

A Study of Radiological and Functional Outcome Following Fibula Fixation with Plate and Long Leg Cast in Managing Closed Distal Third Tibia and Fibula Fracture

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Abstract

Background:

Fractures of the distal third region of Tibia and fibula are commonly seen at our emergency and OPD, a tertiary care hospital and Medical College in West Bengal. Although closed, the skin condition overlying the fracture - sites are not usually good. At our hospital we managed these cases by minimal implantation, maintaining the leg length, by fibula fixation followed by long leg cast and supported weight bearing at 6 week with patella tendon bearing cast, followed by full weight bearing at 3 months.

Method:

This prospective study was conducted at the department of Orthopaedics, Calcutta National Medical College, on 38 patients, of age group 20 to 60 years, who presented at our hospital, between January 2017 and December 2018. The follow up period was a minimum of 6 months for each patient. We assessed the patients clinically and checked the antero-posterior and lateral radiographs at immediate post-operative period, 6 weeks, 3 months and 6 months to see the progress. On satisfactory clinical and radiological evidence of progress of union of three cortices of the Tibia, unsupported weight-bearing was allowed and full range of knee and ankle movement were encouraged.

Results:

Amongst the 38 patients, two patients were lost to follow up and the fractures did not unite radiologically (may be delayed union) in two patients and the cases were re-operated with intramedullary nailing, which subsequently united. In the remaining 34 patients, we achieved satisfactory union, both on clinical assessment and radiographic evidence and patient walked without crutch 3months onwards following surgery with satisfactory range of knee and ankle movement.

Conclusion:

In this study, we observed that this type of treatment protocol with minimal exposure and implantation, is an effective method of managing closed distal third tibia and fibula fracture, with minimal re intervention, incurring lesser financial burden on the state.

Keywords:

Distal tibia, Distal Fibula, fractures, reduction, fixation, leg length, plaster casting.

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I. Background

Multiple local factors such as extent of systemic and soft-tissue injury, velocity of impact, host factors like diabetes, immunodeficiency, nutritional status and nicotine abuse along with stability of fracture fixation and implant overcrowding affect fracture healing. Distal tibial fractures account for 37.8% of all tibial fractures¹, and the fractures of the distal tibia typically occur as a result of axial and rotational forces. Delayed union and non-union are common complications of distal tibial fractures^{2,3}. Treatment of distal tibial fractures are frequently associated with unsatisfactory outcome and complications⁴. Associated fibular fractures in 77.7% of the cases are common with tibial fractures⁵.

In spite of closed nature of the fracture, due to less vascularity of the overlying skin and scant presence of subcutaneous tissue over the bone, the distal part of leg is not often good enough for multiple implantation⁶.

II. Aims Of The Study

1. Aim of this study was to observe union of the fractures of distal tibia and fibula, by achieving a stable reduction of the fracture site of tibia through maintenance of the leg length with accurate reduction and fixation of the fibula.
2. To decrease the incidence of post operative skin complications and infections.

III. Materials And Methods

This was a randomised prospective study, conducted at the Department of Orthopaedics, Calcutta National Medical College. The study was performed in between January 2017 and December 2018.

Thirty-eight consecutive patients, in the age group of 20-60 years, with these type of fractures, who attended the ER or OPD of Calcutta National Medical College and Hospital, within 7 days of injury, were selected for this study, on compliance with inclusion and exclusion criteria. The distal tibia and fibula fracture included in this study were 43A1, 43A2, 43A3 (AO -OTA classification)⁷.

Inclusion criteria:

Age group 20-60yrs

Patients attending within a week of injury (day zero being the day of injury)

Exclusion criteria:

Open fractures, comminuted fractures, segmental fracture, fracture associated with any other limb or organ injury.

In all the patients, under regional or general anaesthesia, fibula was exposed, accurately reduced maintaining the length, rotation and axis of the bone, and fixed with adequate number of screws using a plate of appropriate length. The reduction of the fractured tibia thereby achieved, was checked under fluoroscopy, finer adjustments and manipulations if required were done, followed by a snugly fitting long leg cast. A cast window was done at operated site of the fibula. The wound was inspected on the 4th post-operative day, and the sutures were removed on the 14th post operative day. In the healthy wounds on removal of the sutures, the cast window was closed using a further cast roll. After 6 weeks from the day of surgery, patellar tendon bearing cast was applied and supported weight bearing was encouraged along with knee ROM (range of motion) exercises, quadriceps and hamstring exercises. After further 3 weeks PTB cast was removed and supported weight bearing was allowed depending upon the clinical and radiological findings. At 3 months intermittent, unsupported weight bearing was allowed, with a Sarmiento brace. At 6 months following surgery the patient was again assessed clinically and radiologically for progress of union and, allowed unsupported weight bearing and inferences drawn.

Statistical analysis:

Data were analysed using SPSS (Statistical Package for Social Scientists) version 20.0, IBM, Armonk, New York, USA. The results were shown by proportionate value, with simple tables.

IV. Results

Of the 36 operated patients who followed up as per protocol, there were 21 male and 15 female patients (Table 1). We had maximum number (12) of patients in the bage group of 30-40 years (Table 2). Ten of the 36 patients were 43A1, 14 patients were 43A2 and 12 were 43A3 according to AO-OTA classification (Table 3). We achieved a satisfactory range of motion (ROM) of knee of more than 100 degrees (Table 4). At 6 months follow up following surgery, there was radiological union with sufficient callus at fracture site except two cases (Table 5). All the patients had a satisfactory arc of motion in the ankle joint (Dorsiflexion – Plantar flexion). There was no case of post operative infection. Lower extremity function was assessed and it was observed to be satisfactory in all the patients, except the two cases of non union.

V. Discussion

Fibular fixation plays a positive role in reducing tibial displacement and improving mechanical stability of the entire lesion⁸. There was no statistical relation between the anatomic situation of diaphysis and the anatomic type of the fibular fracture, or it's situation compared to tibial fracture line⁹.The present clinical study provides results similar to biomechanical studies. The consequence of only fibular fixation reduces tibial reduction abnormality in contrary to absence of fibular fixation which produces residual reduction defect of tibia with lack of biomechanical stability of the tibio fibular complex and tibial non-union.

In our study we observed that, maintenance of reduction was satisfactorily associated with plating of the fibula fracture 12 weeks or later after surgery, in accordance with a study by Egol KA et al¹⁰, where fixation of the lower segment of the fibula helped in maintaining the reduction of a distal tibia fixed by intra medullary nail.

VI. Conclusion

In this study we tried to utilize the role of fibular fixation in management of distal third fractures of both the bones of the leg. We observed that there is satisfactory union following minimal surgical exposure, and minimum implantation. The procedure is very effective in case of elderly patients with bad skin conditions. The surgical time being lesser due to non exposure of the tibial side, this procedure is more effective, specially in elderly with more co-morbidities.

We also observed, the procedure to be less expensive, because a single implant was used, and the tibial fracture was managed conservatively without the use of any other implant.

This study would have been more relevant if the sample size would have been larger (a multi-centric study might have helped), the follow-up period would have been longer and on comparison with a different mode of management.

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Table 1: Sample distribution according to gender

SEX DISTRIBUTION	NO OF CASES	PERCENTAGE
MALE	21	58.33
FEMALE	15	41.67

Table 2: Sample distribution according to age group

AGE DISTRIBUTION (Yrs)	NO OF CASES	PERCENTAGE
20-30	10	27.78
30-40	12	33.33
41-50 YEARS	9	25.00
51- 60 YEARS	5	13.89

Table 3: Sample distribution according to AO-OTA classification

FRACTURE TYPE(AO)	NO OF CASES	PERCENTAGE
A1	10	27.78
A2	14	38.89
A3	12	33.33

Table 4: Sample distribution according to knee ROM achieved at 6 months

KNEE ROM (Degrees)	NO OF CASES	PERCENTAGE
<100	2	5.56
100-120	25	69.44
>120	9	25

Table 5: Sample distribution according to radiological union

Radiological union(6 months)	No of cases	Percentage
United	34	94.44
Not united	2	5.56

Figure1:Preoperative Radiograph of fracture



Figure 2: Radiograph of united fracture at 6 months.



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