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Necessity for fibular fixation associated with distal tibia fractures

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ABSTRACT

Introduction: Intramedullary (IM) nailing is a well-accepted treatment for distal third tibia fractures in combination with injury to the fibula. However, the indications for operative stabilisation of the fibula remain controversial.

Methods: The authors performed a retrospective review on a consecutive series of patients who underwent intramedullary nailing of a non-comminuted distal third tibia fracture with or without fibular fixation at a Level I urban trauma centre. A review of surgical records identified 120 patients who initially were included in this study, while a total of 98 patients who met the inclusion criteria were included in the final analysis.

Results: Our results found no difference in the mean value of coronal and sagittal plane alignment in both the immediate post-operative and follow-up time periods. We also saw no statistically significant difference when comparing malalignment between patients treated with or without fibula fixation. There were no deep infections between the two groups. No significant differences were seen between the fibular fixation group and the non-fixation group. Distal screw removal due to prominence or pain was the most common reason for future surgery in both groups.

Conclusion: These findings suggest that the addition of fibular fixation does not affect whether or not alignment is maintained in either the immediate post-operative or short-term follow-up period.

Introduction

Several recent studies have attempted to answer whether or not fibular fixation is required for non-comminuted distal third tibia fractures. To date, no consensus or clinical guidelines for indications have been developed for intramedullary (IM) nailing of distal tibia fractures with associated fibular fracture. Currently, there is a wide assortment of accepted treatment options for this injury, including IM nailing alone, plating of the tibia alone, and the addition of operative stabilisation of the fibula with either tibial nailing or plating [1,2].

Recent literature has concluded that fibular fixation appears to improve fracture reduction at 12 weeks and maintain better overall axial alignment [3]. Other current research seems to support this recommendation [4,5], however, there is yet to be a consensus on the specific parameters that warrant fixation of the fibula. Some authors have suggested proximity of the fracture to the tibial plafond, while fractures of the tibia and fibula at the same level and severe comminution of the fibula are have also been reported as relative indications to fibular fixation [4,5].

Intramedullary (IM) nailing of distal third tibia fractures has been a well-documented technique for reliable short and long-term clinical outcomes [6]. Less documented is the necessity for fixation of the fibula, and the indications for doing so. Following approval from our Institutional Review Board, a retrospective review of a consecutive series of patients with distal tibia and fibula fractures treated with IM nailing, with or without fibular fixation was conducted. Our hypothesis was that the addition of surgical fixation of the fibula will assist maintenance of the reduction of distal tibia and fibula fractures treated with IM nailing.

Materials and methods

This study was performed as a retrospective review on a consecutive series of patients who underwent IM nailing of distal one-third tibia fractures with or without fibula fixation at a single Level 1 urban trauma centre. All surgeries were performed by one of seven orthopaedic trauma fellowship-trained surgeons. Institutional review board approval was obtained prior to initiating the study.

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A review of our surgical records, using surgeon logs and procedural codes, identified 142 patients that had sustained a distal one-third tibia fracture treated with IM nailing with or without fibula fixation between July 2008 and November 2011. Implant selection and basis for fibula fixation were at the discretion of the surgeon and were non-randomised. After meeting the inclusion and exclusion criteria listed below, we had a total of 98 patients for inclusion in this study.

Inclusion criteria

Patients were included in the study if they had: (1) an acute fracture of the distal 1/3 tibia and an associated fibula fracture, (2) tibia treated with IM nail, with or without fibula fixation, (3) an age of 18 years or older, and (4) sufficient follow-up to confirm fracture union.

Exclusion criteria

Patients were excluded from the study if they had: (1) an age of less than 18 years old, (2) a fracture proximal to the distal one-third of the tibia, (3) no fibula fracture, (4) a previous surgery on the same lower leg, and (5) insufficient postoperative follow-up to confirm fracture union.

Data collection

Chart review was initiated and a database was created recording multiple variables for each patient including age, sex, involved side, mechanism of injury, medical comorbidities, tobacco use, whether the fracture was open or closed, level of fibula fracture in relationship to the tibia fracture, and any associated orthopaedic injuries. The time from initial injury to operative management was documented as well as intraoperative data including the type of IM implant, size of nail, distal interlocking screws, estimated blood loss, operative time, and perioperative complications.

All radiographs were reviewed and fractures classified using the OTA fracture classification system by two of the authors not involved with the initial care of the patients. Fracture union was defined by the radiographic evidence of healing on at least three cortices using the AP and lateral radiographs. A nonunion was defined by the absence of radiographic progression around the six-month postoperative period. Any disagreement between the two authors regarding the aforementioned variables was settled by the senior author (BCT).

Statistical analysis

After data collection, stats were analysed with means, ranges and confidence intervals calculated for continuous variables and compared using Student's *t*-tests. Frequencies were calculated for continuous variables and compared using Fisher's exact test for increased accuracy in small proportion analysis. A significance level of $P > 0.05$ was set as significant, with a trend being defined as a P value being between 0.05 and 0.10.

Results

A total of 142 patients underwent IM nailing of distal tibia fractures with or without fibular fixation between July 2008 and November 2011. Forty-four patients were excluded from the study, most due to insufficient radiographic follow-up. Of the remaining 98 patients that were included in this data set, 15 were in the fibular treatment group and 83 in the non-fibular fixation group (Figs. 1 and 2).

Fig. 1. Anteroposterior (A) and lateral (B) radiographs of a distal tibia fracture with associated fibular fracture. Repeat anteroposterior (C) and lateral (D) radiographs are also seen, with successful union of the fractures; no fibular fixation was used in this case.

No significant differences were found between the treatments regarding age, sex, diabetes, or smoking status (Table 1). However, open fractures were much more likely to be treated without fibular fixation ($P = 0.02$). The average length of follow up was 11.7 months between the two groups ($P = 0.19$). Orthopaedic Trauma Association 42-A1, 42-A2, and 42-C1 tibia fractures represented a majority of the injuries in each group (Table 2). Chi-square analysis showed no difference ($P = 0.36$) for mechanism of injury between the two groups. Regarding the fibular fracture itself, all fractures were at the same level or within 2 cm of the associated tibia fracture.

No significant differences were found regarding use of blocking screws, number or orientation of distal interlocking screws, estimated blood loss, and operating room time (Table 3). A significant difference was seen regarding the IM nail diameter, with the fibular fixation group having a larger nail diameter ($P = 0.02$).

When looking at fracture alignment between our two groups, there was little difference in the mean value of coronal and sagittal plane alignment in both the immediate post-operative and follow-up time periods. The follow-up sagittal alignment did show a statistically significant difference in the sagittal plane ($P = 0.03$), but this likely has no clinical significance as the average means were very similar (Table 4).

Comparing malalignment between our two groups, there were no significant differences. At the immediate post-operative radiographs, 28/83 without fibular fixation were >5 degrees of coronal malalignment, compared to 6/15 in the fixation group ($P = 0.64$). Sagittal malalignment >10 degrees was 4/83 in the non-fixation group and 0/15 in the fixation group ($P = 0.39$). At long term follow-up, 42/83 without fibular fixation had coronal malalignment of >5 degrees, compared to 8/15 in the fixation