



## A STUDY OF PATIENTS WITH UNSTABLE BIMALLEOLAR FRACTURES WITH OR WITHOUT SYNDESMOTIC INJURIES TREATED WITH OPEN REDUCTION AND INTERNAL FIXATION AND THEIR FUNCTIONAL ASSESSMENT.

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### ABSTRACT

**Objectives:** To study the patients of unstable bimalleolar fractures and assess their functional stability via AOFAS and OMAS ankle scoring system. Association of union with various factors like smoking, diabetes, soft tissue injury etc was also studied. **Methodology:** Randomized prospective cross sectional study in which 35 patients with bimalleolar fractures were studied and their functional stability assessed using AOFAS and OMAS ankle scoring system. assessment was done at 1,3,6 and 9 months. Complications were noted and various factors affecting union were studied. **Results:** Out of 35 patients treated, overall good to excellent results were obtained in 26 patients. The pain scores and, functional activity significantly improves over 9 months and the alignment score changes are not significant or remain constant. The results were poor in one patient There were no intraoperative complications. The postoperative complication we came across was superficial skin infection in 8 patients, mal union in one patient and swelling and fracture blisters in 10 patients. **Conclusion:** Anatomical reduction is essential in all intra articular fractures, more so if a weight bearing joint like ankle is involved. Open reduction and internal fixation guarantee high standard of reduction. The pain scores and, functional activity significantly improves over 9 months. Accuracy of fixation ensures better fracture healing and consequent earlier return to daily activities translating into a better functional outcome.

**KEYWORDS:** AOFAS; OMAS; Union.

### INTRODUCTION

Ankle is the most injured joint of the body but the least well treated .Ankle injuries gain importance because body weight is transmitted through it and locomotion depends upon the stability of this joint. They are usually mixed injuries, ligamentous and bony. Malleolar fracture have varied presentations which have given rise to a wide variety of classification systems, of which two are in vogue namely Lauge - Hansens and Danis - Weber classifications. Malleolar fractures are one of the most common fractures in orthopaedic traumatology. Malleolar fractures necessitate accurate reduction and stable internal fixation. When malleolar fractures are not reduced accurately they may lead to post traumatic painful restriction of motion or osteoarthritis or both. Many of the fractures which are stable are reduced by conservative treatment and have given good result. The other unstable displaced and open fractures require open reduction internal fixation. The superiority of ORIF over closed treatment have been thoroughly demonstrated in literature. However all studies have not obtained good results in cases of bimalleolar fractures. The purpose of this study is to assess the functional outcome and results

of surgical treatment of malleolar fractures. The treatment options with ORIF technique available for malleolar fractures, to attain a proper anatomical alignment and stability of ankle joint, can lead to rewarding outcome for the patient and surgeon.

### METHODOLOGY

35 patients with Unstable Bimalleolar fractures who attended Lokmanya Tilak Municipal General Hospital Hospital attached to L.T.M. Medical College, Sion, Mumbai between february 2013 to september 2014 were studied. Then the patients radiograph's were taken, both anteroposterior and lateral views of the ankle joints. On admission; detailed history was taken relating to the age, sex, occupation, address, mode of injury past and associated medical illness.

**Inspection:** Relation of ankle to foot either normal, equinus, calcaneus – valgus or varus. Inter relation of malleoli and fossa in the front of malleoli. Prominence of tendoachilles, fossa on both sides of tendoachilles. Pattern, position and size of heel for broadening. **Palpation:** All bones forming the ankle i.e. lower end of

tibia fibula including both malleoli, calcaneus and talus are looked for, local bony tenderness and bony irregularities, displacement, unnatural mobility crepitus, inter relation of malleoli, springing of fibula, Dorsalis pedis and posterior tibial artery pulsations were checked and noted. Active and passive movements of ankle joint are noted. The fractures were classified based on Lauge-Hansen's and Denis-weber classification in adults.

#### THEY WERE THEN TREATED AS FOLLOWS:

##### (1) PREOP. ANALYSIS

##### (2) INTRA OP PROCEEDURE

- a. Exposure and fixation of lateral malleolus
- b. Exposure and fixation of medial malleolus

##### (3) Post Operative Management

##### (4) Follow Up

#### FUNCTIONAL EVALUATION

Functional results were analyzed using the ankle scoring system of AOFAS & OMAS.

(1)AOFAS: **Ankle-Hindfoot Scale (100 Points Total)** Pain (40 points) The AOFAS Score consists of 3 components, pain, functional activity and alignment.

(2)OMAS: **Olerud and Molander Scoring of Symptoms After Ankle Fracture(100 points)** The OMAS scores also increase over the observation period of 9 months which translates into a better functional recovery over the observation period.

#### OBSERVATION TABLES

**TABLE 1: VARIOUS FACTORS AFFECTING UNION**

| FACTORS  | STATISTICAL ANALYSIS                                                                                                                                                                                                        | INFERENCE                                                                                                                                |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| AGE      | Mean time of union was <b>12.59</b> weeks for cases with age less than 35 years which were comparable with <b>13.7</b> weeks for cases with age $\geq 35$ yrs and the difference was significant.                           | <i>Thus in our study we found age to affect the time for union</i>                                                                       |
| SEX      | mean time for union in males was found to be 13.29 weeks which was not significantly higher than the time for union in females 12.5 weeks ( <b>p value =0.63</b> using Mann Whitney test)                                   | <i>Thus in our study we did not find sex to affect the time for union</i>                                                                |
| SMOKING  | Mean time of union was <b>17.20</b> weeks for smokers which were significantly more as compared to <b>12.53</b> weeks for Non smokers ( <b>P value 0.0001</b> )                                                             | <i>Thus in our study we found smoking to affect the time for union.</i>                                                                  |
| DIABETES | mean time for union in diabetics was 15.2 weeks which was significantly more than the mean time for union in non-diabetics about 12.87 weeks. By using Mann Whitney test, <b>the p value = 0.02</b> , which is significant. | <i>we found diabetes to have significant effect on the time for union, it was also associated with high incidence of wound infection</i> |

**Table 2: OMAS SCORE: SIGNIFICANCE & P VALUE**

|         | Omas score at 3 months – omas score at 1 month | Omas score at 6 months – omas score at 1 month | Omas score at 9 months – omas score at 1 month | Omas score at 6 months – omas score at 3 months | Omas score at 9 months – omas score at 3 months | Omas score at 9 months – omas score at 6 months |
|---------|------------------------------------------------|------------------------------------------------|------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Z       | -5.168a                                        | -5.169a                                        | -5.180a                                        | -5.174a                                         | -5.169a                                         | -5.177a                                         |
| P value | 0.0001                                         | 0.0001                                         | 0.0001                                         | 0.0001                                          | 0.0001                                          | 0.0001                                          |

**Table 3: AOFAS SCORE: SIGNIFICANCE & P VALUE**

|         | Mean aofas score at 3 months – mean aofas score at 1 month | Mean aofas scores at 6 months – mean aofas score at 1 month | Mean aofas score at 9 months – mean aofas score at 1 month | Mean aofas scores at 6 months – mean aofas scores at 3 months | Mean aofas scores at 9 months – mean aofas scores at 3 months | Mean aofas scores at 9 months – mean aofas scores at 6 months |
|---------|------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| Z       | -5.099a                                                    | -5.164a                                                     | -5.186a                                                    | -5.186a                                                       | -5.169a                                                       | -5.093a                                                       |
| P value | 0.0001                                                     | 0.0001                                                      | 0.0001                                                     | 0.0001                                                        | 0.0001                                                        | 0.0001                                                        |

**Table 4: COMPARISON OF AOFAS &OMAS SCORES**

|                                                | Correlation coefficient | P values |
|------------------------------------------------|-------------------------|----------|
| Mean aofas at 1 month v/s mean omas at 1 month | 0.393                   | 0.02     |
| Mean aofas at 3 month v/s mean omas at 3 month | 0.763                   | 0.0001   |
| Mean aofas at 6 month v/s mean omas at 6 month | 0.867                   | 0.0001   |
| Mean aofas at 9 month v/s mean omas at 9 month | 0.963                   | 0.0001   |

**Table No. 5: Complications Immediate Post Op & Long Term**

| S.No. | Complications                  | No. | Percentage % |
|-------|--------------------------------|-----|--------------|
| 1     | Mal Union & Non Union          | 1   | 2.85         |
| 2     | swelling and fracture blisters | 10  | 28.5         |
| 3     | Infection & Wound Problems     | 8   | 22.85        |
| 4     | Synostosis                     | 0   | 0            |
| 5     | Compartment Syndrome           | 0   | 0            |
| 6     | Sympathetic Dystrophy          | 0   | 0            |
| 7     | Arthritis                      | 0   | 0            |

## RESULTS

The AOFAS Score consists of 3 components, pain, functional activity and alignment. We observed in our population of 35 patients that the pain score significantly improves over 9 months, functional activity significantly improves over 9 months and the alignment score changes are not significant or remain constant. Thus the mean AOFAS Score are expected to improve over the observation period of 9 months which is what our following observations point out. We interpreted the AOFAS score as the percentage of functional activity change in our study group. C over a period of 9 months during regular follow up. We found that the OMAS scores also increase over the observation period of 9 months which translates into a better functional recovery over the observation period. The results were poor in one patient. There were no intraoperative complications. The postoperative complication we came across was superficial skin infection in 8 patients, mal union in one patient and swelling and fracture blisters in 10 patients. The functional recovery after 9 months of our study was  $\geq 90\%$  that is 24 patients out of 35.

## DISCUSSION

Ankle injuries commonly result from road traffic accidents and twisting injuries. Young males, active and mobile patients are at greater risk for sustaining ankle injuries. Accuracy of fixation ensures better fracture healing and consequent earlier return to daily activities translating into a better functional outcome. The accuracy of fixation could be judged by post operative x-rays which are as good a modality for assessment of reduction as a CT scan.

A good reduction and fixation requires a thorough knowledge of mechanism of injury of ankle. Beris AE et al did a review of 144 patients and studied the surgical treatment of malleolar fractures.<sup>[1]</sup> The bend of the lateral malleolus should be reproduced when the plate is being used. The fibular length has to be maintained for lateral stability of the ankle. Displaced and unstable ankle injuries often require early operative treatment for early and better functional outcome. Lee YS et al also did operative treatment of displaced lateral fractures and studied its advantages.<sup>[2]</sup> The choice of implant is crucial to neutralize the deforming forces to obtain optimal results. Open reduction and internal fixation guarantee high standard of reduction besides eliminating the chances of loss of reduction. Early intervention, good aseptic precautions and good general condition of patient

will reduce the chances of infection and subsequent post operative complications like wound dehiscence or implant exposure. Simanski CJ et al and Pettrone FA et al studied functional treatment and early weight bearing after an ankle fracture. Pettrone also chalked down quantitative criteria for prediction of results.<sup>[3,4]</sup>

We found that patients were doing well one year after ankle fracture surgery, with most experiencing little or mild pain and few restrictions in functional activities. At 9 months, the patients had significant improvement in function compared with that at six months after the surgery which could be validated using the AOFAS or the OMAS scores. Good results could be expected even if the time of union was longer.<sup>[5,6,7]</sup> Many other studies on functional and lifestyle outcomes were done and results were similar to our 9 months of study. Lash N et al studied functional and lifestyle outcome after two years, Kitaoka HB et al, Egol K, A et al also studied outcome after unstable ankle fractures were fixed after syndesmotic stabilization.<sup>[8,9,10]</sup>

The various complications were also taken into consideration in our study. There were no intraoperative complications. The postoperative complication we came across was superficial skin infection in 8 patients, mal union in one patient and swelling and fracture blisters in 10 patients. Konard G et al studied effect of tourniquets, post op pain and swelling and found similar results as our study.<sup>[11]</sup> Korim MT, Bhatia M did a case control study on surgical site infection and enumerated various causes responsible.<sup>[12]</sup> Little MT also enumerated complications following treatment of supination external rotation ankle fractures through posterolateral approach.<sup>[13]</sup>

We identified several factors that are significantly associated with a delay in functional recovery at one year: older age, the presence of diabetes mellitus, smoking, and presence of soft tissue injury and development of post operative skin infections. Similarly we could identify factors affecting time for union in ankle fractures like old age, presence of diabetes, smoking and soft tissue injury to negatively affect the time of union. Hoogendorn JM, Moghaddam A studied effects of cigarette smoking on fracture healing. Later study also pointed out decreased TGF 1 in cigarette smokers.<sup>[14,15]</sup> Retzepi M, Graves DT studied how diabetes worsens fracture healing and increases post operative morbidity.<sup>[16,17]</sup> Chaudhary S et al studied

complications like skin infection and delayed wound healing in patients of diabetes.<sup>[18]</sup>

The effect of accuracy of fixation, judged on x rays, on final functional outcome could not be effectively analysed as we encountered only one mal aligned patient who still developed reasonable function in the end. Larger studies are needed to successfully quantify the effects. It is important to counsel patients and their families with regard to the functional recovery that they can expect after the injury. The ability to identify patients who are at risk may allow the treating physician to alter care strategies to maximize recovery. The findings in our study were hampered by a small sample size and so larger studies focusing on areas like effect of soft tissue injury on time for fracture union are needed. The present study is in agreement with the above mentioned studies.

### CONCLUSION

Anatomical reduction is essential in all intra articular fractures, more so if a weight bearing joint like ankle is involved open reduction and internal fixation guarantee high standard of reduction besides eliminating chances of loss of reduction. The fibular length has to be maintained for lateral stability of the ankle. Poor clinical results are found to be associated with unsatisfactory surgical reduction. Diabetes smoking soft tissue injuries and post operative wound skin infection and old age all affect both time for fracture union and functional recovery of the patients. Larger clinical studies with more heterogenous populations could help accept or refute the findings in our study design.

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