Donald Seligson ³⁾ Kuntscher
.
.
.
가 .
.
.
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가 .
.
.
가 ,
가 ,
가 1994 2 1997 6
(Table 3).
30
Type II, III 가 가 ,
가 , Type I
가 .

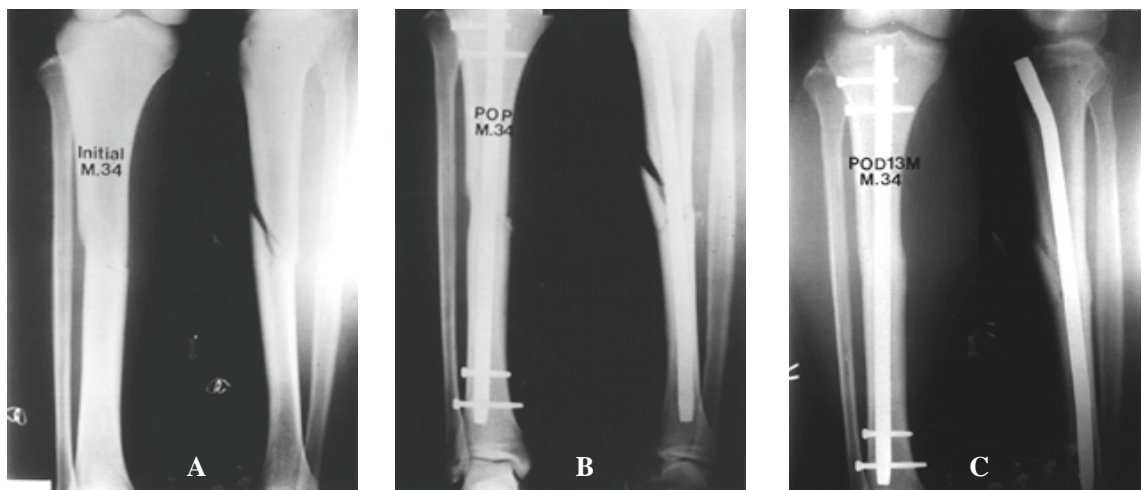
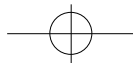


Fig 4. A 52-year-old female fractured the distal 1/3 of tibia due to slip down and the type of fracture was type , B1. A. Initia B. Postoperation C. Postoperation 13 Months



900 •

/ 12 4

- 1) (87%) , (50%)가 .
- 2) 가 가 , 1/3 (90%) , (B1)
- 1/3 .
- 3) 가 가 , .
- 4) , 가 가 .

REFERENCES

- 1) **Anderson LS and Hutchins WC** : Fractures of the fibular treated by cats and transfixing pins. *Clin. Orthop*, 105;179, 1974.
- 2) **D ' Aubigne RM and Eachman PM** : Blind intramedullary nailing for tibial fracture, *Clin Orthop*, 105;267-275, 1974.
- 3) **Donald G and Seligson D** : Treatment of tibial shaft fractures by percutaneous Kuntscher nailing. *Clin Orthop*, 78;64-73, 1983.
- 4) **Edwards Per** : Fractures of the shaft of the tibia, 492 conservative case in adult, *Acta Ort hop. Scandinavica, Supplement*, 76, 1965.
- 5) **Gustilo RB and Anderson JT** : Prevention of infection in the treatment of 1025 open fractures of long bones, *J Bone Joint Surg*, 58-A;453-458, 1976.
- 6) **Henley M.D.** : Intramedullary devices for tibial fracture stabilization. *Clin Orthop*, 240;87-96, 1989.
- 7) **Johner R and Wruhs O** : Classification of tibial shaft fractures and correlation with results after rigid internal fixation. *Clin Orthop*, 178;7-25, 1983.
- 8) **Melis GC, Sotgin F and Hepori P** : Intramedullary Nailing in segmental Tibial Fracture. *J Bone Joint Surg*, 63-A;1310-1318, 1981.
- 9) **Merianos S, Pazaridis P, Serences S., Orfandis and Smyrinis P** : The use of Ender nails in tibial shaft fractures. *Acta Orthop. Scand*, 53;301-307, 1982.
- 10) **Nicoll EA** : Fracture of the tibial shaft. A survey of 705 cases. *J Bone Joint Surg*, 46-B;373-378, 1964.
- 11) **Onnerfalt R** : Fracture of the tibial shaft treated by primary operation and early weight bearing. *Acta Orthop. Scandinavica, supplementum*, 171, 1978.
- 12) **Russel GG, Henderson R and Arnett G** : Primary and delayed closure for open tibial fractures. *J Bone Joint Surg*, 72-B;125-128, 1990.
- 13) **Rosenthal RE, Ronald E and John et al** : Non-union in open tibial fractures. Analysis of reasons for failure of treatment. *J Bone Joint Surg*, 59-A;244-248, 1977.
- 14) **Segal D** : Flexible intramedullary nailing of tibial shaft fracture. *Instructional Courses Lectures*, 338-349, 1987.
- 15) **Winqvist RA, Hansen ST Jr and Clawson DK** : Closed intramedullary nailing. *J Bone Joint Surg*, 66-A;529, 1984.

