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PERCUTANEOUS CALCANEOPLASTY IN DISPLACED INTRAARTICULAR FRACTURE CALCANEUM

Orthopaedics

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ABSTRACT

The ideal treatment for displaced intraarticular calcaneal fractures is still under debate. Open reduction and internal fixation is the most popular surgical procedure; however, wound complications, hardware failure and infection remain a major concern.1,2,3.

Aims: assess the outcomes and efficacy of treatment of fracture calcaneum by close reduction and cement augmentation (minimally invasive percutaneous technique).

Settings and Design: 50 patient underwent Hospital based prospective interventional study, from April 2015 to December 2016, 50 patient with calcaneum fracture who meet inclusion criteria .

Results: All cases progressed to bony union in 2–3 months. According to AOFAS score, clinical results were excellent in 12 cases, good in 25 and fair in 12 cases and poor in one case.

Conclusions: A minimum 1 year follow-up, the results are very encouraging. Percutaneous calcaneoplasty is a bridge between ORIF with plating and conservative method including benefit of both. Our study shows fairly good result and associated with minimum economic burden & complication and early return to daily activities.

KEYWORDS:

calcaneum ,bonecement, percutaneous.

Introduction:

Calcaneal fracture or Oscalcis fracture is a complex injury that presents 1-2 % of all fractures. It is the most common of the tarsal fracture[1]. A common fracture mechanism is an axial stress to talocalcaneal joint caused by a fall from a height more than 1 meter or by road accidents.[2,6]

socio economic importance of the injury is considerable, as high proportion of calcaneal fractures (80% to 90%), occurs in men belongs to medium and low strata, in their prime working years. Men are more affected then the women and the incidence is higher in young and middle aged subjects.

Open reduction internal fixation (ORIF) is the most popular surgical approach, utilizing a lateral approach to expose fragments, obtain reduction, and stabilize by plating with additional bone grafting. However, soft tissue complications remain a major concern, due to the thin and vulnerable skin over the lateral calcaneal wall, which is cut and retracted during surgery, and jeopardized by the underneath plate. The reported rate of complications is reported between 15 and 25%, with additional problems arising from delayed work recovery and compensation.

Literature about this new minimally-invasive technique is very poor. Gupta et al.7,9 and Jacquot and Atchabahian8 reported excellent outcome in terms of bone healing and complications rate by treating calcaneal fractures with the balloon.

Looking at our belief in terms of minimally-invasive percutaneous osteosynthesis (MIPO), and supported by direct experience in kyphoplasty techniques for compression vertebral fractures [5,6]. we started the application of these tools, in association with minimally-invasive techniques, for closed reduction of Sander's type II and III fractures and augmentation with slow setting acrylic cement (minimally-invasive percutaneous calcaneoplasty).

Subjects and Methods: We prospectively reviewed patients who sustained displaced intraarticular calcaneal fractures and were treated with minimally-invasive percutaneous calcaneoplasty at RNT Medical College and Hospital, Udaipur. MOI fall from height on hard ground followed by motor vehicle accidents. Preoperatively, conventional X-rays and CT scan 3D reconstructions were obtained in all cases, fractures classified as Sanders type and in Type II &III surgery done in 2–6 days. Conventional X-rays followup performed postoperatively and at 1week when partial weight bearing is allowed on 7th day and at 6–8 weeks when full weight-bearing is allowed, at 24 week,at 9 month, at 1 year, and at the last follow-up.

The American Orthopaedic Foot and Ankle Society (AOFAS) ankle/hind foot score are utilized for clinical evaluation, grading results as excellent (90), good (80), fair (70) and poor (<70); Bohler's angle are calculated to assess bone reduction. Time requested to regain normal daily activity is also scheduled.

Study design: Hospital based prospective interventional study
Study area: Department of Orthopaedics, RNTMC, Udaipur
Study duration: April 2015 to December 2016
Study participant: 50 patients with fresh calcaneum fracture who meet inclusion criteria and reported at dept. of orthopaedics were participant.

Inclusion criteria:

1. Close calcaneum fracture
2. Age group 25 to 60 years
3. Displaced intraarticular fracture Sanders classification type 2 and type 3
4. Patient giving informed consent for the study

Exclusion criteria:

1. Open calcaneum fracture
2. Pathological fracture
3. Associated other injury (other fracture, spine injury , neurovascular injury)
4. Bedridden patient due to other causes(CVA)
5. Pregnancy, allergy to cement component or aminoglycosides like gentamycin, vancomycin
6. Patient lost in follow up

Operative technique

All the fractures were operated in lateral position. All fractures were reduced with Essex Lopresti maneuve.7 Surgery was delayed by an average of 2.1 ± 1.5 days (range, 2-5 days) to resolve the soft tissue gross sweeling. Fracture site augmented with PMMA bone cement.

Surgical procedure

The patient was put under regional or spinal anaesthesia and placed in a lateral position with affected side up on a radiolucent table under image intensifier control followed by painting and draping of the parts under aseptic conditions.

The principles of reduction included first destraction of talocalcaneal joint using Steinmann pin transverse in the calcaneum. The second step is elevation of displaced fragment using the modified Essex-Lopresti maneuver7 under image intensifier, control Heel varus or valgus using transverse Steinmann pin. Following reduction lateral, axial and brodens views were checked under image intensifier. PMMA bone cement prepared and vertebroplasty needle inserted in fracture line under thalameic surface under image intensifier and needle tip position checked in various view by rotating image intensifier. Once sure of position and reduction cement injected (7-10 gm) through VP needle cannula and trocar used to push needle cement reduction maintained till cement consolidate and augment the fracture. Final fixation and subtalar motion were checked under image intensifier confirming stability and quality of reduction of fracture.

Postoperatively patients were given below knee plaster for 7 days.

Immediate surgical complications if any were noted.

- Slab removed 7 days post operatively, crape bandage applied and partial weight bearing, normal range of motion exercise started.
- Full weight bearing started 6-8 weeks post operatively depending on radiological and clinical evaluation.

Follow up evaluation:

Patients were followed up in orthopedic OPD at 2 week, 6 weeks, 12 weeks, 6 months, 9 months and 1 year. Each patient was evaluated on each visit clinically and radiologically.

Clinically patients were assessed for evaluation of union by observing clinical signs of absence of tenderness on putting stress at the fracture site.

Radiological union was assessed by observing haziness of fracture site. Any post-operative complication (if present) was noted and appropriate intervention was undertaken.

Patients were evaluated using AOFAS system.

Results:

Sanders (1992) gave a classification based on the number and location of articular fragments as observed by computed tomography. There were maximum fracture of type II (46.6%) followed by type III (36.6%) and type IV (10%).

Table 1: Comparative pre and post-operative measurements

Characteristic	Pre-operative	Post-operative	P-value
Bohler's angle	9.80±2.89	23.17±4.62	<0.0001 (S)
Gissane's angle	160.9 ± 7.95	123 ± 11.75	<0.0001 (S)
Height	3.58 ± 0.3	4.17 ± 0.27	<0.0001 (S)
Width	4.3 ± 0.17	3.7 ± 0.18	<0.0001 (S)

In the patients treated by percutaneous calcaneoplasty, pre and post-operative comparative values for Bohler's angle, Gissane's angle height and width shows the change is significant as p-value is < 0.0001. [Table 1].

The mean delay in operation was 1.5 ± 1.12 days in 84 % fractures, 8.2 ± 2.58 days in 8 %fractures & 18.3 ± 1.52 days in 8 % of fractures. Overall, mean delay in the operation was 2.1 ± 1.5 days.

On suture removal almost all patients (96%) of patient had healthy skin condition, except for 2 cases that showed superficial infection although, infection covered well after oral antibiotic and dressings .

The mean interval between operative intervention & weight bearing was found to be 48.25±3.5 days in 8% cases with associated post-operative complications. It was found to be 40±2.25 days in 92 % cases without any associated post operative complication. Overall mean interval between operative intervention and weight bearing was 44.5±3.2 days.

Table 2: Various complications associated with surgery

Complications	No. of fractures (out of 50)	%
Subtaler arthritis	2	4
Skin complications	2	4
No complications	46	92

Various complications seen post-operatively were subtalerarthritis in 2 cases (4 %) & superficial Skin complications in 2 cases (2 %). Majority of cases (92 %) were not associated with any complications [Table 2].

Table 3: AOFAS system outcome

Grade	No of fractures	%
Excellent	14	28
Good	28	56
Fair	6	12
Poor	2	4

We followed AOFAS system for assessment of final outcome, the mean score in patients who were treated by percutaneous calcanoeplasty was 87.9 ± 9(Good) in Type 2 fractures, 79.5 ± 10.6 (Good) in Type 3 fractures. Overall, average AOFAS was 79.7 ± 12.5 (Good). [Table 3]

Excellent results are seen in 28 % cases, Good results in 56% cases, Fair results in 12 % cases & poor results in 4 % cases. So, in majority of cases had good results.[Table 9]

Table 4: Post-operative movements (in degrees)

Fracture type (Sander's classification)	No. of fractures	Plantar flexion (Mean)	Dorsiflexion (Mean)	Inversion (Mean)	Eversion (Mean)
Type 2	28	40.6± 6.93	17.6±5	30±7.5	14.8±3.4
Type 3	22	31.86± 5.5	11.57±3.29	21.85±5.6	11.28±2.7
Overall	50	33.27±8.4	12.7±5.4	23.26±8.19	11.53±4

Discussion: Displaced intra-articular fracture calcaneum are best treated operatively. For sanders type II & III displaced intraarticular calcaneum fracture minimally invasive percutaneous calcaneoplasty have shown promising result for future.

MIPO is a bridge between ORIF with plating and conservative method including benefit of both. Our study shows fairly good result and associated with minimum ecomic burden & complication and early return to daily activities.

References:

1. Zwipp H, Rammelt S, Barthel S. Calcaneal fractures—open reduction and internal fixation (ORIF) Injury.2004;35(Suppl 2):SB46–SB54 .
2. Potter MQ, Nunley JA. Long-term functional outcomes after operative treatment for intra-articular fractures of the calcaneus. J Bone Jt Surg Am. 2009;91(8):1854–1860. doi: 10.2106/JBJS.H.01475.
3. Howard JL, Buckley R, McCormack R, Pate G, Leighton R, Petrie D, Galpin R. Complications following management of displaced intra-articular calcaneal fractures: a prospective randomized trial comparing open reduction internal fixation with nonoperative management. J Orthop Trauma. 2003;17:241–249. doi: 10.1097/00005131 -200304000-00001.
4. Court-Brown CM, Schmidt M, Schutte BG. Factors affecting infection after calcaneal fracture fixation.Injury. 2009;40(12):1313–1315. doi: 10.1016/j.injury.2009.03.044.
5. Robinson Y, Heyde CE, Forsth P, Olerud C. Kyphoplasty in osteoporotic vertebral compression fractures—guidelines and technical considerations. J Orthop Surg Res. 2011;19:6–43.
6. Papanastassiou ID, Phillips FM, Van Meirhaeghe J, Berenson JR, Andersson GB, Chung G, Small BJ, Aghayev K, Vrionis FD. Comparing effects of kyphoplasty, vertebroplasty, and non-surgical management in a systematic review of randomized and non-randomized controlled studies. Eur Spine J. 2012;21(9):1826–1843. doi: 10.1007/s00586-012-2314-z.
7. Gupta AK, Gluck GS, Parekh SG. Balloon reduction of displaced calcaneus fractures: surgical technique and case series. Foot Ankle Int. 2011;32(2):205–210. doi: 10.3113/FAI.2011.0205.
8. Jacquot F, Atchabahian A. Balloon reduction and cement fixation in intra-articular calcaneal fractures: a percutaneous approach to intra-articular calcaneal fractures. Int Orthop. 2011;35:1007–1014. doi: 10.1007/s00264-011-1249-z.
9. Bano A, Pasku D, Karantanas A, Alpantaki K, Souvatzis X, Katonis P. Intra-articular calcaneal fracture: closed reduction and balloon-assisted augmentation with calcium phosphate cement: a case report. Cases J.2009;2:9290. doi: 10.1186/1757-1626-2-929
10. Broome B, Mauffrey C, Statton J, Voor M, Seligson D. Inflation osteoplasty: in vitro evaluation of a new technique for reducing depressed intra-articular fractures of the tibial plateau and distal radius. J Orthopaed Traumatol. 2012;13:89–95. doi: 10.1007/s10195-012-0185-z.
11. Griffin D,Parsons N, Shaw E, Kulikov Y, Hutchinson C, Thorogood M, Lamb S E . Operative versus non-operative treatment for closed, displaced, intra-articular fractures of the calcaneus: randomised controlled trial BMJ 2014;349:g4483 doi: 10.1136/bmj.g4483.
12. Jacquot F and Atchabahian A. Balloon reduction and cement fixation in intra-articular calcaneal fractures: a percutaneous approach to intra-articular calcaneal fractures. IntOrthop. 2011 Jul; 35(7): 1007–1014.
13. Jacquot F, Letellier T, Atchabahian A, Doursounian L, Feron J. Balloon reduction and cement fixation in calcaneal articular fractures: a five-year experience. International Orthopaedics (SI. COT) (2013) 37:905–910 .
14. Essex-Lopresti P. The mechanism, reduction technique, and results in fractures of the oscalcis, 1951-52. Clin Orthop. 1993 May. 3-16. [Medline].