IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 10 Ver. VI (Oct. 2015), PP 01-04
www.iosrjournals.org

A Study on Internal Fixation of Bimalleolar Ankle Fractures

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I. Introduction

Bimalleolar ankle fractures are the most common variant of injuries around the ankle joint. Ankle injuries apart from road traffic accidents can also result from a slip while walking or getting down from stairs or a twisting injury in sports and fall from a height. All these tend to produce ankle injuries when one attempts to turn violently over a fixed foot or the foot being used as lever to produce twist at the ankle .Great majority of ankle injuries are caused by indirect violence. If not treated properly the ankle injuries are a source of disability in the form of pain,instability and early degenerative arthritis of the ankle. As has been shown experimentally by Paul L.Ramsey about 1mm lateral shift in Talus ,produces about 42 %of decrase in tibiotalar contact area.This obviously shows the need for perfect anatomical reduction ,which could be better achieved by open reduction and maintained by internal fixation.

Aims And Objectives

1. To analyse results of internal fixation in displaced bimalleolar ankle fractures.
2.To analyse results of faster rehabilitation
3.To analyse the results of complications.

II. Materials And Methods

A prospective study was undertaken in the field of management of displaced ankle fractures regarding the role of anatomic reduction and internal fixation by various methods.

During the period from June 2012 to June 2015 ,58 displaced bimalleolar ankle fractures were treated operatively .Among them 10 patients were lost for follow up. The remaining 48 patients were studied clinically and radiolographically and the data was obtained and analyzed.

Inclusion of cases:

1. All displaced bimalleolar ankle fractures in adults were included.
2 .Bimalleolar ankle fractures associated with fracture of the posterior malleolus which could be managed with conservative management were included.
3.Open bimalleolar ankle fractures.

Exclusion criteria for cases:

1.Undisplaced fractures and fractures treated by closed reduction.
2. Childhood and epiphyseal injuries around ankle were excluded from the study.
3.Ankle fractures with late presentation ,with nonunion or malunion were not included in the study.

Among 48 patients 28 are males and 20 are females. There were 12 compound injuries and in 10 patients ankle subluxation and in 4 ankle dislocation were noted.10 patients had associated posterior malleolar fracture which were managed conservatively.

III. Observations And Analysis Of Results

Of the fractures 58 treated at Siddhartha Medical College/Government General Hospital ,Vijayawada ,from June2012 to June 2015.10 patients were lost for follow up and remaining 48 patients were observed and the results are analysed. They ranged in age from 20-65 years with 30(62.5%)patients being between 40-65 years and 18(27.5%)patients being between 20-39 years old.

There were 28(58.3%) men and 20 (41.7%)women .In 11(45.8%) Right side was injured and in 13(54.2%) patients left side was involved. In our series the commonest mode of injury was Slip and fall (50%)Road traffic Accidents and others (8.3%). In our series there were 36(75%)patients had closed injuries and 6(25%)had compound fractures or fracture dislocations.

According to Lauge-Hansen Classification, Supination Adduction injuries were 4,Supination External rotation injuries were 12,Pronation Abduction were 22 and Pronation External rotation were 10,there were no Pronation Dorsiflexion injuries in this study group.

The above data tells Pronation Abduction,Supination External rotation and Pronation External Rotation are the common mechanism that causes injuries around the ankle joint.

Every patient with gross displacement,subluxation or dislocation received some sort of manipulation to reduce displacements and dislocations and every patient received below knee POP immobilization.

The compound wounds were treated on emergency basis with thorough wash with 5% Betadine and Normal Saline depending on the grade of the injury. Tetanus Immunoglobulin depending on the contamination ,IV antibiotic for 1 to 2 weeks in case of Grade II and Grade III compound injuries.

All the patients were treated surgically according to AO-ASIF PRINCIPLES.Among the 48 lateral malleolar (or distal fibular) fixations24(50%) with 1/3 tubular plate,14(28%) with rush nail,6(12.5%)with Kwire fixation,4(8.3%) with malleolar screw was done .Among the 48 medial malleolar fixations,the commonest being malleolar or cancellous screw fixations was done in 34(70.67%)patients,and Tension band technique in 8(16.67%)patients,Kwire fixation in 6(13.3%)patients.The syndesmotic screw was applied in 4 fractures (Supination External Rotation) both were placed through the fibular plate.These screws were removed before weight bearing after 10 weeks in all the patients post-operatively. Steinman pins are applied through the calcaneum ,talus into tibia in 4 cases with ankle dislocation and they were removed post operatively after 3 weeks.

An average period of post –operative immobilization in a posterior below knee slab was3.75 weeks(Range 0-6 weeks)the average period of non weight bearing ankle exercises was 4.5 weeks (Range 3-8 weeks);the average period of partial weight bearing was 5.6 weeks(range 4-8 weeks). We allowed full weight bearing at an average of 9.3 weeks after operation range(8-12 weeks).Most of our patients resumed their previous work status after 10 weeks(range 9-14 weeks).An average total period of follow up was 49.5 weeks (range 20-90 weeks). The average time taken for fracture union was 14 weeks (range 11 to 18 weeks).In this series we encountered two medial malleolus nonunion and two fibular non unions which were asymptomatic.

There were 12 complications encountered in this series two asymptomatic non unions, two fibular non unions, 4 periarticular osteoporosis,4 superficial wound infections. Among the 48 patients we achieved excellent and good functional results in 15(62.5%)patients,good objective results in 18(75%)patients and good radiographic results in 40 (83.3%) patients.

We achieved more favourable results in younger patients and as the age advances the results were less favourable. The subjective results as analyzed according to Lauge Hansen and Denis Weber types.We achieved fair to good results of 100% in Supination Adduction injuries,66.7%good to excellent results in Supination External rotation injuries,64% good to excellent in Pronation Abduction and 60% good to excellent in Pronation External rotation injuries. We achieved good to excellent results of 33.3% in typeA injuries,67% in type B injuries,67% in type C injuries. In our study we did not encounter complications such as compartment syndrome,deep seated infections ,malunion ,sympathetic dystrophy.

As our average follow up was only 40 weeks we can not comment on arthritis of ankle.

IV. Discussion

Bimalleolar ankle fractures are the most common type of ankle fractures. The management of bimalleolar ankle fractures is a challenge to the orthopedic surgeon. There has been no consensus in the literature regarding the appropriate treatment of ankle fractures especially associated with ligament tears.

The conservative method of treatment of displaced bimalleolar ankle fractures is mostly associated with malunion ,leading to an altered biomechanics of ankle and resulting in early degenerative arthritis and stiff painful ankle. Many surgeons reported excellent results in the treatment of displaced bimalloelar ankle fractures with AO-ASIF principles. The Lauge-Hansen and Denis-Weber(A.O) classification systems are the two most widely used systems for classification of ankle fractures.The genetic detailed classification by Lauge Hansen gives good information about the extent of skeleton and ligamentous involvement but because of many sub groups, is impractical in daily routine work.

The Weber classification in contrast, only focuses on the fracture of the fibula and its relation to the syndesmosis and is thus insensitive to the degree of skeletal and ligamentous involvements. Further more type B includes various injuries with different prognosis.

It was not possible for us to compare the group treated operatively and a corresponding group treated non-operatively,either in our own institution or as reported in literature. A total of 48 patients were followed and analyzed for results. In our study 24(50%) patients were due to slip and fall ,58% of patients were males, highlighting the fact that being more active more prone for injuries.

Regarding age incidence almost equal number of patients were recorded in the age group 50-65,20 patients(41.7%) and in the young adults between the ages of 20-39, 18 patients (37.5%)with mean age of 44.5 years. Even though the young population is more mobile and more prone to accidents,the study group had more numbers of patients in 50-65 age group because of associated medical problems who required specialized care in a super speciality hospital.54% of injuries were left sided.

30(62.5%) out of 48 patients having associated medical problems and the patients were above the age of 50 years which explains the need of specialized medical care.

In this series compound fractures were seen in 12 patients (25%) of which 83% were in Grade I and Grade II Gustilo-Anderson type. There were 10 (21%) subluxations and 4(8.3%)dislocations were treated. This fact indicates the greater amount of soft tissue and ligamentous injury.

In our study 66% of cases (32)belonged to pronation abduction and pronation external rotation injuries,which are common mechanisms of ankle injuries. According to Danis Weber(A.O)30 PATIENTS (63%) Belong to type C.This signifies that most of the fibular fractures were above the level of syndesmosis with partial or complete rupture of syndesmotic ligaments.

Open reduction and internal fixation using AO-ASIF method is an excellent treatment for fractures of the ankle that are displaced or unstable.

De Souza etal achieved 90% satisfactory results in displaced external rotation abduction fractures of the ankle. In our study we achieved 95% satisfactory results in Abduction and External rotation injuries. In this study group the results are comparable because high velocity injuries were less common 42% as compared with 33 % in their study. Another reason was early presentation of patients and less compound injuries.

As pointed out by Gustilo &Anderson the most important prognostic factor in open fractures is the level of energy creating the wound which directly relates to the degree of soft tissue injury.

Johnson and Lance did a study on open reduction and internal fixation in the field of open ankle fractures.They achieved 64% excellent ,23% good and 13% poor results.In the study group among the12 compound fractures,excellent results were achieved in 2(16.7) good results in 6(50%),fair results in 2(16.7%)and poor results in 2 (16.7%)patient.

The cases which yielded poor results were Grade II injury associated with severe comminution of fibula above the syndesmosi s. They were treated with thorough wound wash and pop slab for 2 weeks , followed by ORIF. The poor results in grade II &III compound fractures were attributed to non-anatomic reduction,articular surface damage and delay in fixation of fractures.

We came across 4 superficial wound infections in Grade II & III injuries among 12 compound injuries which were managed conservstively. The low infection rate in study was also due in part to the immediate debridement and irrigation of wounds and peri-operative IV antiobiotics.

In this study group we treated 4 Danis Weber type C fractures with supra syndesmotic screw and achieved good results in all the patients..We removed syndesmotic screw 10-12 weeks after operation and allowed weight bearing. In our study we immobilized every patient with below knee pop slab .We achieved good ranges of dorsiflexion and plantar flexion after slab removal.

V. Conclusion

1. Most of the bimalleolar ankle fractures were due to indirect violence, occurred more frequently in adult population.
2. Slip and fall was commonest mode of injury to ankle.
3. Ahigher incidence was observed in old adults
4. Ahigher incidence was observed in males.
5. Left ankle was more often involved than right ankle.
6. The pronation-abduction was found to be the commonest mechanism of injury followed by Supination Extenal rotation injury.
7. It has been found that most of the fibular fractures were supra syndesmotic with partial or total rupture of syndesmotic ligaments.
8. Proper preoperative planning,good operative skills and excellent post operative management was needed to obtain the best results.
9. Open reduction and internal fixation using AO-ASIF method is an excellent treatment of displaced ankle fractures.
10. Earlyand extensive wound debridement and stable internal fixation enhancing stabilityand function of ankle will give good results in open ankle fractures.
11. The post operative cast immobilization will not cause restriction of range of motion of ankle and it aids in better healing of soft tissue around ankle.

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