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RESEARCH ARTICLE

SINGLE POSTEROLATERAL APPROACH TO POSTERIOR MALLEOLUS AND DISTAL FIBUALA FRACTURES : A CASE SERIES

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Abstract

Introduction : Posterolateral approach to posterior malleolus and distal fibula has several advantages like ability to approach both fractures with same incision, fracture reduction under direct vision and good posterolateral soft tissue coverage on hardwares. However this approach demands particular fracture pattern with cominution involving predominantly on posterior tibia. *Materials and methods* : Study included eight patients among which five were men and three were females. Mean age group was 30.2 years. One patient had open fracture and seven patients had closed fractures. Three patients had trimalleolar fractures and five patients had posterior malleolus with distal fibula fractures without medial malleolus.Posterolateral approach was used in all and distal fibula were fixed first. Posterior malleolus fixation was done with cortical screws(n=5) and buttress plating(n=3). Medial malleolar(n=3) fixation was done with Kirschner wires. Syndesmotic fixation was done in one patient. Postoperative immobilization was done for four weeks. *Results* : Intraoperative stability was good in all patients with no intraarticular step at ankle joint. Mean postoperative followup was about ten months. No patients had postoperative infection or wound dehiscence.Functional assessment were done with Ankle-Hindfoot scale at nine months in all patients and showed a score of 90(n=2), 89(n=1),87(n=1),84(n=1), 82(n=2), and 78(n=1) out of 100.Radiological assessment showed complete fracture union at an average of six months. No patient hardware prominence at ankle. *Conclusion* : Posterolateral approach is a excellent approach for posterior malleolus and distal fibula fractures which allows for direct reduction and fixation of both fractures through same approach.
KEYWORDS : posterolateral approach, antiglide,tibial plafond, buttress plate, sural nerve

INTRODUCTION

Tibial plafond with distal fibula fractures are usually treated with early reduction of distal fibula followed by open reduction of tibial plafond once swelling subsides by various approaches since soft tissue healing problems are quite often in these fractures in presence of swelling[1-3]. There are many approaches for tibial plafond namely anteromedial, anterolateral, postereomedial and posterolateral which can be used depending on fracture patterns. Each approaches have their own advantages and disadvantages. In posterior malleous fractures combined with distal fibula

fractures, fracture fixation using anteroposterior screws using anterior approach is kind of indirect reduction where anatomical reduction chances are less as compared to direct reduction using posterolateral approach[4]. In addition other advantages of posterolateral approach are, good soft tissue coverage over implants and hence may act has barrier for superficial infection to deep[5], ability to fix both posterior malleolus and distal fibula through same incision[6], lesser hardware prominence as compared to routine anteromedial approach due to sufficient soft tissue coverage. However this approach demands particular fracture pattern, that is, approach is useful when comminution is predominantly posterior[5]. In this study of eight patients, we used posterolateral approach for open reduction and internal fixation of posterior malleolus and distal fibular fractures and experienced excellent results clinicoradiologically.

MATERIALS AND METHODS

This prospective study was conducted in department of Orthopaedics, Sri Laxmi Narayan Institute of Medical Sciences, Pondicherry between May 2013 to March 2014. Inclusion criteria were posterior malleolar fractures with distal fibular fractures including trimalleolar fractures, closed or open. All the patients satisfying inclusion criteria were admitted on outpatient or emergency basis. Appropriate Xrays were taken and computed tomographies(CT) were taken in all patients. Patients were immobilized with plaster of paris. There were eight patients in our study. Among them five patients had posterior malleoli with distal fibular fractures and three patients had trimalleolar fractures. One patient had open fracture which was trimalleolar and rest of them had closed fractures. One patient had intramedullary nail insitu put for tibial fracture which was united and she developed trimalleolar fracture afresh(Figure 1).All patients were planned for elective surgeries except in a patient with open trimalleolar fracture in which wound debridement and external fixator spanning ankle was applied on emergency basis(Figure 2).Prone position was used in all patients for posterolateral approach. Intraoperatively, incision was made along posterior border of fibula just lateral to achillis tendon. The internervous plane being between flexor hallucis longus and peroneal tendon. Sural nerve was identified and isolated. In all patients fibula was fixed first with one-third tubular plate or recon plates(Figure 5). In one patient, due to low lateral malleolar fracture and oblique pattern,we used recon plate in antiglide mode. Posterior malleolar fragment was reduced under direct vision and fixed with cortical screws in five patients and buttress plated in three patients(Figure 3 and 4). Ankle joint congruency was checked fluoroscopically. Three patients with trimalleolar fractures, medial malleolus was fixed with Kirschner(K)- wires by closed methods under fluoroscopic guidance after changing position into supine. In one patient, syndesmotic screw was put since we suspected syndemotic injury(Figure 2). Postoperatively all patients were immobilized with plaster of paris for four weeks. Ankle range of movement were started at four weeks. Partial weight bearing was started at eight weeks and full weight bearing at three months except in a patient with syndesmotic screw in which partial weight bearing was started at three months after syndemotic screw removal. Functional assessment with Ankle-Hindfoot scale was done at nine months postoperatively. Radiological assessment was performed at 6,10,14 and 24 weeks postoperatively.

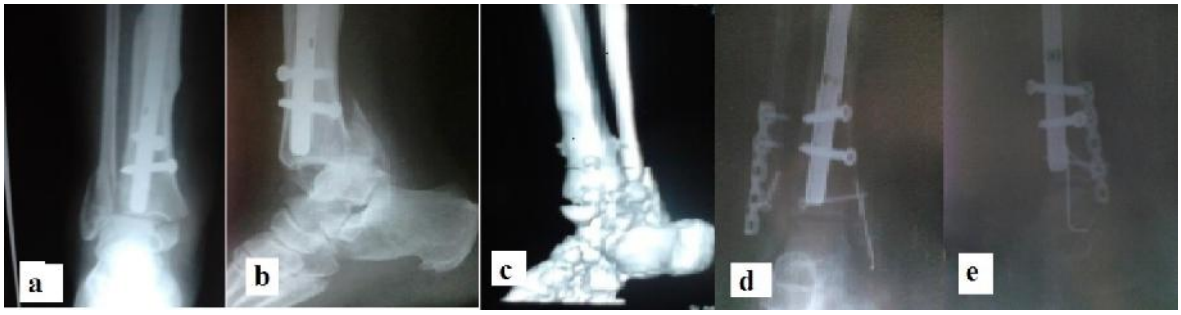

Figure 1. a and **b.**Preoperative X rays showing trimalleolar fractures with intramedullary nail insitu, **c.** CT scan of same patient showing trimalleolar fractures, **d** and **e.** postoperative X-rays with medial malleolus fixed with K-wire, posterior malleolus with cortical screw and fibula with recon plate in antiglide mode.

Figure 2. **a** and **b**. Open trimalleolar fracture initially debrided and stabilized with external fixator. 2 weeks later once wound healed, open reduction reduction and internal fixation was done through posterolateral approach for posterior malleolus and distal fibula. Syndesmotic screw too was applied, **c**. By three months external fixator and syndemotic screw were rermoved and patient was made to weight bear.

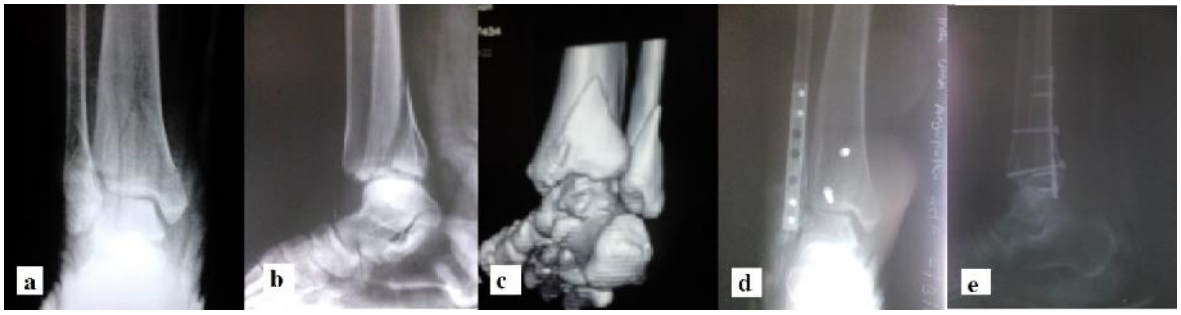

Figure 3. **a** and **b**. Preoperative X rays in a patient with posterior malleoli and distal fibula fractures, **c**. CT scan showing the same, **d** and **e**. Postoperative Xrays showing posterior malleolus fixed with cortical screws and fibula with one third tubular plate.

RESULTS

This study included eight patients among which five (n=5) were men and three (n=3) were females. Mean age group was 30.2 years. Mode of injury were road traffic incidents (n=3) and self fall (n=5).

Intraoperative stability was good in all patients. Direct vision reduction of posterior malleoli were possible in all.No patients showed intraarticular step at ankle joint after fixing posterior malleolus as checked fluoroscopically. Fibula were plated posteriorly and length were achieved in all patients. All patients were followed up postopertively and mean followup period was ten months. No patients had postoperative infection or wound dehiscence in any stage of thier followup except in a patient with open trimalleolar fracture where wound healing healing was delayed. Kirschner wires were removed at six weeks in a patients with associated medial malleolli fractures(n=3). Syndemotic screw removal was done at three months in a patient with syndesmotic injury. Functional assessment were done with Ankle-Hindfoot scale at nine months in all patients. It showed a score of 90(n=2), 89(n=1),87(n=1),84(n=1), 82(n=2), and 78(n=1) out of 100. In a patient with relatively poor score(score 78) was due to gross stiffness at ankle and minimal midfoot deformity which was probably due to prolonged keeping of external fixator spanning ankle for better wound care. Radiological assessment showed complete fracture union at an average of six months(Figure 6). No patient had loss of reduction at any stage of follow-up. No patient showed hardware prominence over posterior ankle due to fibular plating or posterior malleolar plating.

Figure 4. **a** and **b.** Preoperative X rays in a patient with trimalleolar fracture, **c** and **d**. Postoperative X ray showing posterior malleolus fixed with T-buttress plate with additional K-wire, medial malleolus with K-wire and fibula with one third tubular plate.

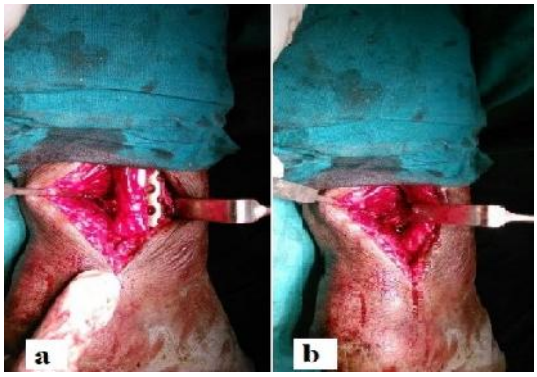

Figure 5. a and **b**. Intraoperative pictures showing fibula fixed with recon plate and posterior malleolus fixed with cortical screw

Figure 6. Shows completely united fracture at six months follwup

DISCUSSION

Tibial plafond fracture management needs proper timing since their abilitites to cause wound healing problems. Immediate surgeries in presence of swelling over ankle is major reason for that. Hence many surgeons prefer to wait till swelling subsides before going for open reduction or else they apply external fixator spaning ankle so that swelling reduces and soft tissue healing is better.There are several approaches to tibial plafond fractures namely anteromedial,anterolateral,posteromedial and posterolateral. However each approach demands particular fracture pattern. Anteromedial approaches are routinely used for tibial plafond fractures which allows excellent buttressing of anteromedial fracture fragments and same time articular congruency can be checked over ankle after reduction directly[7]. It is however less advantageous for exposure of the lateral column of the distal tibia and the syndesmosis[7]. Another greater disadvantage of this approach is incidence of wound complications like dihescence is quite high in this approach due to delicate skin anteromedially[8]. Hence implant exposures to environment and further infection rates are high. Even without wound complication

this approach will give significant hardware prominence which might impinge on patients skin continuously causing discomfort. Hence unless fracture pattern is really demanding, this approach is less preferred which are managed with minimal invasive percutaneous plating to reduce soft tissue complications[9]. Anterolateral approaches have also been described for tibial pilon fractures.This approach uses a skin incision placed between the distal tibia and fibula, overlying the anterior border of the fibula.This approach avoids the fragile medial soft tissues and hence wound healing problems. Like posterolateral approach this approach too has advantage of ability to fix both tibial plafond and fibular fractures and at same time it provides excellent exposure of the articular surface[10]. However, the superficial peroneal sensory nerve and anterior perforating peroneal artery is particularly at risk of injury during this approach.

Formerly posterior malleoli were reduced indirectly and fixed with anteroposterior screws though this type of reduction cannot always ensure adequate articular reduction. Studies have shown that this technique does not achieve the same degree of anatomic reduction of the posterior malleolus as direct reduction[4]. Studies also shown that posteroanterior screw-fixation provides biomechanically superior fixation than anteroposterior screw-fixation[11,12]. Size of posterior malleolus where it needs to be fixed is also debatable issues. Studies have shown that when size of posterior malleolus is more than 25-30% of articular surface then, it needs to be fixed[13]. In all our patients sizes were more than 25% of the articular surfaces and hence we decided to fix them all. Studies regarding posterolateral approach allowing to fix posterior malleolus and distal fibula fractures through same approach are few in English literature. This approach has several advantages. This approach allows to fix posterior malleolus and distal fibula through same approach and that too under direct vision[6]. Adequate soft tissue coverage in the form of flexor hallucis and peroneal muscle cover over hardwares makes implants less prominent over skin and hence chance of wound dehiscence, infection is less in this approach[5]. In our study too none of our patients showed hardware prominence or skin irritation or any signs of infection in any stages of followup. This is sharp contrast to Bhattacharya et al[14] which showed that the posterolateral approach does not eliminate the wound complications common to other approaches. However this approach is not without disadvantages. Ankle joint is poorly visualized as compared to anteromedial or anterolateral approaches and hence intraarticular step is not appreciated after posterior malleolar reduction[5]. This mandates use of intraoperative fluoroscope to check intraarticular step. Similarly we used fluoroscopic guidance in all patients intraoperatively. Another disadvantage of this approach is, it mandates particular type of fracture pattern in tibial plafond[5]. Fractures with predominant anterior communition cannot be dealt with posterolateral approach. Hence only fractures with predominant posterior communition is suited for this approach. The need for prone position to apply this approach is another disadvantage in this approach.

Neurovascular structures particularly at risk in this approach are sural nerve and peroneal artery. The sural nerve runs along the lateral border of the Achilles tendon (from medial to lateral) approximately 10 cm proximal to the Achilles tendon insertion. We encounterd same course of nerve in almost all patients and was preserved in all. Lidder S et al[6] showed peroneal artery bifurcate and perforate through interosseous membrane between 4 to 10 cm from tibial plafond and knowing the variations we did not damage peroneal artery in any patients.

CONCLUSION

Posterolateral approach is excellent approach to posterior malleolus and distal fibula. With a single approach, fractures can be fixed involving both posterior malleolus and distal fibula under direct vision and can experience good clinicoradiological outcome without complications like wound dihescence, skin irritations due to hardwares. However this approach needs specific fracture pattern with fracture predominance at posterior ankle and has less applicability when comminution is anterior. Poor visualization of ankle is also major disadvantage of this approach unlike anteromedial or anterolateral approaches to ankle.

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