



Original Article

Evaluation of Functional outcomes in Bimalleolar Fractures Treated with CCS and DFALP

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Abstract

Introduction: *Bimalleolar fractures are very common in ankle injuries because of increased incidence of road traffic accidents and industrial trauma. Anatomical reduction and stable internal fixation is important for good outcomes.*

Aim & Objectives: *To study functional outcomes of Bimalleolar fracture treated with CCS and DFALP; To achieve anatomical/near anatomical fracture reduction, stable internal fixation and early mobilization of the ankle.*

Materials and Methods: *We have evaluated functional and radiological outcomes of 20 patients treated with closed / open reduction with internal fixation used Cannulated Cancellous Screw (CCS) for medial malleolus and Distal Fibular*

Anatomical Locking Plate (DFALP) for Lat malleolus .Lauge Hansens classification was used for fracture evaluation. Baird and Jackson Scoring system was used to evaluate functional outcomes.

Results: *In this prospective study, 20 cases of Bimalleolar fractures of ankle were selected by exclusion and inclusion criteria and treated with CCS and DFALP. Most common mode of injury was supination external rotation injury accounts for 45 % (9 cases). All cases were treated surgically with closed / open reduction with internal fixation. All cases of medial malleoli fracture were treated with cannulated cancellous screw and all cases of lateral malleoli fractures were treated with distal fibular anatomical locking plate by minimally invasive procedures. We found excellent results in 55% (11 cases), good results 25% (5 cases), fair results in 15% (3 cases) and poor result in 5% (1 case).*

Conclusion: *In this study, after analysing our functional and radiological outcomes and has been compared with other published result and found that Cannulated Cancellous Screws (CCS) and distal fibular anatomical locking plate (DFALP) give excellent results. From this study it is concluded that CCS and DFALP are the good implants and ideal treatment modalities for Bimalleolar fracture of ankle.*

Level 1 evidence: *Prospective study*

Keywords: *Bimalleolar fracture, CCS, DFALP, SER.*

Introduction

Ankle fractures account for 9% of all fractures. Untreated or badly treated ankle fractures can present with severe disability, so anatomical/ near anatomical fracture reduction and stable fixation is important to have good outcomes. The incidence is 1.87 cases per 1000 people per year and around 2% of ankle fractures are open fractures.¹ Bimalleolar fracture account for one fourth of all ankle fracture. It is more common in women and people over 60 years of age. There has been an increase in the prevalence of such fractures over the last two decades both in the young, active patients and in the elderly².

Aims and Objectives

This study is done to evaluate outcomes of Bimalleolar fractures treated with CCS and DFALP, to find out better ways of treatments for bimalleolar fractures and to know the advantage and disadvantage of this treatment modality.

In this study we have studied 20 cases of bimalleolar fractures operated in the Department of Orthopaedic Surgery, BSA hospital, Rohini, Delhi between Oct 2010 – Sept 2012 with a view to analyze the mechanism of injury, fracture patterns, mode of treatment employed and related complications. Inclusion criteria included patients with age above 18 years, patient who gave consent for operative treatment with minimum follow up available of at least 6 months, bimalleolar fracture associated with any other fractures. Exclusion criteria included patients with age below 18 years, patient who presented with open fractures and patient with neurovascular injuries. Our main objective was to achieve anatomical or close to anatomical reduction and stable internal fixation.

Materials and Method

Close reduction was tried in all cases of lateral malleolus fracture. Cases in which close reduction achieved DFALP were applied through minimally invasive incision (2-3 cm). Cases in which close reduction were not achieved, ORIF were done through longitudinal lateral incision (3-5 cm) is

the standard approach for most lateral malleolus fractures. The dissection plane is between the peroneus tertius anteriorly and the peroneus longus and brevis posteriorly. Care was taken not to damage the superficial peroneal nerve, which lies very close anteriorly, especially in the proximal part of the incision. It should be identified and protected.

Close reduction was also tried in all cases of medial malleolus fractures. Cases in which close reduction were achieved, fracture were fixed with two CCS through stab incision. Cases in which close reduction were not achieved, fractures were expose through 4-6 cm medial longitudinal incision. Incision was put over the medial malleolus between its anterior and posterior borders with the lower end curving anteriorly at the tip of medial malleolus. The incision was deepened to the bone protecting the long saphenous vein over the anterior part of the incision. Fracture edges were cleaned, reduction achieve and hold the reduction with towel clip. Two guide wire were passed and drill with 4mm cannulated drill bit. Measure the appropriate length of screw. Now two CCS of required length were inserted with or without washer. Skin closure was done. Sterile dressings were applied and compression bandage given. Below knee posterior pop slab was given. The patient was shifted to recovery room and then to post-operative ward. Suture were removed by 13th day. Regular follow up were done at 6th, 12th, 18th, 24th, 48th and 96th weeks postoperatively. On every follow up clinical and radiological evaluation were done. Pop slab were removed and Ankle mobilization were started by 6th postoperative week. Partial weight bearing were started by 6th - 8th week and full weight bearing by 12th week postoperatively

Functional and radiological results were analysed according to Biard and Jackson scoring system. Syndesmotic screws were removed by 6th postoperative week.

Observation and Results

Early operative treatment of bimalleolar fractures decreases morbidity and improve the functional outcome. The treatment of Bimalleolar fractures with closed/open reduction and stable internal fixation gave good results. The post-operative assessment advised by Baird and Jackson^[31] showed 55 % (11 cases) patients in this series achieved excellent results and 25 % (5 cases) patients achieved good results, which is attributed to anatomical reduction of the lateral malleolus as well as medial malleolus. In 15% cases Fair and in 5% cases Poor result were observed in our study. The mean age in this study was 44 years. This finding was similar to observation of Baird and Jackson^[31], Roberts RS, Beris^[2] et al and Lee^[25] et al. The commonest mode of injury was road traffic accident in the present study. The left side (55 %) was more commonly affected than right (45 %) in our study group. In the present study, Lauge Hansens classification was used for fracture evaluation. The most common type of injury was Supination external rotation 45% (9 cases) and Supination adduction 20 % (4 cases), Pronation external rotation 20 % (4 cases) and least common was pronation abduction 15% (3 cases).

Table-1

Type of injury	No. of pts.	percentage
Supination external rotation	9	45 %
Supination adduction	4	20 %
Pronation external rotation	4	20 %
Pronation abduction	3	15 %
Total	20	100 %

Table-2

Study	No. of patient	Most common type	Percentage
Roberts SR ³	25	Supination external rotation (SER)	34%
Baird Jackson ⁵	24	Supination external rotation (SER)	44%
Our study	20	Supination rotation (SER)	09 (45 %)

Table-3 Results as per Fracture Type: (Blair and Jackson scoring system)

Type	No. of patient	Result
SER Ext (Supination Rotation)	09	Excellent 5 Good 3 Fair 1 Poor 0
SAD (Supination Adduction)	04 2 cases associated with posterior malleolar fracture	Good 2 Excellent 1 Fair 1
PER Ext (Pronation rotation)	04 1 case associated talus fracture	Excellent 1 Good 2 Fair 0 Poor 1
PAB (Pronation Abduction)	03	Excellent 1 Good 1 Fair 1 Poor 0

Table-3

Complications	Number	Percentage
Infection	2	10 %
Nonunion	1	5 %
Malunion	0	--
Hardware Prominence	2	10 %
Varus Malalignment	1	5 %
Syndesmotic Instability	1	5 %
Post Traumatic Arthritis	1	5 %

Table-4 Final Score According to Subjective, Objective and Radiological criteria: (Baird and Jackson Scoring system)

Category	A	B	C	D	E	Total
Pain	11	7	2	-	-	20
Stability	18	2	-	-	-	20
Walking	11	8	1	-	-	20
Running	4	13	2	1	-	20
Work	16	2	2	-	-	20
Movements	16	2	2	-	-	20
Radiographs	19	-	-	1	-	20

Table-5 Composite Score

Composite Score	No.of Patients	Percentage
Excellent(96-100)	11	55 %
Good (91-95)	5	25 %
Fair (81-90)	3	15 %
Poor (0-80)	1	5 %

Case : 1

Preoperative x ray



Post op x ray



Postoperative x ray



Case: 3

Pre op x ray



Postoperative x ray



Case: 2

Pre Op x ray



Discussion

The results in this study were compared with that of Burnwell and Charnley¹, Colton², DeSouza⁴ et al. In Colton's series they found that 70% patients had good to excellent results. Burnwell and Charnley in their series of 132 patients found 102 (77.3%) had good results, 16% had fair results and 6% patients were found to have a poor score. In the study conducted by DeSouza⁴ et al on 150 fractures of ankle treated by open reduction and stable internal fixation using AO ASIF method, they obtained 90% good results. In a study conducted by Beris et al of 144 patients with ankle fracture there were good to excellent results in 74.3% patients, fair results in 14.6% and poor result in 11.1%. Posttraumatic osteoarthritis was found to be associated significantly with poor clinical results and unsatisfactory fracture reduction and fixation. All these were comparable to present study where 80 % patients had excellent to good results, 15 % fair and poor results in 5 % patients.

Observation in present study support the contention of Yablon et al that lateral malleolus is the key to the anatomical reduction of bimalleolar fractures, because the displacement of the talus followed that of the lateral malleolus. The patient who had poor result in this study is due to failure to achieve anatomical reduction. This may be due to soft tissue interposition which led to non-union and arthritis in ankle. The presence of a posterior bony fragment greater than 25% of the joint surface has been shown previously to affect the outcome and increase the risk of osteoarthritis. In this series there were two patients with posterior malleolar fractures both of them fixed with posterior lag screw among them one case gave poor result in follow-up which was associated with severity of initial trauma and soft tissue compromise. We have used syndesmotic screw through DFALP in 8 cases which were associated with syndesmotic injury and these screws were removed at 6th postoperative week. In the present study the decisive factors which influence the results are-

1. Plaster cast immobilization post operatively for 6 weeks did not compromise the ankle movements. The rapid gaining of range of movement from 6 to 12 weeks may be due to the positive attitude to exercise and resumption of full weight bearing by 12th weeks.
2. Bimalleolar fractures of the ankle have a varied presentation. A broad understanding of all aspects of mechanism of injury, patho-anatomy and treatment options coupled with surgical experience is required before any attempt should be made to treat these injuries.
3. Type of fracture, severity of injury is inversely proportional to the final results obtained.

Authors and years	Good to excellent	Fair	Poor
Burwell and charnley ¹	102 (77.3%)	22 (16.7%)	8 (6.0%)
Colton ²	18 (70.0%)	4 (14.6%)	4 (15.0%)
DeSouza et al. ⁴ (1985)	135 (90.0%)	9 (6.0%)	6 (4.0%)
Our study (2013-15)	16 (80 %)	3 (15 %)	1 (5 %)

Conclusion

In the present study of 20 patients, all of the medial malleoli fractures were treated with CCS and lateral malleoli fractures with DFALP showed congruence articular surface with anatomical reduction. This will give excellent to good result. After analysing our results (Functional and radiological) and on comparing with other published series, CCS and distal fibular anatomical locking plating gave excellent to good results in majority of cases. It is concluded that CCS and DFALP are the good implant for fixation of bimalleolar fracture.

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