



FUNCTIONAL OUTCOME OF CLOSED INTRAARTICULAR DISPLACED CALCANEAL FRACTURES MANAGED WITH LOCKING PLATE FIXATION

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ABSTRACT

The treatment of displaced intraarticular calcaneal fractures remains a challenge to orthopaedic surgeons since long time. Complications associated with conservative treatment i.e. incongruence of the posterior facet and, incongruence of the calcaneocuboid joint, arthritis, pain, heel widening leads to functional impairment to patients. Recent advances in this field of surgery have enabled surgeons to perform open reduction internal fixation with locking plate using extensile lateral approach in a safe, and reliable manner and to get better functional outcome by maintaining surgical anatomy and preventing complications associated with conservative treatment of displaced intraarticular calcaneal fractures.

KEYWORDS : calcaneal fractures, locking plate, extensile lateral approach

INTRODUCTION

The Calcaneum is a bone of the tarsal of the foot which constitutes the heel. It is the largest among tarsal bones. The Calcaneum is the commonest tarsal bone to sustain fracture injury.

Calcaneum fractures account for up to 75% of all foot fractures and 1–2% of all fractures⁽¹⁾

With the majority of the patients being industrial workers, these fractures have a significant economic cost in today's world. It has been noted that the impact of these fracture is so severe that some patients may be totally incapacitated up to 3 years post injury. In some cases, partial impairment may be seen up to 5 years⁽²⁾.

Cotton⁽³⁾ famously said that "the man who breaks his calcaneus is done" indicated towards the severity of functional impairment and economical loss to patients.

Falls from a height are the major contributors towards calcaneal fractures. This mechanism is responsible for 80 to 90% of cases. Since the calcaneus is selectively a hollow structure composed of cancellous bone enclosed in a thin cortical shell, any fall, even a short one may result in fracture as the talus is driven downwards into the calcaneus⁽⁴⁾. When a person falls from a height, the compressive forces fracture not only the calcaneus but may produce a proximal injury as well. Cave⁽⁵⁾ postulates that compression fractures of the dorsal or lumbar spine are seen in almost 10% of all calcaneal fractures. Lower limb injuries are more common and are seen in 25% of the cases.

There has been a definite improvement in technique and approaches in the operative treatment of calcaneal fractures. Technological advances have seen the introduction of newer plating systems. There are many studies which say that conservative treatment gives comparative results to operative treatment for joint depressed intra articular calcaneal fractures⁽⁶⁾. However most of these studies were done using older operative techniques and surgical approaches. Many newer studies have claimed better results for depressed calcaneal fractures using newer operative techniques, implants and approaches. However as the enigma about the optimal treatment of these fractures still persists and the functional outcome also has a greater bearing in the Indian

populace due to a comparatively high functional demand, this study was aimed to study the functional outcome of closed intraarticular displaced calcaneal fractures, managed with lateral extensile approach with a locking plate fixation.

MATERIALS AND METHODS

Study Design:

The present prospective study was conducted in the Department of Orthopaedic Surgery Jhalawar Medical College & SRG Hospital to evaluate the functional outcome of displaced intraarticular calcaneal fractures treated with an extensile lateral approach with locking plates via AOFAS hind foot score.

Study Duration: April 2023 to July 2024

Sample Size: 30 patients of displaced intraarticular calcaneal fractures meeting selection criteria.

Inclusion Criteria

1. Age between 18-60yrs.
2. Displaced intraarticular calcaneal fractures (Sanders type 2,3,4).
3. Able to understand the content of the informed consent form and to be willing to participate in the study by signing informed consent form.

Exclusion Criteria

1. Patients with extra-articular fracture and sanders type 1 fracture.
2. Compound fracture (Gustilo-Anderson type 2 and 3).
3. Medically not fit for surgery.
4. Patient having Paraplegia/paraparesis due to difficulty in assessment of the functional outcome.
5. Fracture of the long bone in the index limb.
6. Pathological fracture.
7. Surgical site infection

Patient Evaluation:

Patients presenting in the Emergency department and the Outpatient department were admitted for thorough evaluation. Detailed history was taken to rule out other systemic injury, ascertain the duration of injury, mode of injury, co morbid illness, and history of previous surgeries and for ruling out other major system involvement as a part of trauma screening. Diagnosis of fracture was done clinically with the

help of tenderness, swelling, deformity and X-ray of the calcaneum - axial, and lateral views along with CT scan. fractures were classified according to the sander's classification. Pre operative bohler's and gissane's angles were measured. Measures were taken to reduce the swelling, such as limb elevation, and ice pack application. All patients were operated after the appearance of wrinkles.

All patients were operated via extended lateral approach in lateral decubitus position under pneumatic thigh tourniquet after appropriate anaesthesia. The limb was painted and draped till mid calf region. The L shaped incision directly down to the periosteum of the lateral wall with no blunt soft-tissue dissection in the midportion of the wound was given to create full thickness flap, starting 2 cm above the tip of lateral malleolus and just lateral to tendo achilles and taking it up to the base of 5th metatarsal. Full thickness flap is retracted by K-wires placed in fibula, talus neck and cuboid by "no touch" technique. After complete exposure, lateral wall was removed and placed in a secure location for later repositioning. Fracture reduction and correction of calcaneus varus, height and width were done under direct vision and with the help of fluoroscopy. K wires were used for the temporary stabilization of fracture fragments. Lateral wall was repositioned and Application of locking calcaneal plate and locking screws is done. lateral, axial and Anteroposterior view obtained intraoperatively. Closure was done using Allgower-Donati suture technique and below knee slab applied.

Postoperatively limb elevation and intravenous antibiotics were given for 5 days. Suture removal was done after 14 days. Appropriate Post Op. X-Ray -Lateral view and axial view was taken. At second Postoperative week, active range of motion of the ankle joint is started and gentle passive movement of subtalar joint done.

Patients were followed up at 4th week, 8th week, 12th week and 24th week interval. Serial radiographs were taken at each follow-up visit to assess bone healing based on Bohler's angle, Gissane' angle. Functional outcome was assessed using AOFAS score at follow-up.



Figure 3: Fracture Fixation With Locking Plate And Intraoperative Fluoroscopy



Figure 4: Closing Wound By Donati Suture Technique



Figure 1: Preoperative XRay And CT Scan



Figure 5: Postoperative X Ray



Figure 2: Incision And Full Thickness Flap Raised



Figure 6: Postoperative Day 14 Suture Removal Healthy Stitch Line

RESULTS

In this study we observed that majority of the patients were young with mean age 38.1 years. The majority of patients were male (83%). It was observed that among 30 patients 18 (60%) had right sided fracture while 10 (33%) had left sided fracture, 2(7%) had b/l fracture. It was observed that among 30 patients 22 (73%) patients had history of fall from height while 8 (27%) had history of road traffic accident (RTA). It was observed that among 30 patients 13 (43%) had type II fracture, 10 (33%) had Type III fracture, 7 (24%) had Type IV fracture. It was observed that among 30 patients 26(87%) patients were operated between 1-5 days, 4(13%) patients operated between 6-10 days.

Mean time for union was 12.96 wks. In this study mean pre-operative bohler's angle was 11.93° and mean post-operative bohler's angle was 29.36°. In this study mean pre-operative Gissane's angle was 135.96° and mean post-operative Gissane's angle was 115.5°. It was observed that among 30 patients, 6(20%) patients had excellent, 20(67%) had good, 3(10%) had fair and 1(3%) had poor outcome according to AOFAS score. It was observed that among 30 patients 1(3%) patient had wound infection, 2(7%) had stiffness, 2(7%) had implant prominence related problem and 25(83%) patients had no complication.

DISCUSSION

In our study it was observed that majority of patients were young male, this finding was comparable to study by Rajesh V Chawda⁽⁷⁾ et al, Carlo Biz⁽⁸⁾ et al, Nambiar⁽⁹⁾ et al.

Most common mode of injury was fall from height. Rajesh V Chawda⁽⁷⁾ et al, Mitchell⁽¹⁰⁾ et al reported same in their previous studies.

Timing of the surgery is an important determinant of treatment outcome. Majority of patients patients were operated within 1-5 days of injury after appearance of wrinkle sign that helps in avoiding soft tissue healing problem and infection prevention. Benirschke SK⁽¹¹⁾ et al concurred that surgery in the third week from injury is burdened with higher percentage of soft tissue healing complications.

The mainstay of open reduction is anatomical reduction of fracture and to restore anatomy of calcaneum (height, width, bohler and gissane angle) and hold with locking plate and screws allowing early mobilization.

Many authors written about medial, lateral or combined approach, we used extensile lateral approach which give exposure of entire lateral surface of calcaneum and subtalar joint allowing anatomical reduction of height, width and length.

Mean post-operative bohler's angle was 29.36° in our study. Rajesh V Chawda⁽⁷⁾ et al study, found post-operative mean Bohler's angle of 34.74 degree. The value of bohler's angle showed correlation with the quality of outcome and in literature also mentioned that Bohler's angle is highly prognostic indicator. Paley and Hall⁽¹²⁾ stated that Bohler's angle is an indirect measurement of both calcaneal height and the arch angle, a small Bohler's angle is associated with poor result.

We used bone graft only in severely comminuted fractures to support elevated fragment and fill large bone defect.

The time for fracture union showed that mean time for union among patients was 12.96 weeks. This was comparable to study by Rajesh V Chawda⁽⁷⁾ et al, Carlo Biz⁽⁸⁾ et al.

At final follow-up average AOFAS score was 84.2, with 6(20%) patients had excellent, 20(67%) had good, 3(10%) had fair

and 1(3%) had poor outcome. Majority of patients were able to return to work.

We observed 1(3%) patient had wound infection, 2(7%) had stiffness, 2(7%) had implant prominence related problem and 25(83%) patients had no complication. Wound infection was superficial and managed with dressing and appropriate antibiotics, prominent implant were removed after union, stiffness was mostly due to not following physiotherapy.

Major concern of calcaneal surgery using lateral approach is flap related complications that can be minimised by careful full thickness flap elevation and holding flap with k wires using no touch technique and closure using Allgower-Donati suture technique with adequate pre and post operative antibiotic coverage.

CONCLUSION

It can stated that by doing proper patient selection, local skin condition (wrinkle sign), use of adequate pre and post operative antibiotics , selection of implant (locking compression plate), proper surgical technique (lateral extensile approach) following strict aseptic protocols, closure using allgower-donati technique, early range of movement exercise , regular follow up, helps to avoid majority of the complications and good functional and radiological outcome can be achieved for intraarticular calcaneum fractures managed by a lateral extensile approach with locking plate fixation.

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