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## Pott's fracture: Study of functional outcomes of various surgical treatments

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### Abstract

**Background:** Pott's fractures are very common in ankle injuries because of increased incidence of road traffic accidents and industrial trauma. Anatomical reduction and stable fixation is important for a painless ankle joint.

**Aim & Objectives:** To study functional outcomes of various surgical treatments of pott's fracture; to achieve stable fixation and early mobilization of the ankle.

**Materials and Methods:** We have evaluated clinical, radiological and functional outcomes of 30 patients treated with different treatment modalities, which include - tension band wiring (TBW), Kirschner (K)-wire, malleolar screw (MS) and cannulated cancellous screws (CCS) for medial malleolus fracture and rush nail, one-third tubular plate, fibular locking plate for lateral malleolus fracture.

**Results:** In this prospective study, 30 cases of Pott's fractures of ankle were treated by different surgical method. Most common mode of injury was pronation and external rotation injury accounts for 53.34%. 29 cases were treated with open reduction internal fixation and one case associated with plafond fracture treated with external fixator. 15cases of medial malleoli fracture treated with TBW and 14 cases with malleolar / cannulated cancellous screw. Lateral malleoli fractures were treated with rush nail/ fibular plate. We found excellent results in 17 cases, good results in 8 cases, fair results in 4 cases and poor result in 1 case.

**Conclusion:** In this study, after analysing our result, clinical and radiological results has been compared with other published result and found that TBW and fibular plate give excellent results.

**Level 1 Evidence:** Prospective study

**Keywords:** Pott's fractures, TBW, CCS, MS, one-third tubular plates

### Introduction

Of all long bones, the tibia and fibula have highest incidence of fracture more so near ankle joint. Untreated or badly treated ankle fractures can present with severe disability, so anatomical reduction is important to have good outcome. Ankle fractures account for 9% of all fractures, with an incidence of up to 174 cases per 100,000 adults per year and around 2% of ankle fractures are open fractures<sup>[1]</sup>. Pott's fracture is eponym of bimalleolar fracture, which account for one fourth of patients of ankle injury, it is more common in women, 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 elderly<sup>[2]</sup>.

Of all long bones, the tibia and fibula have highest incidence of fracture more so near ankle joint. Untreated or badly treated ankle fractures can present with severe disability, so anatomical reduction is important to have good outcome. Ankle fractures account for 9% of all fractures, with an incidence of up to 174 cases per 100,000 adults per year and around 2% of ankle fractures are open fractures<sup>[1]</sup> Pott's fracture is eponym of bimalleolar fracture, which account for one fourth of patients of ankle injury, it is more common in women, 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 elderly<sup>[2]</sup>.

### Aims and Objectives

This study is done to compare functional outcome of various modalities of surgical fixation of Pott's fractures, to compare the results of cases managed by different methods of treatment, to find out better ways of treatments for Potts' Fractures in our tertiary care centre,

to know the complications of open reduction and internal fixation in Pott's fracture.

In this study we have studied 30 cases of Pott's fractures operated at the Department of Orthopaedic Surgery, BJMC, Ahmedabad between June 2017– May 2019 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 consented to undergo operative treatment of Pott's fracture with minimum follow up available of at least 6 months, Pott's fracture associated with any other fractures. Exclusion criteria included patients with age below 18 years, patient who presented with open fractures and patient having Pott's fracture associated with neurovascular injuries. Our main objective was to achieve anatomical length of the leg and proper configuration of ankle mortise.

### Materials and Method

The longitudinal lateral incision 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. Handling the damaged soft tissue is crucial. 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. Reduction of the fracture was done by traction and counter-traction in all fractures, after reduction hold both fragments with reduction holding forceps and fixed with semitubular plate or anatomical fibular plate. Drill hole were made with 2.5mm drill bit. The length of the screw was measured with a screw gauge and tapped with 3.5mm tap. The plate was then fixed with the measured length of cortical screws. For fixation of the fibular fracture with rush nail, the starting point for the rush nail is the distal tip of the fibula.

A medial appropriate longitudinal 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. An AO wire of 20 gauge is passed through the predrilled hole on the tibia from anteromedial to anterior aspect and was made in the figure of eight passing behind the two K-wires and tensioned with the help of two pliers and the tips of wire were cut with a

cutter. The two K- wires were bend with bender and punched into bone engaging the wire, protecting the tibialis posterior tendon and neurovascular bundle. The medial malleolus is fixed with two partially threaded cancellous bone screws 4.0 mm or malleolar screws, if the quality of the bone is not so good, or the fragment is small, a tension band wiring can be used as mention above, if the fragment is large and the fracture plane is vertical, the fracture is fixed with a medial buttress plate. 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. At 6 weeks, x- ray of the ankle was taken antero-posterior, lateral, mortise view was done after removal of cast and looked for signs of fracture union, if satisfactory were advised for ankle joint mobilization and non-weight bearing walking. At 8th weeks, patients were again assessed with x-ray, if satisfactory partial weight bearing started followed by full weight bearing by the end of 12 weeks. Functional and radiological results were analysed according to Baird and Jackson scoring system Regular follow up was done at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> postoperative months. Syndesmotom screws were removed by 6th week.

### Observation and Results

Prompt operative treatment of ankle fractures decreases morbidity and improve the functional outcome. The treatment of Pott's fractures with open reduction and stable internal fixation using AO principles gave good results. This study supports these conclusions. The post -operative assessment advised by Baird and Jackson [31] showed 56.67% patients in this series achieved excellent results and 26.67% patients achieved good results, which is attributed to anatomical reduction of the lateral malleolus as well as anatomical reduction of talus radiologically. The mean age in this study was 43.83 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 (53.34%) was more commonly affected than right (46.67%) in our study group. In the present study Lauge Hansens classification system was used for operative evaluation. The most common type of injury was pronation external rotation (53.34%) and supination external rotation (40%) and least common was pronation abduction.

**Table 1:** Most common type of injury

Study	No of patient	Most common type	Percentage
Roberts SR (34)	25	Supination external rotation	34%
Baird and Jackson (31)	24	Supination external rotation	44%
Beris (2), <i>et al.</i>	144	Supination external; rotation	--
Our study	30	Pronation external rotation	16 (53.34%)

**Table 2:** Results As Per Fracture Type: (Blair and Jackson scoring system)

Type	No. of patient	Result
PER (Pronation External Rotation)	Bimalleolar:16	Good 4 Excellent 10 Fair 2
SER (Supination External Rotation)	Bimalleolar:12 2 cases associated with posterior malleolar fracture	Good 4 Excellent 7 Fair 1
SAD (Supination Adduction)	Bimalleolar:2 1 case associated with talus fracture	Good 1 Poor 1

**Table 3:** Complications

Complications	Number	Percentage
Infection	5	16.67%
Nonunion	1	3.34%
Malunion	0	--
Hardware Prominence	2	6.67%
Varus Malalignment	1	3.34%
Syndesmotic Instability	1	3.34%
Post Traumatic Arthrities	1	3.34%

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

Category	A	B	C	D	E	Total
Pain	17	11	2	--	--	30
Stability	29	1	--	--	--	30
Walking	17	12	1	--	--	30
Running	6	20	3	1	--	30
Work	24	3	3	--	--	30
Movements	25	2	3	--	--	30
Radiographs	29	-	-	1	--	30

**Table 5:** (Composite Score)

Composite Score	No. of Patients	Percentage
Excellent (96-100)	17	56.67%
Good (91-95)	8	26.67%
Fair (81-90)	4	13.34%
Poor (O-80)	1	3.32%

## Discussion

The results in this study were compared with that of Burnwell and Charnley<sup>[1]</sup>, Colton<sup>[2]</sup>, DeSouza<sup>[3]</sup> *et al.* In Colton's series he found that eighteen (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 DeSouza<sup>[3]</sup> *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%. Excellent and good results were achieved in 107 of the 144 patients surgically treated by Beris. Overall, excellent to good results were seen in bimalleolar fractures. 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 83.34% patients had excellent to good results, 13.34% fair and poor results in 3.34% 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 fibular plate in 7 cases of Pott's fracture which were associated with syndesmotic injury and these screws were removed at 6th week's follow up. 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 motion from 6 to 12 weeks may be due to the positive attitude to exercise and resumption of full weight bearing by 12th weeks.
2. Among all fractures, six fractures involving distal fourth of fibula which were non comminuted and minimally displaced were treated with rush nail had excellent results but this can be attributed to the open reduction and anatomical fixation of medial malleolus. Malleolar 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 <sup>[33]</sup>	102(77.3%)	22(16.7%)	8(6.0%)
Colton <sup>[36]</sup>	18(70.0%)	4(14.6%)	4(15.0%)
DeSouza <i>et al.</i> (1985) <sup>[16]</sup>	135(90.0%)	9(6.0%)	6(4.0%)
Our study (2014-17)	25(83.34%)	4(13.34%)	1(3.32%)

**Table 2:** Results As Per Fracture Type: (Blair and Jackson scoring system)

Type	No. of patient	Result
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**Conclusion**

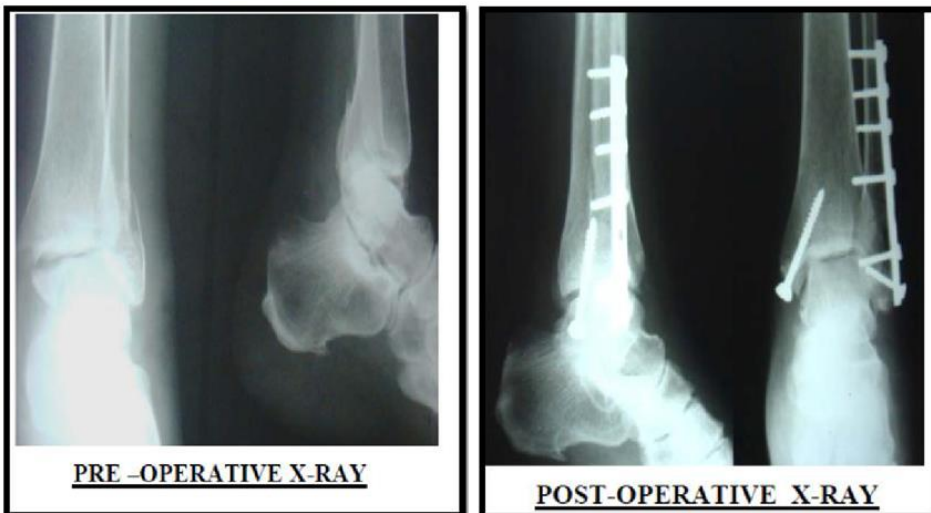
In the present study of 30 patients, majority of the medial malleoli fractures were treated with TBW and lateral malleoli fractures with plating showed congruence articular surface with anatomical reduction. This will give excellent to good result. After analysing our results (clinical and radiological) and on comparing with other published series, tension band wiring and fibular plating gave excellent to good results.



Preoperative Xray

Immediate Postoperative Xray

**Case 1:** 47 Yrs old Female with Closed Fracture Bimalleolar Potts (L)



PRE -OPERATIVE X-RAY

POST-OPERATIVE X-RAY



UNION AT 8 WEEKS

6 MONTHS FOLLOW-UP

**Case 2:** 28 Yrs old Male with closed Fracture Bimalleolar Potts Fracture

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