Original Research Paper

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Orthopaedics

A COMPARATIVE STUDY OF ANTERO-POSTERIOR SCREW VERSUS POSTERO-ANTERIOR SCREW FOR POSTERIOR MALLEOLUS FRACTURE

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ABSTRACT **Introduction:** Optimal treatment of ankle fractures with posterior malleolus fragment is controversial. Posterior malleolus is significant stabilizer preventing posterior subluxation of ankle. Posterior malleolus fracture have generally been neglected because of these fragment is considered to be reduce spontaneously after open reduction of the lateral malleolus by ligamentotaxis by posterior-inferior tibiofibular ligament. Fixation of this fragment is important in the role of ankle mechanics. **Objectives:** We compare in this study better surgical & functional outcome for this posterior malleolus fracture fixation by AP SCREW and PA SCREW **Methods:** We prospectively evaluated 30 patients (15 patients for AP screw fixation and 15 patients for PA screw fixation who underwent for fixation by anterior posterior screw by percutaneous method and posterior lateral approach for posterior anterior screw fixation. We assigned alternating patient who received AP SCREW fixation VS PA SCREW fixation based on order in which they presented to our institution.We use American Orthopedics foot and ankle society (AOFAS) score, range of motion of ankle and X-Ray finding. The mean Follow up was 15 Months(Range 12-20 Months). **Result & Discussion:** Full union without any loss of reduction was obtained in 27 out of 30 patients. As anterior posterior screw is a blind procedure, the risk of injury to anterior tibial artery & nerve, purchase of screws distal threads for fragment is debatable. In posterior plating better visualization of fragment and anatomy will help in better fixation of posterio malleoi fragment. Assessment of treatment outcome using the AOFAS demonstrated significant high score of 97.4 in group with posterior antero screw fixation with posterior lateral approach compare to score of 80 in group anterior posterior screw fixation. **Conclusions:** In comparison to the anterior-posterior screw fixation,open reduction and fixation of the, posterolateral key fragment of the ankle using posterolateral approach via Posterior anterior screw resulted in a more accurate fracture reduction outcome 12 months after surgery.

KEYWORDS :

INTRODUCTION

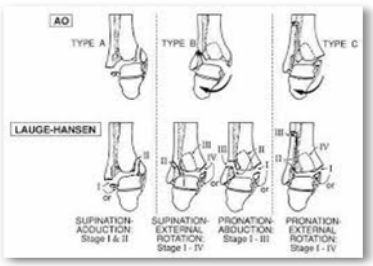
The annual incidence of ankle fracture is approximately 122-184/one lakh person years1. Optimal treatment of ankle fractures with posterior malleolus fragment is controversial[2]. Posterior malleolus fracture occurs in 7-44% of all ankle fracture, most in setting of rotational ankle fracture3 and rarely seen alone[4]. Posterior malleolus fracture may occur as a part of any rotational mechanism and fragment size varies. Posterior malleolus is significant stabilizer preventing posterior subluxation of the ankle however primary restraint to posterior forces is the anterior tibial fibular ligament and fibula. In general, most posterior malleolus fracture tends to be small, laterally based fragment, still connected to posterior tibio fibular ligament[5]. Posterior malleolus fracture have generally been neglected because these fragment is considered to be reduce spontaneously after open reduction of the lateral malleolus by ligamentotaxis by posterior-inferior tibio fibular ligament. However ORIF with early range of motion after operative treatment of intra-articular fracture is widely accepted. Recent studies have shown the importance of posterior malleolus on the stability of tibio fabular syndesmosis and ankle joint[6].

In this study, report results of selective ORIF and compare the result of two technique of ORIF.

MATERIAL AND METHOD:

All patients between 18 to 70 years of age with posterior malleolus fracture will be included in study . All patients will undergo pre-operative investigation and who will be fit for surgery for open reduction and internal fixation under general or spinal anesthesia .Pre tested pre validated structured questionnaire will be used. All patient who`s fracture pattern describe in weber classification will be used in data collection tool. All the 30 patients are included in this study conducted at tertiary care hospital. Patient were followed up at regular interval at 6 week , 12 week & 18 week and functional outcome assessment calculated by using AOFAS score.

CLASSIFICATION(AO & LAUGE HANSEN)



INCLUSION CRITERIA:

Definitive diagnosis of unilateral ankle joint fracture based on clinical and imaging technologies.

Open reduction internal fixation surgery performed by the same senior author.

Involvement of posterior malleolus.
25% presence of posterior malleolus fracture fragment.
Danis - Weber Type B fracture.

EXCLUSION CRITERIA:

Posterior malleolus fracture fragment less than 25%.
Danis – Weber Type A & C.
Patient who is medically unfit for surgery.
Fracture old more than 4 weeks.

OPERATIVE PROCEDURE

All operations were performed under spinal anaesthesia with proper care and sterility maintained . According to patients' wishes, fixation

methods were randomly performed on these patients .Patients were placed in supine position, and the air pressure tourniquet on the upper thigh of the limb. The posterolateral approach was selected and reduction was performed under direct vision. The skin incision was made at the midline between the posterior edge of the lateral malleolus and the Achilles tendon, with the distal end extended to the tip of the lateral malleolus.With attention paid to protect the small saphenous vein and sural nerve the skin incision was taken, the subcutaneous tissue and deep fascia were exposed . The deep fascia was cut longitudinally to expose the peroneal tendon. The peroneal tendon was pulled laterally, and the lateral malleolus fracture was reduced and fixed. Then, the posterior malleolar fragment of the distal tibia were exposed along the flexor hallucis longus and peroneus longus.Fixation and reduction were performed in order, i.e. reduction and fixation of first the lateral malleolus, the posterior malleolus, then the medial malleolus, and the distal tibiofibular syndesmosis joint was stabilized. The patient was placed in the lateral position when reduction and fixation of the lateral malleolus and posterior malleolus was complete During the operation, care was taken to protect the peroneal artery, posteroinferior tibiofibular ligaments, and periosteum on the fracturefragments. After clearing the fracture site, the PMF was reduced under direct vision. Kirschner wires were used for temporary fixation, two to three 3.5-mm cannulated screws were placed from the posterior to anterior direction.For fixation of PMF with an AP screw, PMF was reduced under direct vision via a posterolateral approach, and temporarily fixed with a K-wire. Then, the patient was placed in the supine position. Through the curved incision on the anteromedial aspect of the medial malleolus, two to three 3.5-mm screws were placed from the anterior to posterior direction to fix the PMF, and fix the medial malleolus. A cotton test was performed during the operation to determine the stability of the tibiofibular syndesmosis. A 3.5-mm lag screw was used to stabilize the syndesmosis If instability was present.

Postoperative management

After surgery, all patients in each group received the same rehabilitation treatment (treatments routinely conducted to prevent infection, decrease swelling, and prevent deep vein thrombosis in the affected limb). After 24 h of surgery, the drainage tube was removed, then patients were allowed to perform active and passive functional exercises. X-rays were performed to assess fracture healing. For patients who received fixation for separation of distal tibiofibular syndesmosis, the lag screws were removed 12 weeks after surgery. All patients were allowed to bear full weight at 3 months postoperative.

PRE OPERATIVE XRAY


POST Operative XRAY

A)FIXATION DONE USING AP SCREWS

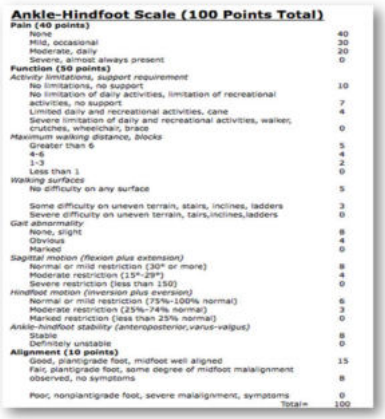
B)fixation done using PA screw

FOLLOW-UP:

At 6 week, 12week and 18 week.

FUNCTIONAL OUTCOME:

It will be calculated by using AOFAS score.



Ankle-Hindfoot Scale (100 Points Total)

Pain (40 points)	
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0
Function (50 points)	
Activity limitations, support requirement	
No limitations, no support	10
No limitation of daily activities, limitation of recreational activities, no support	7
Limited daily and recreational activities, cane	4
Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace	0
Maximum walking distance, blocks	
Greater than 6	5
4–6	4
1–3	2
Less than 1	0
Walking surfaces	
No difficulty on any surface	5
Some difficulty on uneven terrain, stairs, inclines, ladders	3
Severe difficulty on uneven terrain, tairs,inclines,ladders	0
Gait abnormality	
None, slight	8
Obvious	4
Marked	0
Sagittal motion (flexion plus extension)	
Normal or mild restriction (30° or more)	8
Moderate restriction (15°-29°)	4
Severe restriction (less than 150)	0
Hindfoot motion (inversion plus eversion)	
Normal or mild restriction (75%-100% normal)	6
Moderate restriction (25%-74% normal)	3
Marked restriction (less than 25% normal)	0
Ankle-hindfoot stability (anteroposterior,varus-valgus)	
Stable	8
Definitely unstable	0
Alignment (10 points)	
Good, plantigrade foot, midfoot well aligned	15
Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms	8
Poor, nonplantigrade foot, severe malalignment, symptoms	0
Total=	100

Discussion

The goal of the surgical treatment of ankle fractures is to restore the normal anatomical morphology of the ankle, maintain joint stability, and reach maximum functional recovery. Unlike the treatment for medial and lateral malleolar fractures, the surgical indications and surgical fixation methods for PMF are inconclusive [9]. Therefore, in this study, we investigated the efficacy of posterior-anterior (PA), anterior-posterior (AP) screws . In previous studies, PMFs with small displacement were often reduced indirectly and fixed with screws using the anterior to posterior approach , which can avoid delayed wound healing, soft tissue adhesion and iatrogenic sural nerve damage caused by soft tissue dissection. However, due to the interposition of soft tissue or loose osseous fragments in the PMF gaps, it is difficult for indirect reduction to achieve anatomical reduction, and it is technically difficult to fix small or comminuted fragments [8]. In recent years, more attention has been paid to the importance of anatomical reduction and internal fixation of PMF [7]. Anatomical reduction and fixation of posterior ankle fractures can be achieved under direct vision using a posterolateral approach, which is highly accepted . In this study, we chose the posterolateral approach to reduce posterior ankle fractures under direct vision. When the fragment size was ≥25%, there was no statistical difference in the AOFAS score, with limited dorsiflexion ROM between the PA screw and PA plate fixations, which is similar to the results of a AP screws.Typical complication of screw fixation include infection, hypertrophic scars, implant loosening, nonunion and re-fracture after implant removal.

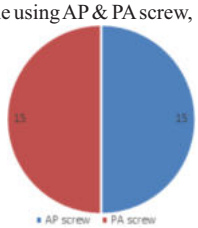
STATISTICAL ANALYSIS: The data obtained from the study was analyzed with help of RCT and unpaired T-test .(p value less than 0.05.)

RESULTS

:Full union without any loss of reduction was obtained in 27 out of 30 patients. As anterior posterior screw is a blind procedure, the risk of injury to anterior tibial artery & nerve, purchase of screws distal threads for fragment is debatable. In posterior fixation PA screws better visualization of fragment and anatomy will help in better fixation of posterior malleolus fragment. Assessment of treatment outcome using the AOFAS demonstrated significant high score of 97.4 in group with PA screws with posterior lateral approach compare to score of 80 in group anterior posterior screw fixation.

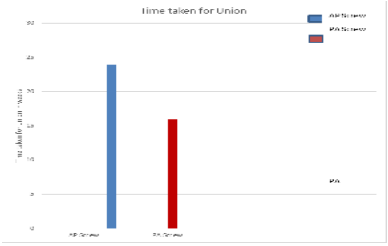
	TOTAL NO. OF PROCEDURE
AP SCREWS	15
PA SCREWS	15

Number of fixation done using AP & PA screw,



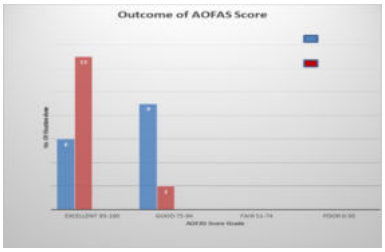
Mean time taken for radiological union in both groups (In weeks)

Method of PMF Fixation (Time taken for Union)		P Value	
AP Screw		PA Screw	<0.01
Time taken for Radiological Union		Time taken for Radiological Union	
Mean	SD	Mean	SD
24week	6.67	16week	3.70



Above table shows that there was significant statistical difference between mean time taken for radiological union in both treatment groups.Fixation done using AP Screw takes more time for radiological union than fixation using PA Screw

2.Distribution of study subjects according to AOFAS score & type of treatment.



Conclusions

Each fixation method for the treatment of ankle fractures has its own advantages and disadvantages.Our findings suggested that there was no statistical difference in AOFAS scores or limited ankle-dorsiflexion ROM among patients who had a fragment size of ≥25% regardless of the fixation type of the posterior malleolus . AP screws are easy to use and remove and cause displacement of the fracture fragment, and PA screws is biomechanically the most stable method for fixation of a PMF with good union rate. For patients who had a fragment size of < 25%, both PA and AP screws provide good fixation, cause less surgical trauma, and promote postoperative functional recovery.

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