ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 02 | February - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EFFECT OF DYNAMIC HINDFOOT VALGUS DEFORMITY FOLLOWING INTRAMEDULLARY FIXATION OF TIBIA AND CONSERVATIVELY MANAGED PROXIMAL AND MIDDLE 1/3RD FIBULAR FRACTURES ON ANKLE FUNCTION RETROSPECTIVE STUDY

Orthopaedics

Dr. Daniel Arun S Post Graduate trainee, Department of Orthopaedics, Chettinad Hospital and research institute, Kelambakkam, tamilnadu, India.

Dr. Sathik Babu M B Professor, Department of Orthopaedics, Chettinad Hospital and research institute, Kelambakkam, Tamilnadu, India.

Dr. Prem Kumar K Associate professor, Department of Orthopaedics, Chettinad Hospital and Research Institute, Kelambakkam, Tamilnadu, India.

Dr. A. Ganesh* Assistant professor, Department of Orthopaedics, Chettinad Hospital and Research Institute, Kelambakkam, Tamilnadu, India. *Corresponding Author

ABSTRACT

Objective: Evaluate Effect of dynamic hindfoot valgus deformity following intramedullary fixation of tibia and conservatively managed proximal and middle 1/3rd fibular fractures on ankle function **Design:** Retrospective study **Materials and methods :** The study involved 20 patients who had undergone conservative management for proximal to middle one-third (except distal one-third level) fibular fracture and who had unilateral middle and distal one-third tibial fractures treated by anatomic reduction and interlocking intramedullary nail fixation. **Outcome Measures:** The Knee Injury and Osteoarthritis Outcome Score (KOOS) and the Foot and Ankle Disability Index Score were used to calculate functional outcome ratings for each patient. In addition, Mean Length of fibula and Mean hindfoot valgus was observed. **Results:** 20 patients were studied The mean KOOS score was 86.5, and the mean FADI score was 89.4. [8,9] The statistical difference in FADI and KOOS in cases of operated side and the contralateral side were statistically insignificant leading to the conclusion that the occurrence of the hindfoot valgus angulation does not cause any functional impairment of the ankle. The increase in calcaneal valgus on the clinical hindfoot examination was a mean of 6 compared to that of the other extremity. Fibular shortening was identified in 14 cases and mean fibular shortening was found to be 1.1 cm. **Conclusions:** Dynamic hindfoot valgus deformity is a foreseen complication in cases of distal diaphyseal fractures of tibia treated with intramedullary nailing along with conservatively managed concurrent proximal and middle third fibular fractures. This deformity is predominantly seen in cases where fibular shortening occurs but its effect on the ankle function is almost unhindered.

KEYWORDS

tibia fracture, intramedullary nailing, malalignment, complication, radiographic

INTRODUCTION

One of the most frequent diaphyseal fractures among all long bones are tibial diaphyseal fractures which are usually associated with fibular shaft fractures.

These injuries are primarily brought on by torsional trauma or high-energy trauma like vehicular or road traffic accidents. Because of the advancement of more recent intramedullary devices and the decline in related complications, the use of intramedullary (IM) nailing to treat tibial fractures is now well established.

The effectiveness of fibular fixation in distal extraarticular tibia-fibular fractures, in addition to tibial intramedullary nailing, is still debatable.

Closed Tibial diaphyseal fractures are generally treated surgically with IMIL nails and are frequently accompanied by fibular fractures. Distal one third Fibular fractures are ideally fixed surgically. Proximal and middle one third fractures are mostly treated conservatively.

Ankle alignment and functional results in patients symptomatically treated for fibular fractures are still unclear.[1] In this study, we investigated the effect of dynamic hindfoot valgus deformity and evaluated whether the conservative management for these concurrently-associated proximal and middle 1/3rd fibular fractures following intramedullary nailing of tibia resulted in impairment in ankle function.

MATERIALS AND METHODS:

The study was conducted in the department of Orthopaedics in Chettinad hospital and research institute from January 2021 to January 2023, which involved 20 patients of which 12 were males and the rest were females.

Inclusion criteria for our study were 1) patients who had undergone conservative management for proximal to middle one-third (except distal one-third level) fibular fracture and who had unilateral middle and distal one-third tibial fractures treated by anatomic reduction and interlocking intramedullary nail fixation, 2) age >18 years 3) Closed fractures

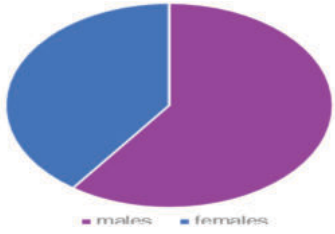

Fig 1 : sex distribution in our study

The exclusion criteria were 1) open fractures 2) non-union of tibia fractures. The mean follow-up period was 12 months .

The patients getting admitted in our hospital were selected based on inclusion and exclusion criteria. Informed written consent was taken from the patients to participate in this study.Using a goniometer, the hindfoot alignment was clinically assessed at the follow-up examination. To compare tibial and fibular lengths between the injured and contralateral limbs, full-length antero-posterior and lateral radiographs of the tibia and fibula were taken for both the lower limb extremities at the same distance.

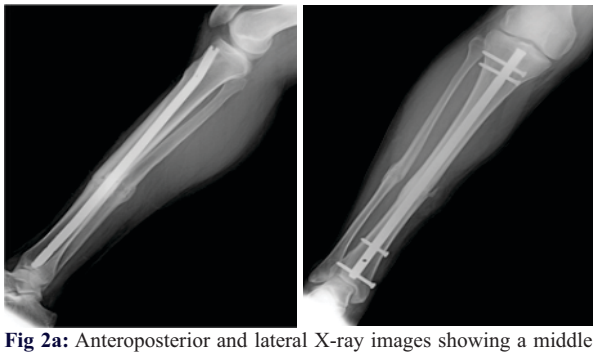

Fig 2a: Anteroposterior and lateral X-ray images showing a middle one-third tibial shaft fracture with an associated fibular fracture and a healed tibial fracture treated with intramedullary nailing.

Fig 2b: Anteroposterior and lateral X-ray images showing a junction of middle and distal one-third tibial shaft fracture with an associated fibular fracture and a healed tibial fracture treated with intramedullary nailing.

Picture archiving and transmission system (PACS) was used to measure lengthening. The Knee Injury and Osteoarthritis Outcome Score (KOOS) and the Foot and Ankle Disability Index Score were used to calculate functional outcome ratings for each patient (FADI)[9]. This study was approved by IHEC and that all investigations conformed with the ethical principles of research.

Fig 3a and 3b: Stance position. Solid lines were marked on the skin to identify the tibial angle and the calcaneal stance.

3.RESULTS

All patients demonstrated radiographic union of both the tibia and fibula. Anatomic union occurred in 20 cases (100%) and was defined for tibia with an equal length to the contralateral limb.

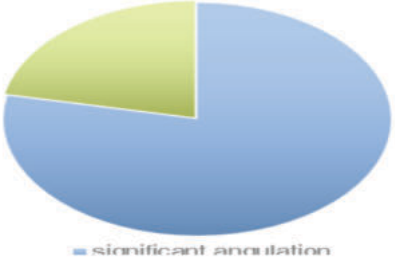

Fig. 4: Incidence of hindfoot valgus

The increase in calcaneal valgus on the clinical hindfoot examination was a mean of 6° compared to that of the other extremity.(ref to table 1)

Table 1 Fibular shortening was identified in 14 cases and mean fibular shortening was found to be 1.1 cm.(ref to table 2)

	Mean hindfoot valgus noted
Operated side	6 degrees
Contralateral side	3 degrees

Table 2

	Mean Length of tibia (in mm)	Mean Length of fibula (in mm)
Operated side	331	325
Contralateral side	333	336

The mean KOOS score was 86.5, and the mean FADI score was 89.4. [8,9] The statistical difference in FADI and KOOS in cases of operated side and the contralateral side were statistically insignificant leading to the conclusion that the occurrence of the hindfoot valgus angulation does not cause any functional impairment of the ankle.(ref Fig 5)

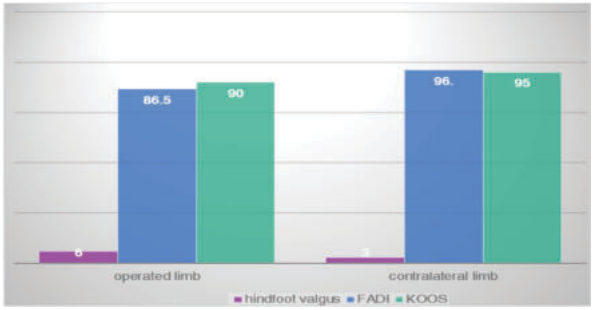

Fig : 5

4.DISCUSSION

Both bone fractures of leg are one of the most frequent orthopaedic injuries that we encounter in emergency department. Treatment remains controversial due to the variety of fracture patterns and soft tissue problems which are associated with these injuries. Most Diaphyseal fractures of Tibia are treated successfully with Closed reduction and internal fixation of tibia with intramedullary interlocking nail while most of the proximal and middle 1/3rd shaft fractures of the fibula are managed conservatively. In general, only the distal one third fractures of fibula are surgically fixed due to the involvement of the syndesmotic joint.

Numerous complications have been reported following both surgically managed and conservatively managed distal tibial diaphyseal fractures, which includes ankle malalignment, rotational deformity, and lower extremity angulation. [2, 12]

Results of our study correlated with that of Poblocki et al who noted that most of the cases with distal tibial fractures had impaired tibial alignment but no complications were reported relating to the ankle, even though these hitches may impede lower extremity function and can cause knee or ankle pain. [3]

Despite the possibility of fibular shortening following fractures, Hooper et al [7] reported positive outcomes following conservative management of isolated diaphyseal fibular fractures which also corelated with our study. Although there were no ankle-related issues, no details about bone shortening were given. In the current study, a calcaneal valgus deformity (mean angulation of 6 degrees) was observed during bone healing from a tibial shaft fracture, and fibular shortening (mean shortening of 1.1 cm) was also observed. The same exposure time, position, and distance were used on X-rays to measure the fibular length and was compared it to a normal fibula.

A hindfoot assessment was done in a standing, weight-bearing position. A hindfoot alignment disorder is dynamic; thus, hindfoot cases must be evaluated in the weight-bearing position both clinically and radiologically. In our study we used the technique of Astrom and Arvidson et al to measure the angles using goniometer to observe the alignment of the ankle. [10]

However, the hindfoot deformity which was seen in our study does not show any impairment in the functional outcome following conservative treatment of the proximal and middle third fractures of fibula. Saltzmann et al had described coronal plane alignment using x rays or on a long axial view in weight bearing position, but we did not use these techniques because the quality of the x-rays depends on the technician. [5, 13]

Whorton and Henley et al demonstrated that tibial alignment or bone healing are unaffected by fibula fixation in individuals with open tibial and fibular shaft fractures. [11]

But according to certain research, stabilising the fibula in individuals who have distal tibial or fibular fractures improves fracture stability up to 12 weeks after surgery. Biomechanical Studies by Stufkens et al and Strauss et al have shown that fibular fixation may help in preventing the loss of alignment in cases of distal tibial fractures which is managed by intramedullary nailing or plate fixation methods. [5, 6]

5.CONCLUSION

Dynamic hindfoot valgus deformity is a foreseen complication in cases of distal diaphyseal fractures of tibia treated with intramedullary nailing along with conservatively managed concurrent proximal and middle third fibular fractures. All the hindfoot cases should be evaluated in weight bearing position both clinically and radiologically. This deformity is predominantly seen in cases where fibular shortening occurs but its effect on the ankle function is almost unhindered. An additional study is required to assess the long-term functional analysis in cases of supra-syndesmotic and syndesmotic injuries of the ankle.

6.REFERENCES

1. J. G. Garrick, R. S. Riggins, R. K. Requa, and P. R. Lipscomb, "Fracture of the mid-shaft of the tibia and fibula. A survey of treatment," *Clinical Orthopaedics and Related Research*, vol. 88, pp. 131–137, 1972.
2. H.A.Vallier,B.A.Cureton,andB.M.Patterson,"Factorsinflu- encing functional outcomes after distal tibia shaft fractures," *Journal of Orthopaedic Trauma*, vol. 26, no. 3, pp. 178–183, 2012.
3. K. Pobłocki, M. Domaradzki, J. Gawdzik, P. Prochacki, and R. Rajewski, "Complications after intramedullary nailing of the tibia,"*ChirurgiaNarządo w Ruchui OrtopediaPolska*,vol.76, no. 5, pp. 274–277, 2011.
4. K. A. Egol, R. Weisz, R. Hiebert, N. C. Tejwani, K. J. Koval, and R. W. Sanders, "Does fibular plating improve alignment after intramedullary nailing of distal metaphyseal tibia fractures?" *Journal of Orthopaedic Trauma*, vol. 20, no. 2, pp. 94–103, 2006
5. E. J. Strauss, D. Alfonso, F. J. Kummer, K. A. Egol, and N. C. Tejwani, "The effect of concurrent fibular fracture on the fixa- tion of distal tibia fractures: a laboratory comparison of intra- medullary nails with locked plates," *Journal of Orthopaedic Trauma*, vol. 21, no. 3, pp. 172–177, 2007.
6. S. A. Stufkens, C. J. van Bergen, L. Blankevoort, C. N. van Dijk, B. Hintermann, and M. Knupp, "The role of the fibula in varus and valgus deformity of the tibia: a biomechanical study," *Jour- nal of Bone and Joint Surgery*, vol. 93, no. 9, pp. 1232–1239, 2011.
7. G. Hooper, R. A. Buxton, and W. J. Gillespie, "Isolated fractures of the shaft of the tibia," *Injury*, vol. 12, no. 4, pp. 283–287, 1981.
8. E. M. Roos, H. P. Roos, L. S. Lohmander, C. Ekdahl, and B. D. Beynnon, "Knee injury and osteoarthritis outcome score (KOOS)—development of a self-administered outcome mea- sure," *Journal of Orthopaedic & Sports Physical Therapy*, vol. 28, no. 2, pp. 88–96, 1998.
9. R. L. Martin, R. G. Burdett, and J. J. Irrgang, "Development of the foot and ankle disability index (FADI)," *Journal of Ortho paedic & Sports Physical Therapy*, vol. 29, pp. A32–A33, 1999.
10. M.AstromandT.Arvidson,"Alignmentandjointmotioninthe normal foot," *Journal of Orthopaedic & Sports Physical Therapy*, vol. 22, no. 5, pp. 216–222, 1995.
11. A. M. Whorton and M. B. Henley, "The role of fixation of the fibula in open fractures of the tibial shaft with fractures of the ipsilateral fibula: Indications and outcomes," *Orthopedics*, vol. 21, no. 10, pp. 1101–1105, 1998.
12. L. K. Cannada, J.O. Anglen,M.T.Archdeacon,D.Herscovici Jr.,and R. F. Ostrum, "Avoiding complications in the care of fractures of the tibia," *Instructional Course Lectures*, vol. 58, pp. 27– 36, 2009.
13. C. L. Saltzman and G. Y. El-Khoury, "The hindfoot alignment view," *Foot & Ankle International*, vol. 16, no. 9, pp. 572–576,1995.