



Study of Tibia-Fibula Fracture & its Effect on Union of Fracture & Prognosis

KEYWORDS

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ABSTRACT *Background* : Ever since mankind came into existence and progressed to modern civilization, the incidence of trauma has increased by leaps and bounds. In particular, fractures of the shaft of the tibia and fibula present one of the most challenging problems in orthopaedic surgery today. Our main purpose today is to return full function in the shortest possible time. The study was undertaken to evaluate whether the level and type of fracture and type of trauma have any effect on the union and ultimate prognosis. **Methods**: A series of a consecutive 100 cases of fractures of the shaft of the tibia and fibula, was studied. Closed and open fractures were studied. No single method of management was used and the overall results of the whole study, were evaluated. **Result** : Maximum number of cases (72%) had comminuted fractures as a result of direct high energy trauma and they showed a much longer time in fracture union (23 weeks) in comparison to cases with transverse and oblique fractures. which got united within 21 weeks and 20 weeks respectively. Children showed a much earlier union at an average of about 13 weeks in comparison to the adults who took 20 to 25 weeks for fracture union. A direct correlation of the age was not observed which is discussed later. **Conclusion** : In the present series, the incidence of non union was relatively high. This is due to the fact that, all the cases were open fractures with contamination due to high energy trauma.

Introduction

Ever since mankind came into existence and progressed to modern civilization, the incidence of trauma has increased by leaps and bounds. Presently we live in the age of high velocity trauma. In this era of modern industrialisation, with increasing road traffic, mechanisation of agricultural methods and various recreational sports, life has become very busy and active. As a consequence people are more exposed to risk factors which cause accidents. These accidents cause different types of fractures and injuries. Fractures of the leg bones are one of these. In particular, fractures of the shaft of the tibia and fibula present one of the most challenging problems in orthopaedic surgery today.^{1,2}

The management of tibial shaft fractures is beset with immense difficulties. As the tibia is a subcutaneous bone, it is more vulnerable to open and contaminated fractures. The mechanism of the fractures is many a time due to high energy trauma with comminution and displacement, leading to a delay in healing. Cosmetic disfigurement results if the apposition of the bone fragments is imperfect, or if the fracture is open with soft tissue lacerations. If attention is not paid to proper rotational and axial alignment, severe functional disability may result.^{3,4} There are a very few fractures which give scope to so much of discussion of therapeutic principles, as tibial fractures. This is because these are very commonly occurring fractures. Also, certain tibial fractures can be very difficult to treat and the complication rate is high, leading to an unsatisfactory outcome.

Therapeutic principles vary considerably between different centers. Management can be conservative, operative or a combination of both. Each method has its own merit & every effort should be made to adopt a method best suitable to the individual patient with the available resources.^{5,6} This is the era of preservation; the management of the fracture does not stop at saving life and limb. Our main purpose today is to return full function in the shortest possible

time. The study was undertaken to evaluate whether the level and type of fracture and type of trauma have any effect on the union and ultimate prognosis.

Material And Methods:

This study was conducted in the Department of Orthopaedics, at Krishna Hospital and Medical Research Centre, Karad, during the period from January 1992 to January 1994.

A series of a consecutive 100 cases of fractures of the shaft of the tibia and fibula, was studied. Closed and open fractures were studied. No single method of management was used and the overall results of the whole study, were evaluated.

Majority of the fractures were the consequences of road traffic accidents, agricultural mishaps, and a few had as-sault injuries and fall from a height. Patients from different age groups were included in this study. The youngest patient treated was 4 years old while the oldest was 75 years old. Most of the accident victims with fractures of the shaft of the tibia and fibula belonged to the age groups of 21-40 years.

This makes it obvious that the population at maximal risk is the young adult population.

In case of comminuted or oblique fractures the length was carefully assessed. In a few cases a repeat above the knee cast was applied for a span of 4 to 6 weeks and later converted into a below the knee cast if radiologically insufficient union was observed.

The patient was mobilized on the same day as the operation without weight bearing till the sutures were removed, and oedema settled. Later below the knee cast was applied and weight bearing was started after 3 months.

Observation & Results :**Table 1 : Influence of the type of the fracture on tie union of open fractures**

Type of #	8-12	Union in weeks			25-28	Total no of cases	Average of union in weeks
		13-16	17-20	21-24			
Transverse	1	4	7	7	9	28	23
Comminuted	1	1	1	2	1	6	21
Oblique	1	-	2	1	1	5	20

Maximum number of cases (72%) had comminuted fractures as a result of direct high energy trauma and they showed a much longer time in fracture union (23 weeks) in comparison to cases with transverse and oblique fractures, which got united within 21 weeks and 20 weeks respectively.

Table No.2 : Level of fracture affects union

Level of #	8-12	Union in weeks			25-28	Total no of cases	Average of union in weeks
		13-16	17-20	21-24			
Upper third	-	1	1	2	-	5	21
Middle third	-	3	1	5	5	14	23
Lower third	3	1	8	3	6	21	21

More than half the patients (54%) had fractures situated in the lower third of the shaft of the tibia. The next common site was the middle third (36%) and only 10% of the fractures were situated in the upper third of the shaft of the tibia. Surprisingly fractures of the middle third took a relatively longer time to unite (23 weeks) than fractures in the lower third (21 weeks). This paradoxical observation has been discussed later.

Table No.3 Patient's age influences fracture union

Age in years	8-12	Union in weeks			25-28	Total no of cases	Average of union in weeks
		13-16	17-20	21-24			
≤ 15	3	1	-	-	-	4	13
16-30	-	-	4	7	8	19	25
31-45	-	3	4	2	1	10	20
≥ 45	-	1	2	1	2	6	22

About-half the patients (49%) belonged to the age group ranging from 16 to 30 years. Only 10% cases were in the age group younger than this, whereas rest of the 41% of the cases belonged to higher age groups. Here also children showed a much earlier union at an average of about 13 weeks in comparison to the adults who took 20 to 25 weeks for fracture union. A direct correlation of the age was not observed which is discussed later.

Table No.4 Union is affected by the grading of the open fracture.

Open #	8-12	Union in weeks			25-28	Total no of cases	Average of union in weeks
		13-16	17-20	21-24			
Grade I	3	5	8	7	5	28	21
Grade II	-	-	2	3	5	10	25
Grade IIIa	-	-	-	-	1	1	28
Grade IIIb	-	-	-	-	-	-	-

Amongst all the patients with open fractures who showed union within the expected time about three fourth of the patients (72%) had open grade I fractures according to

modified Gustilo's classification (1983). whereas about one fourth of the patients (25%) had grade II open fractures. Only one case (3%) had grade IIIa open fracture. No patient in this series had grade IIIb open fracture which showed union within the expected time. There was no case of grade IIIc fracture.

Table No.5 : Method of immobilization**Table No. 5**

Method of immobilization	8-12	Union in weeks			25-28	Total no of cases	Average of union in weeks
		13-16	17-20	21-24			
Plate	-	1	6	6	4	17	23
Closed reduction	3	4	4	2	3	16	19
Ext. fix + plaster	-	-	-	2	3	5	26
Ext. fix + plate	-	-	-	-	1	1	28

41 % of the open Grade I fractures were treated by closed reduction and antibiotic coverage, whereas the rest 598 needed some form of internal or external fixation device for proper immobilization of the fracture. Amongst these, 43% of the cases were treated by plating, 13% were treated with external fixator which later was changed to plaster Cast immobilization till union and 1 case (3%) which was treated with an external fixator was later replaced by a plate. Thus almost half of the cases in the present series (46%) were treated by open reduction and plate fixation.

DISCUSSION

A number of factors seem to have an influence on healing of fractures, viz. whether the fracture is closed or open, the degree of contamination in an open fracture, and level of the fracture in the shaft.

In our study, 1 of the two cases of oblique type of fracture had delayed union while 2 of the 13 cases of comminuted fracture had delayed union. No case of transverse fracture had delayed union.

Overall, with reference to the above table, the percentage of normal union in our study was 79 % and that of delayed union was 21 %. In the Oni (1988) ⁷ series there was 81 % incidence of normal union and 19 % of delayed union.

Application of the Chi square test with $P > 0.05$ suggests that there is no significant difference between the results of the present series and the reference series.

Influence of the level of the fracture in the bone shaft -117 in closed fractures on the healing process it is gathered that in our series, only 3 cases of fractures at the middle third level of the bone shaft had delayed union and no case with upper and lower third level fracture had delayed union.

Thus the percentage of normal union here was 92 % and delayed union was 8 %. In the Oni (1988) series ⁷ the percentage of normal union was found to be 80 % and delayed union was seen to be 20 %. Application of the Chi square test with $p > 0.05$ suggests that there is no significant difference in the results of both studies.

The effect of the level of the fracture on the time of healing in open fractures is tabulated below. The findings of our study are comparable to the work of various studies showed that the anatomical site of the fracture on the tib-

ia, had no significant influence on the outcome. So the anatomical classification of tibial shaft fractures is of no value in predicting the prognosis for the patient. In the present series also, the time taken for union at all the levels is almost the same.

In the present study we had 15 cases (18 %) of delayed union, and 4 cases (5 %) of nonunion. All these were due to open fractures. According to Foy (1990) ⁸, delayed union in a tibial fracture is defined when bony union has not occurred by 20 week. Our cut off point for delayed union was 28 weeks. According to Clifford et al. ⁹ (1988) delayed union was defined inability in full weight bearing beyond 26 weeks or implant failure. Ruedi et al.(1976) ¹⁰ reported 3 % incidence of delayed union in closed fractures and 7 % incidence in open fractures. All fractures were treated by AO compression plating.(D.C.P)

In the present series, the incidence of non union was relatively high. This is due to the fact that, all the cases were open fractures with contamination due to high energy trauma.

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