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## Ilizarov

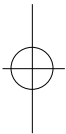
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= Abstract =

### Treatment of Comminuted Tibial Fractures using Ilizarov Method

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From March 1996 to March 1999, thirty two cases of comminuted tibial fractures were treated with Ilizarov external fixator. 13 cases were closed fractures and 19 cases open fractures. Among 19 open fractures, there were 3 cases of Gustilo type , 10 cases of type and 6 cases of type fractures. All the cases could not be initially treated by open reduction and internal fixation because of open wound or severe comminution. Among 32 cases, 4 were tibial condyles, 22 were tibial shafts, 6 were tibial plafonds. All the cases were followed up from a minimum 12 months up to 35 months with an average of 22 months.

We obtained satisfactory bony union in all cases with the average duration of 18.1 weeks. Bone graft was done initially in two cases. Numerous complications were encountered, most commonly, joint stiffness and pin tract infection were developed but they were treated well. To avoid such complications, careful management was needed. According to Tucker 's classification, the result was graded as excellent in 8, good in 18, fair in 4 and poor in 2 cases.

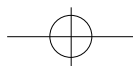
We conclude that Ilizarov external fixator is a very useful method for initial treatment in getting reduction, maintenance of reduction, early ambulation and fracture healing in cases of

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communitied tibial fractures whether open or closed.

**Key Words** :Tibial fracture, Comminuted, Ilizarov external fixation

2 (6.3%) 가가 .

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4 (12.5%), 22  
(68.8%), 6 (18.7%) (Table 1),

**Table 1.** Site of Fracture

Site of Fracture	No. of cases(%)
Condyle	4(12.5%)
Shaft	22(68.8%)
Plafond	6(18.7%)
Total	32(100.0%)

19 (59.4%),  
13 (40.6%) . 19 Gustilo-  
Anderson<sup>14)</sup> 3 (15.8%), 10  
(52.6%), 6 (31.6%) (Table 2).

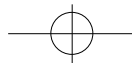
**Table 2.** Type of Fracture

Type of Fracture	No. of cases(%)
Closed	13(40.6%)
Open	Gustilo 3(9.4%)
	Gustilo 10(31.2%)
	Gustilo A 3(9.4%)
	B 3(9.4%)
	C 0(0.0%)
Total	32(100.0%)

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32 18 (56.3%)  
10 (55.6%) 가  
6 (33.3%), 1 (5.6%), 1 (5.6%)

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32 가 22 (68.8%), 가 10 (31.2%)  
, 19 84 , 31  
40 가 10 (31.3%) 가 .  
3.  
24 (75%), 6 (18.7%),



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6. 24 24  
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25 C-arm , 4  
Ilizarov , Ilizarov  
4 1 , 1 4  
Ilizarov 28.5 , 32 17 (53.1%)  
1 , 9 (52.9%),  
Ilizarov 6 (35.3%), 2 (11.8%) (Table 4).

**Table 4.** Complications

Complications	No.of cases(%)
Joint stiffness	9(52.9%)
Pin tract infection	6(35.3%)
Angular deformity	2(11.8%)
Total	17(100.0%)

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12 tension device  
Anderson <sup>14)</sup>  
6 A 3 1  
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B 3 1 2  
가  
16 24 가 12 (37.5%) 가  
(Table 3), 18.1  
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3 , 6  
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2 1  
15 , 1 15  
38 22  
Tucker <sup>28)</sup>(Table 5) 8 ,  
18 , 4 , 2

**Table 3.** Duration of Bone union

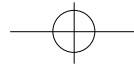
Duration of Bone union(weeks)	No.of cases(%)
0 - 12	2(6.2%)
12 - 16	8(25.0%)
16 - 20	12(37.5%)
20 - 24	6(18.9%)
24 - 28	2(6.2%)
28 - 32	2(6.2%)
Total	32(100.0%)

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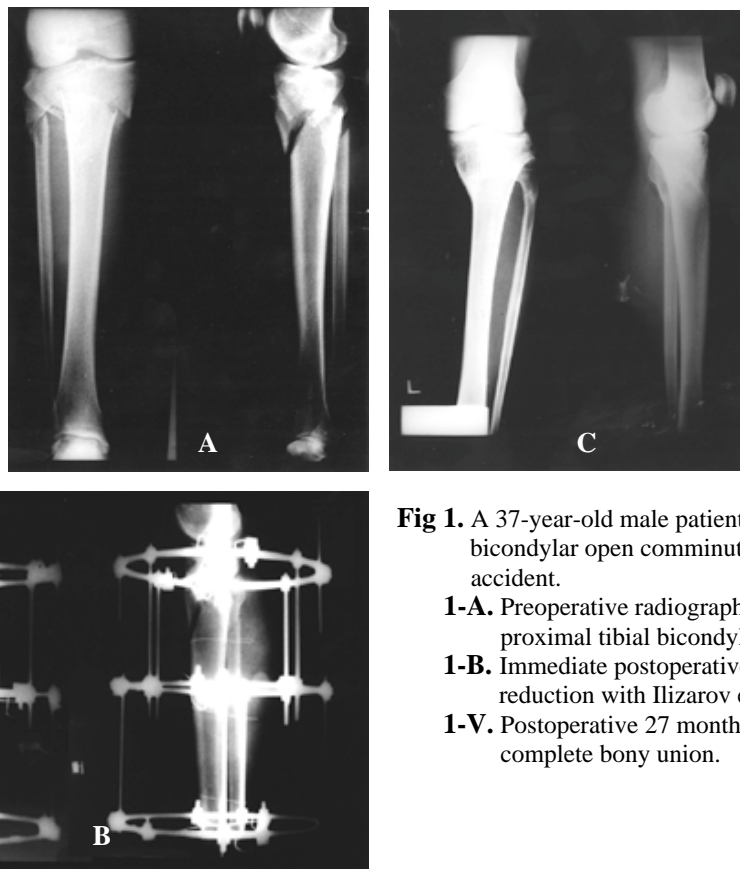
Gustilo type

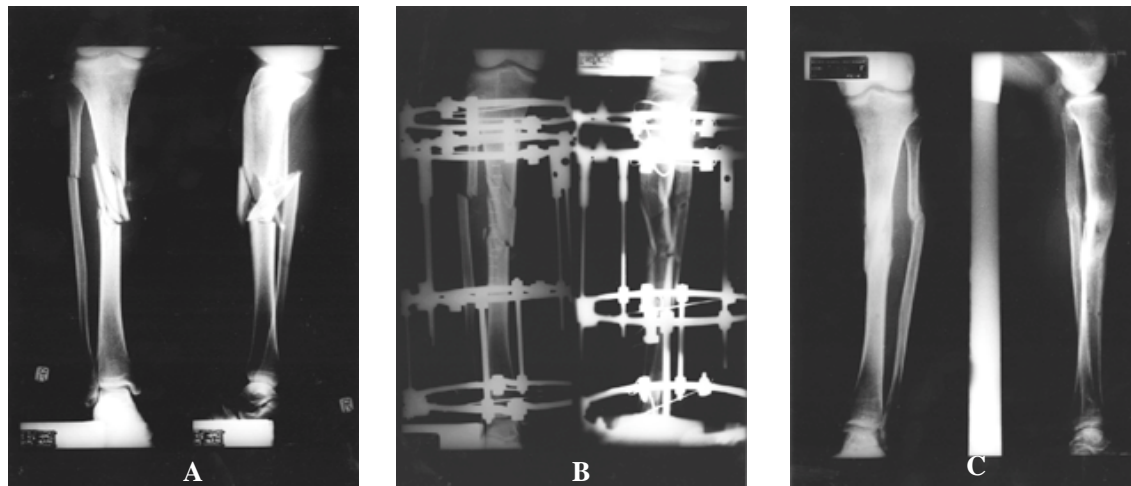
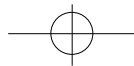
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**Table 5.** Functional result of tibial fracture according to Tucker's classification(1991)

Criteria	Excellent	Good	Fair	Poor
Bony union	+	+	+	+
< 1cm shortening	+	One criteria missing	Two criteria missing	Three criteria missing
< 7 degree angulation	+			
< 15 degree rotational deformity	+			
Full knee extension	+			
> 125 degree of knee flexion	+			
>75% normal ankle motion	+			
No infection	+			

Ilizarov device 12 tension < 2> 34  
 17 , 20 Gustilo type 7  
 . 2 3  
 Tucker (Fig. 1-A,B,C). Ilizarov . 26

**Fig 1.** A 37-year-old male patient with left tibial bicondylar open comminuted fracture by traffic accident.**1-A.** Preoperative radiograph shows intra-articular proximal tibial bicondylar fracture.**1-B.** Immediate postoperative radiograph after closed reduction with Ilizarov external fixator.**1-V.** Postoperative 27 months radiograph shows complete bony union.

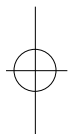


**Fig 2.** A 34-year-old female patient with right tibial shaft open segmental comminuted fracture by traffic accident

**2-A.** Preoperative radiograph shows segmental comminuted tibial shaft fracture.

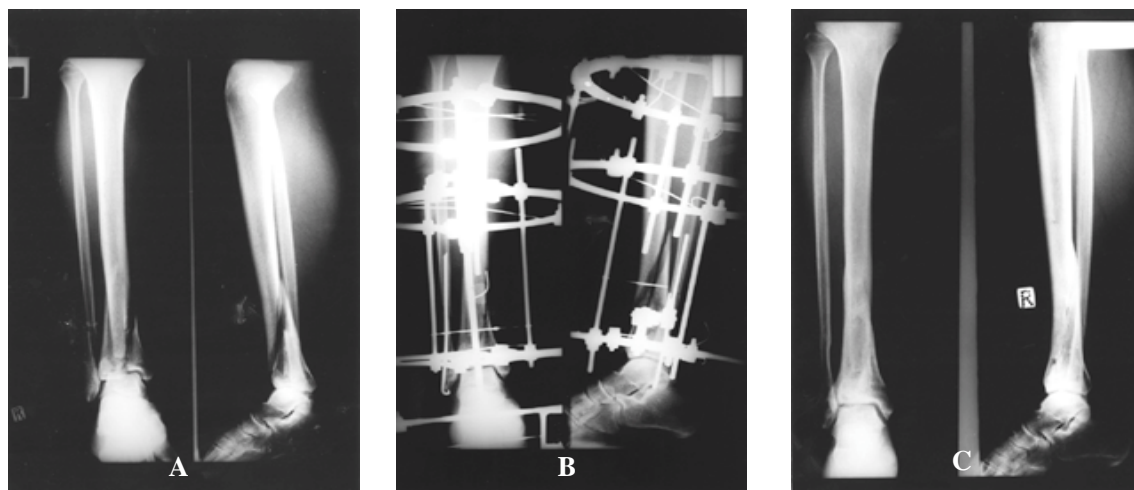
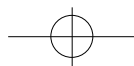
**2-B.** Immediate postoperative radiograph after closed reduction and limited open reduction with Ilizarov external fixator.

**2-C.** Postoperative 20 months radiograph shows complete bony union.



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(Table 3-A,B,C).  
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14,26 Ilizarov 1952  
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7.8)  
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Ilizarov





**Fig 3.** A 34-year-old male patient with right pilon fracture by fall down.

**3-A.** Preoperative radiograph shows intra-articular comminuted distal tibial fracture and distal fibular shaft fracture.

**3-B.** Immediate postoperative radiograph after closed reduction with Ilizarov external fixator and rush pin.

**3-C.** Postoperative 20 months radiograph shows complete bony union.

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18.1

75%

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, 1cm

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25%

5,12,15,16)

11,21)

Sarmiento<sup>23,24,25)</sup>

17.4

21.7 가

5%

가

. Brown<sup>9)</sup>

83-100%

Bach<sup>6)</sup>

100%,

가

22), Green<sup>13)</sup>

AO가

93%

Taylor<sup>27)</sup>, Tucker<sup>28)</sup>

Ilizarov

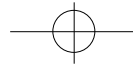
94-100%,

6-8

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3,4)

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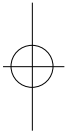


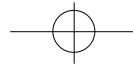
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2-6 , 4-12 18.1 . 32 17 (53.1%)  
 , 1-2 가 .  
 24 가  
 28.2 . , Ilizarov  
 , , , 가 . Lange <sup>20)</sup> 50  
 24% , Tucker <sup>28)</sup> 22 10% 가 가 가  
 . 18.8% 가  
 , 가  
 . Burgess <sup>10)</sup> ,  
 Green<sup>13)</sup>, Karlstrom Olerud<sup>17,18,19)</sup>

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