

Comparison of Results of Conservative and Operative (Interlocking Nail) Treatment of Closed Isolated Diaphyseal Tibial Fracture In Female Patients

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ABSTRACT

Background: Closed isolated tibial shaft fractures conventionally have been treated conservatively with closed manipulative reduction and a cast. The aim of this study to compared the radiological outcome after fixation with the cast treatment and closed interlocking nail.

Material & Methods: All patients with an isolated closed unilateral fracture of the tibial diaphysis who visited in department of orthopedic, SMS Medical College, Jaipur were evaluated. Inclusion criteria were displaced closed fractures. The fractures of type A and B, according to the AO-classification system, 34 patients (26 men) having a mean age of 38 (17– 78) years fulfilled the criteria and entered the study.

Results: The mean time to radiographic union was nineteen weeks for the 17 patients who had been managed with a cast compared with thirteen weeks for the 17 patients who had been managed with nailing ($p < 0.05$). JOHNER & WRUHS criteria for comparative assessment of final result after Tibial shaft fracture either with closed reduction followed by plaster casting or Tibial interlocking nail based on functional, radiological, clinical & subjective Outcome.

Conclusion: The results of our study showed that closed intramedullary nailing may yield better clinical and functional outcome than use of a POP cast for many patients who have a displaced closed tibial shaft fracture.

KeyWords: Intramedullary Nailing, Tibial Shaft Fracture, Closed Reduction.

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INTRODUCTION

High energy trauma has resulted in complex or comminuted fractures of tibia, which are frequently open with significant loss of skin and soft tissues and may be associated with compartment syndrome or neuro-vascular injury. Such fractures, when associated with vascular injuries, historically had a very poor outcome. Available literature suggests that open fractures of the tibial shaft are both common and may be fraught with complications like malunion, delayed union, nonunion, and infection.¹⁻³

Closed isolated tibial shaft fractures conventionally have been treated conservatively with closed manipulative reduction and a cast, while surgical management has been reserved for cases in which an adequate closed manipulative reduction could not be obtained or maintained. During the last two decades, excellent results have been reported by a number of investigators after treatment with both closed intramedullary nailing¹⁻⁵ and conservative management.⁶⁻⁸ In the literature, the results after different types of treatment have often focused on time-to-union and complications. Few studies have included questions about

general function.⁹ The combination of general function, quality of life and morbidity during fracture healing has not been studied in a prospective study. The aim of this study to compared the radiological outcome after fixation with the cast treatment and closed interlocking nail.

MATERIALS & METHODS

All patients with an isolated closed unilateral fracture of the tibial diaphysis who visited in department of orthopedic, SMS Medical College, Jaipur were evaluated for inclusion in the present study. Inclusion criteria were displaced closed fractures. The fractures of type A and B, according to the AO-classification system, were considered suitable for the study (Müller et al. 1990).¹⁰ The following exclusion criteria were used: 1) patients who had other major injuries which could influence the final functional result, 2) Patients with cardiopulmonary, rheumatological, neurological, or metabolic disease, 3) patients with previous injuries which influenced their general function, 4) patients with fractures within 5 cm distal to the tibial tuberosity or 7 cm proximal to the ankle joint,

5) open fractures and 6) those with open growth plates. 34 patients (26 men) having a mean age of 38 (17– 78) years fulfilled the criteria and entered the study. The patients gave their informed written consent before inclusion in the study, which was approved by the hospital's ethics committee. Patients who agreed to participate in the study were randomized using the technique of stratified randomization by minimization (Pocock 1983).¹¹

Closed tibial nailing was performed with the patient lying supine. A calcaneal pin was used if traction was required. We used a longitudinal mid patellar incision and approach to the proximal tibial cortex 1–1.5 cm below the joint line, just beneath the patellar

tendon. The nail diameter was 8 mm in 6 patients, 9 mm in 8 and 10 mm in 3. In all patients, the nail was inserted after reaming. Static locking was performed in all patients. Active movement and partial weight bearing encouraged soon after the operation. Weight bearing was allowed after six weeks, depending upon progression of healing and associated injuries.

Statistical analyses were done with use of the paired Student t test to compare differences between the two groups in terms of the time to union, the knee joint mobility, ankle joint mobility, deformity and the time until the patients returned to work. Statistically significant difference was defined as $p < 0.05$.

Table 1: Time of union & Average time of union in Group 1 & 2.

| Time of union | Group 1 (Nail) | Group 2 (Cast) |
|---------------------------|-----------------|----------------|
| Within 20week | 17 | 10 |
| Within (21 – 30) week | 0 | 7 |
| Above 30 week | 0 | 0 |
| AVERAGE UNION TIME | 19 weeks | 13 weeks |

Table 2: Shortening in Length in Group 1 & 2

| Shortening in Length in cm | Group 1 (Nail) | Group 2 (Cast) |
|----------------------------|-----------------|----------------|
| < 1cm. | 2 (11%) | 6 (35.3%) |
| >1 cm | 1 (5.9%) | 0 (0%) |
| > 1.5cm | 0 (0%) | 3 (17%) |
| No shortening | 14 (82.4%) | 8 (47.1%) |
| Total number | 17 | 17 |

Table 3: Results in Group 1 & 2.

| Results | Group 1 (Nail) | Group 2 (Cast) |
|------------------|-----------------|----------------|
| Excellent | 13 (76.5%) | 4 (23.5%) |
| Good | 3 (17.6%) | 8 (47.05%) |
| Fair | 1 (5.9%) | 3 (17.6%) |
| Poor | 0 (0%) | 2 (11.76%) |

RESULTS

The mean time to radiographic union was nineteen weeks for the 17 patients who had been managed with a cast compared with thirteen weeks for the 17 patients who had been managed with nailing ($p < 0.05$). A non-union occurred in two patients who had been managed with a cast and in one patient who had nailing. Two patients who had a non-union after management with a cast had intact fibula. Three patients who had been managed with a cast had shortening of more than 1.5 centimeters. No patient had shortening of more than 1.5 centimeters after intramedullary nailing. Two patients had varus or valgus malalignment of more than 10 degrees, and two had 10 degrees of recurvatum after management with a cast. No patient had varus, valgus, or sagittal malalignment after intramedullary nailing. These differences were significant ($p < 0.05$, chi-square test). No patient in either group had rotational deformity of more than 10 degrees or a compartment syndrome. No patient who had intramedullary nailing had hardware failure. Elective removal of nail is done in six of the 17 patients more than eighteen months after the injury, usually because of pain in the knee. For the matched pairs of patients, the mean time to union was nineteen weeks after management with a cast and thirteen weeks after management with nailing ($p < 0.05$) (Table 3 The differences between the two groups were significant ($p < 0.05$).

DISCUSSION

Fractures with more than 1-2 cm of initial shortening also are a relative contraindication to functional cast-bracing because the initial 1-2 cm amount of shortening indicates the final amount of shortening after healing. In addition, an inability to bear weight while wearing the patellar-tendon brace or the fracture-brace is predictive of a longer time to union. Sarmiento et al.⁸ had thirty years of experience with the treatment of tibial shaft fractures with a functional cast-brace, and to our knowledge, the results of their study were excellent — the best reported in the literature. However, their results have not been reproduced by other researchers.^{5,12}

The mean time to union was 18.3 weeks for Group A compared with 15.7 weeks for Group B ($p < 0.05$), and the mean time until the patients returned to work was twenty-three weeks for Group A and 13.5 weeks for Group B ($p < 0.01$); both of these differences were statistically significant. There was significantly more angular deformity in Group A, with nine patients having varus or valgus angulation of more than 5 degrees and no patient in Group B having an angular deformity ($p < 0.01$). Shortening of 1-2 cm occurred in six patients in Group A and in one patient in Group B ($p < 0.01$). No infections were noted in either group. Bone et al.⁹ performed a retrospective study of ninety-nine patients who had a closed, isolated, unilateral, displaced tibial shaft fractures was

performed to ascertain the result of the type of treatment on the functional and clinical outcome. Forty-seven patients were managed with closed intramedullary nailing with reaming, and fifty-two were managed with closed reduction and a cast. The two groups were comparable in terms of the ages of the patients, the locations and degrees of displacement of the fractures, and the number of patients with smoking history. The time to union was significantly quicker in the patients who had been managed with closed intramedullary nailing than in those who had been managed with a closed reduction and cast (mean, eighteen compared with twenty-six weeks; $p = 0.02$). A non-union occurred in one patient (2 per cent) who had been managed with nailing and in five patients (10 per cent) who had been managed with a cast. There were no post-operative infections in either group. Elective Removal of the interlocking nail was performed in twenty-six patients. Twenty-five patients who had been managed with intramedullary nailing and twenty-five who had been managed with a POP cast were followed for a mean duration of 4.4 years. The results obtained by Hooper et al., Bone et al.⁹ and Karladani et al.¹³ were very similar to those in our current study. According to Sarmiento et al.⁸, poor result by conservative treatment with POP cast in several study may be due to poor patient selection for example conservative treatment with a cast-brace for a fracture for which such treatment is relatively contraindicated — for example, a tibial shaft fracture with an intact fibula or one associated with more than two centimeters of initial shortening as seen on the initial radiograph. Thus, the study may be biased selectively towards the group managed with intramedullary nailing. Puno et al. reported markedly improved ankle evaluation score for the group that had been treated with intramedullary nailing. Thus, Their study established a direct relationship between the extent of residual deformity of the limb and the clinical result for the ankle but not that for the knee.¹² The responses to the SF-36 survey in our current study showed significant differences, in the patients' bodily pain perceptions, mental health, social functioning, vitality, general health, and physical role functioning, between the group that had been managed with a POP cast and the group that had had intramedullary nailing. Our study had several limitations. The time to union was significantly prolonged after treatment with a POP cast, but this could have been influenced by the surgeon not encouraging the patients to bear weight fully as early as they could have. Two patients who had been managed conservatively had a nonunion. One of those two patients who had a nonunion had an intact fibula, which could have contributed to the non-union.

CONCLUSION

In conclusion, we recognize that, when the proper indications for intramedullary nailing or use of a POP cast are present, the choice of treatment of isolated, closed tibial shaft fracture should be made by the informed patient. The results of our study showed that closed intramedullary nailing may yield better clinical and functional outcome than use of a POP cast for many patients who have a displaced closed tibial shaft fracture.

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