



Medial malleolus screw fixation and fibular plating in bimalleolar ankle fractures

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Abstract

Background: Bimalleolar fractures involving breaks at the lateral and medial malleolus of ankle are frequently occurring fractures at the ankle joint and almost always require surgery in order to achieve optimal function and weight bearing on the affected limb.

Objectives: To evaluate use of medial malleolus screw fixation and fibular plating as a treatment modality of closed bimalleolar fractures in adults.

Material and methods: Prospective observational study done at our institute on 40 patients that were assessed at 6 months post operatively using Olerud and Molander Score (OMAS) and radiologically.

Results: According to OMAS scoring system, out of our 40 patients

20(50%) had excellent results

12(30%) had good results

4(10%) had fair results

Thus, having positive outcomes of 90%

Conclusion: Displaced closed bimalleolar fractures should be treated with Cannulated Cancellous screw for medial malleolus and semitubular plate fixation with screws for lateral malleolus fractures.

Keywords: bimalleolar ankle fracture screw fixation plating

1. Introduction

Ankle fracture are one of the most common lower limb fracture ^[1]. According to Sir Robert Jones ankle joint is the most injured joint in the body but usually it is not well treated ^[2]. Ankle fracture are 9% of all the fractures ^[3] of which 1/4th constitute the bimalleolar ankle fractures ^[4]. Usually patients get ankle fracture by twisting injuries and falls by sports injuries but RTA is commonest mode of injury in India ^[5]. Prolonged immobilization by cast leads to plaster disease⁶. Hence, surgery by internal fixation is the most common mode of treatment. Most of the time these injuries are difficult to identify and treat, especially if injuries to syndesmosis are not well treated then ankle instability and poor results are the common sequelae.

Aim and objectives

To evaluate use of medial malleolus screw fixation and fibular plating as a treatment modality of closed bimalleolar fractures in adults.

To assess functional outcomes following surgical fixation of bimalleolar fractures.

Pre: Operative Radiological Assessment

Anatomical reduction in order to maintain alignment, rotation and fibular length thus restoring the syndesmosis and ankle mortise.

Signs on Mortis view

- **Circle sign:** Complete circle formation from lateral talar process to lateral fibular process⁷.
- **Tibiofibular line:** line drawn from distal fibular tubercle towards tibia should pass through tibial plafond

- Equal and parallel medial superior and lateral clear spaces along with circle sign suggests syndesmotomic alignment.

Two widely accepted classification are Danis Weber and Lauge Hansen system ^[8-10]

Danis weber AO classification

- A. Infrasyndesmotomic fibular fracture
- B. Transsyndesmotomic fibular fracture
- C. Suprasyndesmotomic fibular fracture

Materials and methods

In our prospective study carried out from 1/1/2018 to 30/6/2019 at our institute, involving surgical intervention of bimalleolar ankle fracture and followed up for a period of 6 months. The study included 40 adult cases. X-rays of ankle joint in AP, lateral and Mortise view were utilized. We studied all patients above 18 years of age having bimalleolar fracture and fit for surgery.

Operative procedure

On presentation of these patients the affected limb was temporarily immobilized using below knee slab and kept elevated. Following proper planning, fitness and informed consent, surgeries were done under spinal anesthesia with tourniquet control. ORIF using Cancellous cannulated 4mm screw/malleolar screw for medial malleolus and 1/3rd tubular plate for lateral malleolus was done. Firstly, we fixed the lateral malleolus by plating.

For medial malleolus: Anteromedial incision was taken, fracture site uncovered, soft tissue dissection done, fracture reduced, guide wire inserted, position checked under image intensifier and then using malleolar screw/Cannulated

Cancellous 4mm screw, fixation achieved. In some cases, we have used a k wire or an additional screw to achieve better fixation and prevent rotational instability.

Post Operatively

For three days, IV antibiotics were given, limb elevation achieved with a posterior Below Knee slab. From the operated day itself, patients were encouraged to actively move toes of affected limb. Next day onwards knee flexion was advised. Patients were mobilized without bearing weight on the operated limb using crutches from third Post-Operative

Day (POD 3) onwards. Sutural removal was done on POD12 following which BK cast was done. Patients were recommended to not bear weight on operated limb. Cast was removed at 6 weeks following this, physiotherapy was advised for at least 6-8 weeks. Partial weight bearing was allowed after 8 weeks. Check X-rays were done monthly.

Results

Assessment criteria: All patients had followed up in OPD with X-ray monthly. Symptom and function Assessment were done by Olerud and Molander 1984 scoring system.

Table 1: Scoring system of Olerud and Molander (1984)

| Parameter | Degree | Score (Maximum) |
|--------------------------------|--|-----------------|
| Pain | None | 25 |
| Stiffness | While walking on uneven surface | 20 |
| Swelling | While walking on even surface outdoors | 10 |
| Stair Climbing | Constant and severe | 5 |
| Running | None | 10 |
| Jumping | Stiffness | 0 |
| Squatting | None | 10 |
| Supports | Only in Evening | 5 |
| Work, Activities of Daily life | Constant | 0 |
| | No Problems | 10 |
| | Impaired | 5 |
| | Impossible | 0 |
| | Possible | 5 |
| | Impossible | 0 |
| | Possible | 5 |
| | Impossible | 0 |
| | No Problems | 5 |
| | Impossible | 0 |
| | None | 10 |
| | Tapping, Wrapping | 5 |
| | Stick or Crutch walking | 0 |
| | Same as before injury | 20 |
| | Loss of tempo | 15 |
| | Change of similar job | 15 |
| | Severely impaired work capacity | 0 |

Excellent: if score more than 75 points, Good: between 50-75, Fair: between 30-50, Poor: below 30

Table 2: Functional Outcome

| Excellent | Good | Fair | Poor | Lost to Follow up |
|-----------|------|------|------|-------------------|
| 20 | 12 | 4 | 4 | 0 |

40 cases of bimalleolar fracture have undergone surgery in this study. Youngest and the eldest patients were 24 years and 76 years respectively. 45 years was the mean age of this study. Men had fractures more commonly. Male to female ratio was 6:1. In respect to side of ankle joint, right ankle was more involved i.e. 24(60%) cases and left ankle involved in 16(40%) cases. With respect to mode of injury, 20 patients (50% cases) were involved in Road Traffic Accidents (RTA), fall as a mechanism of injury in 16 patients (40% cases) and other 4 patients (10%cases) had twisting injury.

Majority of cases i.e.50% showed supination external rotation injury. Next common type of injury i.e. 25% was pronation external rotation injury. In our study, all the cases were operated between 2nd to 6th day (77.5%) following injury. Mean time interval was 4 days.

In our study average time for union was 10.4 weeks. Most of the cases had union between 8 to 14 weeks. Our study had complications in 2 patients, of this 1 patient showed

superficial infection which was managed by oral antibiotics and 1 patient had delayed union of the medial malleolus which was treated by immobilization which finally united.

Discussion

Bimalleolar fracture of ankle joint is an intra-articular fracture and involving the important weight bearing ankle joint [11]. Anatomical reduction and rigid fixation lead to good union and early return to daily routine and job [11].

Anatomically ankle joint is a mortise in which the talus is constrained by the fibula laterally and tibia both medially and superiorly. This configuration is also referred as Malleolar fork [12]. Closed method does not achieve anatomical reduction and adequate fixation. Open Reduction and Internal Fixation (ORIF) is best method for restoration of normal anatomical stability of joint. Several studies showed that ORIF of bimalleolar fracture of ankle provides better outcomes [11, 13, 14].

Commonest age group affected was 21 to 30 years with mean age of study as 40 years which was comparable with studies (reference 15, 16, 17). In our study RTA was the most common mode of injury co-occurring with the study by Lee *et al* [17].

In our study Right side was frequently involved. Similar to another study (reference no. 16) most common type of injury was supination, external rotation (50%), followed by pronation external rotation injury (25%) similar to literature (ref no. 16, 17, 18). Hughes *et al* [20] in their study recommended initial fixation of lateral malleolus then medial malleolus, as expected for stability. This allows minimal post-operative immobilization and rapid recovery of function. Medial malleolus fracture is close to plafond and so to restore tibio fibular relationship, it requires to be fixed anatomically. Lateral malleolus should also not be ignored, displaced lateral malleolus is important and requires ORIF [21, 22]. Anatomical reduction of medial malleolus is of paramount importance [23]. 3 options available for fixing lateral malleolus fracture. These include either use of 2/3 interfragmentary screw, double oblique screw from the tip and semitubular plating. Plating has complications such as infections especially in osteoporotic bone²⁴. Semitubular plate fixation is biomechanically better but requires second operation for removal [25]. According to OMAS scoring system, we had 50% excellent results, 30%

good, 10% fair Results and 10% poor results [26]. Therefore, ORIF is the favorite treatment regime in case of bimalleolar ankle fracture. With this treatment, there are little chances of developing complications. At the end of this study, our conclusion is that anatomical reduction of fracture and restoration of its congruity is only possible earliest by surgical fixation. Most patients have full range of motion by end of 14 weeks.

Conclusion

It is a dictum for all intra articular fractures that anatomical reduction and internal fixation is the best way of treatment in weight bearing joints like ankle joint. Open reduction and semitubular plating restore the length of fibula and lateral stability of ankle joint. Thus, it restores the 2 pillars of ankle mortise and syndesmotic integrity. So, we conclude that good functional results can be opted by surgery only. With surgery early mobilisation and early weight bearing is achieved. Malleolar screws are better in fixation of medial malleolus and semitubular plating for fibular fracture.



Fig 1: Pre-Operative Xray



Fig 2: Post-Operative Xray



Fig 3: Preoperative xray



Fig 4: Post-Operative xray after 6 months

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