Functional outcome of postero-lateral approach for fixation of posterior malleolus fracture in case of trimalleolar fractures of ankle: A study of 32 cases

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Abstract

Introduction: Trimalleolar fracture fixation has undergone a sea change in the recent times. Posterior malleolus component used to be fixed by anteroposterior approach which has not been optimum as far as results are concerned. Posterolateral approach has been well described in literature but very few are using it. This study has tried to evaluate the results of this approach.

Methods: Total 32 patients were included in this study. They underwent posterolateral approach and fixation of fibular fracture and posterior malleolus fracture in prone position. Medial malleolus fracture was fixed in supine position. Posterior malleolus was classified based on Haraguchi classification on CT scan. Final evaluation was done using Olerud and Molander scoring system.

Results: All fractures united within three months duration. Excellent results were seen in 40.6%, Good in 43.8%, Fair in 9.4% and Poor in 6.2% cases. Most of the patients could return to pre-injury work levels by six months.

Conclusion: Direct posterolateral approach allows fixation of fibula and anatomical restoration of ankle joint congruency and syndesmotic stability also, obviating the need of syndesmotic screw. Posterior malleolus fixation is essential in tri-malleolar fractures for good functional outcome.

Keywords: posterior malleolus, syndesmosis, tri-malleolar

1. Introduction

Ankle fractures account for a significant portion of all orthopaedic emergencies all over the world [1]. Trimalleolar fractures have a reported incidence of 7% to 14% of all ankle fractures [1, 2]. These fractures have bad prognosis compared to bimalleolar fractures [3]. These fractures are often associated with disruption of distal tibio-fibular syndesmosis. Earlier concept of fixation of posterior malleolus was based on the size, that is if it was more than 25% it should be fixed. This was based on lateral radiograph of ankle. It has now been amply documented that plain radiographic analysis is a poor method of determining the site, size and extent of displacement of posterior malleolus fracture [4, 5]. With better imaging techniques and advances in study of ankle biomechanics, importance of posterior syndesmotic stability and fibular notch congruence has been better studied, documented and accepted [6, 7]. Management of posterior malleolus fracture has been a topic of debate in recent times. Proponents of ORIF have proposed to fix the posterior malleolar fragment irrespective of its size. Recent studies have shown that irrespective of the size of posterior malleolus, fixation by ORIF has better syndesmotic stability and better functional outcome [8]. However one study has shown no difference between the groups in which the posterior malleolus was internally fixed and other group in which it was not fixed [6, 9]. There is difference of opinion as some surgeons routinely fix all posterior malleolar fractures and some surgeons feel that if fibula is fixed anatomically then fixing the posterior malleolar fragment is not essential [10]. There is further difference of opinion as regards to the approach to this fracture. Antero-posterior fixation by percutaneous technique has been practiced by many. However it has several disadvantages as compared to direct posterior approach [11, 12]. Posterolateral approach has been well described but still not widely put into practice by many orthopaedic surgeons for these fractures [13, 14]. In this study we have tried to evaluate the clinical and functional outcome of posterior malleolar fractures treated by postero-lateral approach.
Materials and Methods
This study was conducted at GMERS, GOTRI MEDICAL COLLEGE, VADODARA from Jan-2014 to Dec-2020. A total of 40 patients with tri-malleolar fractures who had undergone ORIF were initially enrolled in the study. Out of these 08 patients were lost to followup and 32 cases could be followed up till their final outcome evaluation. All cases were selected after careful inclusion and exclusion criteria.

Inclusion Criteria: Age between 18 to 70 years. Radiological documentation of Tri-malleolar fracture. Patient willing for surgery. Medically fit patient.

Exclusion Criteria: Bilateral lower limb injury. Open fractures. Other systemic or skeletal injury. Patient refusing surgical management.

All patients were initially evaluated on outdoor basis or in emergency setup. Thorough clinical examination was done to rule out other associated systemic or skeletal injury. Radiological assessment was done in form of standard AP and Lateral view of ankle joint. If ankle was subluxated or dislocated it was reduced as emergency procedure and then immobilized in below knee slab. Three dimensional computed tomogram was done to have better understanding of fracture pattern. The fracture was subsequently classified based on Haraguchi et al classification [15] Primary treatment in form of rest, elevation and analgesics was given and pre-operative evaluation and assessment was done for fitness of patient for surgery. All patients were operated under spinal anaesthesia using a tourniquet. First prone position was given and standard posterolateral approach was taken. Sural nerve was identified and safely retracted. As a first step fibula fracture was anatomically reduced to regain fibular length and fixed with anatomical plate or semitubular plate under fluoroscopic control. Through the same approach posterior malleolar fragment was reduced anatomically and held with wires and fixation confirmed under fluoroscopy. It was then fixed using T-Buttress plate. Wound lavage was done and the incision was closed in layers. Patient was then turned to supine position and then medial malleolus fixation was done by either tension band wiring or cannulated cancellous screws and the incision was closed and sterile dressing applied. Postfixation x-rays were taken for record purpose. Limb elevation was done in post operative phase and gentle ankle mobilization exercises were started as per pain tolerance of patient. Stitch removal was done around 14th day and additional below knee splint was given for four weeks. Patient was evaluated at 6 weeks, 12 weeks and 24 weeks. Partial weight bearing was started at 6 to 8 weeks time. Final assessment was done at six months by using the OLERUD and MOLANDER scoring system [16].
Results
A total of 32 patients were included in the study with 26 males and 06 females. Mean age of occurrence was 41 years with a range of 19 to 65 years. Twisting injury to the ankle was the most common mechanism of injury in all cases. Side of injury was 16 each on left and right side. Average duration of admission to operation interval was 6 days with a range of 2 to 12 days. Average duration of hospital stay was 10 days with a range of 4 to 16 days. Based on Haraguchi classification there were 23 cases of type I fracture and 09 cases of type II fracture of posterior malleolus. All the fractures united by around three months time. Weight bearing was started by most of the patients within 6-8 weeks. Superficial wound infection was seen in only 1 case with an incidence of 3%. There was no incidence of deep infection. Metal irritation was seen in 6 patients that too on medial malleolus side and they underwent implant removal. However none of them had any complaint on lateral or posterior side. There was no incidence of nerve injury in our series. Functional range of motion was achieved in all the cases. Incidence of ankle stiffness and arthritic changes was seen in 2 patients. Based on OLERUD and MOLANDER scoring system we had Excellent results in 40.6%, Good results in 43.8%, Fair results in 9.4% and Poor results in 6.2% cases.

| Parameter       | Degree                | Score |
|-----------------|-----------------------|-------|
| Pain            | None                  | 25    |
|                 | While walking on uneven surface | 20    |
|                 | While walking on surface outdoors | 10    |
|                 | While walking indoors constant and severe | 5     |
| Stiffness       | None                  | 10    |
|                 | Stiffness             | 0     |
| Swelling        | None                  | 10    |
|                 | Only in evenings      | 5     |
|                 | Constant              | 0     |
| Stair climbing  | No problems           | 10    |
|                 | Impaired              | 5     |
|                 | Impossible            | 0     |
| Running         | Possible              | 5     |
|                 | Impossible            | 0     |
| Jumping         | Possible              | 5     |
|                 | Impossible            | 0     |
| Squatting       | No Problems           | 5     |
|                 | Impossible            | 0     |
| Supports        | None                  | 10    |
|                 | Taping, Wrapping      | 5     |
|                 | Stick or Crutch       | 0     |
| Work, Activities of daily life | Same as before injury | 20    |
|                 | Loss of Tempo         | 15    |
|                 | Change to simpler job | 15    |
|                 | Severely impaired work capacity | 0     |

Olerud and Molander scoring system

Discussion
Two to three decades back the approach to ankle fractures was very limited. Lot of importance was given to restoration of medial and lateral pillar of ankle joint. Most surgeons used to follow the earlier criteria based on fragment size, that is if it was more than 25 percent it needed fixation or else it could be treated conservatively. De Vries et al in their study could not find any statistical difference in the outcome with regards to the size of posterior malleolus and to the type of fixation [17]. Advances in imaging techniques and various biomechanical studies have changed the approach towards fixation of posterior malleolus fractures. Cadaveric studies have shown that ORIF of posterior fragment provides greater stability compared to syndesmotic screw fixation [6]. Biomechanical studies have shown that accurate reduction and fixation of posterior malleolus restores nearly 50% of total strength of syndesmosis. Old conventional teaching says that AP screw fixation of posterior malleolus is a good option [18, 19, 10]. However this approach has limited preference because accurate reduction and hold of the fracture fragment is usually difficult. Also these fracture pattern are subjected to large vertical shear forces during loading. Hence these cannot be adequately fixed with AP screws alone. [12, 13, 20]. This often results in loss of reduction resulting in eventual ankle arthritis. Although posterolateral approach has been described almost two decades back, it has still not become universally accepted [21]. This approach provides direct visualization of the fracture fragment which is helpful in better articular congruity restoration and stability of syndesmosis is also possible. The same approach can be used to fix fibula fracture also. Biomechanical studies have proved advantages of posterior plating of fibula versus lateral plating [22]. Shi et al have reported superior functional outcome by direct approach of posterior malleolus fracture [23]. Verhage et al found the posterolateral approach for fixation of posterior malleolus fracture to be better in terms of articular reduction [24]. Li et al have shown better syndesmotic stability after posterolateral approach and fixation as compared to antero-posterior screw fixation [25]. O’Connor et al also concluded that posterolateral approach and fixation of posterior malleolus had better outcome than those treated by AP screw fixation [12].
Milton et al. had an overall infection rate of 4.4%. They had an implant removal incidence of 7% due to hardware irritation [20]. There was 3% incidence of superficial wound infection in our study which eventually healed with antibiotics and dressing.

Conclusion
Restoration of fibular length in Trimalleolar fractures is of paramount importance and a key corner-stone for good functional outcome. Fixation of posterior malleolus under direct vision by antigrade plate is essential for restoration of articular congruity and prevention of late ankle stiffness and arthritis. Both these goals are very well achieved by the posterolateral approach and hence this approach is highly recommended for all orthopaedic surgeons while treating Trimalleolar fractures of ankle.

Limitation of Study
The sample size in the study was small hence large sample size is needed to further reinforce our findings.

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Conflict of Interest
The authors have no conflict of interest to declare.

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