FUNCTIONAL OUTCOME FOLLOWING FIXATION OF ANKLE FRACTURES

(BI/TRIMALLEOLAR)

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ABSTRACT

Introduction: Malleolar injuries are the most common significant lower extremity fractures. These injuries gain importance, because the whole body weight is transmitted through the ankle, and locomotion depends on the stability of the ankle. Open reduction and internal fixation have become the mainstay of treatment for most of the unstable bi/trimalleolar fractures, as these operative methods restores the anatomy, biomechanics and contact loading characteristics of the ankle. To study the functional outcome of surgically treated bi/trimalleolar fractures of ankle in adults.

Methods: A prospective study of 40 cases of bi/trimalleolar fractures of ankle in adults, managed surgically by various techniques in Chettinad Hospital And Research Institute, Kelambakkam, between June 2018 to April 2019, satisfying the inclusion and exclusion criteria were studied. The functional outcome was evaluated using the Biard and Jackson’s ankle scoring system at the end of six month follow up.

Results: In our study we achieved 82.5% excellent to good results, 12.5% fair results, 5% poor results. The results were comparable to other studies. TBW done for many PER and PA injuries showed promising results comparable to that with screw fixation and also lesser reports of skin irritation at the wound site.

Conclusion: It is the method preferred for small tranverse fragments and osteoporotic bones of both malleoli especially in the elderly.

Keywords: Malleolus; plating; Cancellous; biomechanics; medial; TBW

INTRODUCTION

Ankle fractures are common type of fractures treated by orthopaedic surgeons. There has been an increase in the prevalence of such fractures over the last two decades both in the young, active patients and in the elderly.¹ ² Most ankle fractures are complex injuries that are difficult to manage. These injuries gain importance because the whole body weight is transmitted through the ankle and locomotion depends upon the stability of the ankle joint. They have the potential to produce significant long-term disability and complications in the form of pain, instability and early degenerative arthritis.³ As a result of a better understanding of the biomechanics of the ankle, improvements in fixation techniques and findings of outcome studies, there has been a gradual evolution in the effective strategies for the treatment of ankle fractures. The goals of treatment include achieving sound union of fracture and a painless ankle with normal function. As has been shown experimentally by Paul L. Ramsey, about one mm lateral shift in Talus produces about 42 percent of decrease in tibio-talar contact surface ². This obviously shows the need for perfect anatomical reduction, which could be better, achieved by open reduction and better maintained by internal fixation. The operative method restores the anatomy and contact-loading characteristic of the ankle. Additional advantages include easier rehabilitation without a cast, early mobilization and earlier weight bearing⁴. Although fractures of the ankle have traditionally been considered non-controversial with respect to the indications for operative intervention, recent advances in the understanding of the biomechanics of the ankle have given rise to particular areas of clinical uncertainty. These include the indications for the operative treatment of isolated fractures of the lateral malleolus, the operative techniques for syndesmotic injury and its post-operative management and the reliability of radiographic assessment of fractures of the ankle. The purpose of this study, on Bi/trimalleolar fractures of ankle is to evaluate the functional outcome and results obtained after surgical management by various methods of internal fixation.
METHODOLOGY

From June 2018 to April 2019, 40 cases of bi/trimalleolar fractures of ankle in adults were treated at Chettinad Hospital and Research Institute, Kelambakkam by surgical intervention and studied for a period of 6–9 months. 40 patients with bi/trimalleolar fractures of ankle who were admitted and operated at Chettinad Hospital And Research Institute, Kelambakkam, were included in the present study.

All the patients were explained about the aims of the study, the methods involved and an informed written consent was obtained before being included in study. On admission of the patient, a careful history was elicited from the patient and/or attendants to reveal the mechanism of injury and the severity of trauma. The patients were then assessed clinically to evaluate their general condition and a complete survey was done to rule out significant injuries. Careful examination was done to rule out fractures at other sites. Local examination of injured ankle and following clinical signs were looked for. Instability of the syndesmosis was identified on the basis of the mechanism of injury and the fracture pattern. Pain elicited with the squeeze test (manual medial-lateral compression across the syndesmosis) and the external rotation stress test was considered as indicative of clinical syndesmotic instability. Radiologically, tibiofibular clear space of more than six millimeters and widening of the medial clear space of more than four millimeters were considered as indications of syndesmotic instability. Intraoperatively, the stability was checked by laterally displacing the distal fibula from the tibia, if >3 or 4 mm of lateral shift of talus occurs, it suggests instability (Cotton test).5

RESULT & DISCUSSION

Of all the intra-articular fractures occurring in weight bearing joints, the most common joint involved is the ankle joint. Methods to restore function and to prevent arthritis are either closed treatment, which includes manipulative reduction and immobilization in plaster cast or open reduction with internal fixation. Burwell and Charnley showed that anatomical reduction and rigid fixation led to early return to function. There has been gradual evolution in management of ankle fractures due to improved analysis of biomechanics, improvement in fixation techniques and...
analysis of results of recent studies. The goal of treatment is to provide fracture union with painless full motion of ankle, with anatomical restoration of the injured ankle. Closed method of treatment is often in adequate in restoring the anatomy and biomechanics of ankle in unstable malleolar ankle fractures. Conversely, open reduction with internal fixation is an excellent method for restoration of normal anatomy of joint. Several studies indicated that, internal fixation of displaced malleolar fractures of ankle provides better results. The treatment of malleolar fractures with accurate open reduction and stable internal fixation using AO method and principles was found to give a high percentage of excellent and good results. In the current study, the authors have 40 patients with bi/trimalleolar ankle fractures, who were operated upon. All patients were followed up with minimum period of 6 months (Range – 6 to 9 months). Most authors have stated that anatomical reduction of displaced medial malleolus ensures correction of talar displacement and is of paramount importance in treating unstable fractures. However, Heller et al. state that talus is more accurately repositioned in mortise by anatomical reduction of lateral malleolus. Observation in this study support the contention of Yablonet al that lateral malleolus is the key to the anatomical reduction of bi/trimalleolar fractures, because the displacement of the talus faithfully followed that of the lateral malleolus. Poor reduction of the lateral malleolus # would result in persistent lateral displacement or residual shortening. This does not necessarily lessen the importance of medial malleolus, but it does serve to emphasize that the lateral malleolus should no longer be ignored. In the current study, the two patients with poor outcome didn’t have anatomical reduction of the medial malleolus possibly due to soft tissue interposition. Lateral malleolus can be fixed by various methods. Lateral plates, as advocated by AO group has become widely accepted for treatment of fibular fracture. Hughes et al. recommended that lateral malleolus should be fixed first. The medial malleolus is then inspected for stability and fixed if necessary. This allows minimal postoperative immobilization and rapid recovery of function. In the current study, the functional outcome was better in patients who underwent stable internal fixation of the medial malleolus by cancellous or malleolar screw. The results were not equally satisfactory in those patients who had less rigid fixation of the medial malleolus using only Kirschner wires. Tension band wiring of the medial malleolus gave results equivalent of those fixed with screws and lesser reports of skin irritation which was more frequent in those patients with screw fixation. In
many fractured ankles, syndesmosis is stable after reduction and internal fixation of fibula fracture and medial malleolar fracture. Yablon\textsuperscript{11} stated that anatomical reduction of the fibula is the key factor in achieving good outcome of the treatment of ankle fractures with syndesmotic disruption. In the current series, two patients underwent trans-s Syndesmotic screw fixation. Excellent and fair outcomes were seen in one patient each. Although early mobilization was advocated by AO group, other studies\textsuperscript{14} have found no significant difference in the results produced after early mobilization. In the current study, immobilization was done for 4 weeks. Partial weight bearing was advised for those with early radiological signs of union and full weight bearing when the signs of union were complete. The range of motion of ankle was reduced initially, but improved over few weeks. In our series there was 30 degrees or more plantar flexion in 35 patients (87.5\%) and 20 degrees or more dorsiflexion in 33 (82.5\%) patients. With 40 patients there were no instability of ankle or subtalar joints, because we allowed sufficient time for the soft tissues around the ankle to heal. We preferred postoperative immobilization rather than allowing active ankle exercise as there was no difference in the results after 6 months of follow-up. Bray noted that incidence of complications are less in patients who underwent immediate surgery when compared to those who underwent delayed surgery.\textsuperscript{15} Fair to poor results in the current series were seen due to wound infection, associated syndesmotic injury, delayed union of medial malleolus. Restricted activity level and range of movement without radiological evidence of arthritis was noted in four patients. Poor results were seen in Pronation- external rotation and Supination - external rotation type of injuries. Majority of the patients (82.5\%) had good to excellent results in the current study, similar to what was observed in other series like Burnwell & Charnley\textsuperscript{6}, Colton\textsuperscript{16}, De Souza et al \textsuperscript{7}, Beris et al \textsuperscript{9}. The treatment of bi/trimalleolar fractures with accurate open reduction and stable internal fixation using AO method and principles was found to give a high percentage of excellent and good results\textsuperscript{9}. This study supports these conclusions and was comparable with those in other studies.

CONCLUSION

In this review, the 40 cases of bi/trimalleolar fractures of ankle, that were unstable, displaced or both, were treated surgically by open reduction and internal fixation.
Unstable bi/trimalleolar ankle fractures are common due to road traffic accidents.

Ankle injuries are common in middle aged men and elderly women.

Age groups between 31 - 40 years were most commonly injured. The mean age of present study was 37.4 years.

Bi/trimalleolar fractures more common in males than females.

Majority of them were caused by external rotation injuries, supination-external rotation (37.5%) and pronation-external rotation (30%).

Understanding the mechanism of injury is essential for anatomical reduction and fixation.

Fibular alignment (length, rotation) has to be maintained for lateral stability of the ankle.

Anatomical reduction with restoration of the articular congruence is essential in all intraarticular fractures, more so, if a weight bearing joint like ankle is involved. Open reduction and internal fixation restores the articular congruity of the ankle joint.

The operative results were satisfactory in 82.5% cases, with good to excellent functional outcome.

Functional results were much better in younger age groups and men. Fair to poor results were seen in those bimalleolar fractures associated with syndesmosis injury, wound infection and those with unsatisfactory reduction of fracture fragments.

Excellent results are obtained with stable fixation of fracture. Cancellous screws or malleolar screws are better in internal fixation of medial malleolus compared to Kirschner-wire fixation and lateral plating was the best for fibular fractures.

TBW done for many PER and PA injuries showed promising results comparable to that with screw fixation and also lesser reports of skin irritation at the wound site. It is the method preferred for small transverse fragments and osteoporotic bones of both malleoli especially in the elderly.

Functional results improve when the normal bend of the lateral malleolus is restored while plating.

More severe injuries were followed by less satisfactory results.

Chances of non-union due to soft tissue interposition were avoided by surgical treatment.
Delayed union of two cases, were possibly due to unsatisfactory reduction at time of surgery.

✓ Good functional results are obtained by surgical management of bi/trimalleolar ankle fractures. Early weight bearing and mobilization is achieved in these patients.

✓ Plaster cast or slab applied for a period of 3 -4 weeks does not reduce the final outcome. Rehabilitation is quick because immobilization is for a relatively short duration and is followed by weight bearing.

Hence it is concluded that, surgical management of bi, trimalleolar ankle fractures provides good functional outcome. By stable surgical fixation of fracture, early mobilization can be done with good functional outcome.

REFERENCES


