

# The outcome of percutaneous fixation of medial and lateral malleoli(Pott's) fracture among adults in Erbil

**Abdulkadr Muhammed Sleman.**

College of Medicine/Hawler medical university, email-amsalany70@yahoo.com.

## Abstract

**Background and objectives:** Potts fractures are common fractures among elderly age community associated with soft tissue swelling. Percutaneous fixation is regarded as a newly developed technique for surgical intervention of Pott's fractures. To assess the outcome of percutaneous fixation done for patients presented with Potts fractures to Erbil hospitals. **Methods:** This study was a follow up (prospective) study conducted in the Erbil teaching hospital in Erbil city from 1st of March, 2014 to 30th of June, 2016 on 32 adult age patients with Pott's ankle fracture. Radiographs were regularly obtained 6 weeks postoperatively to check for union and 12 weeks postoperatively to evaluate healing, and as needed after more than 12 weeks. **Results:** Mean age of Pott's fracture patients was 43.3 years with predominance of male gender (53.1%). The main mechanism of injury was fall from height (53.1%) and common fracture type (according to Danis-Weber classification) was A (68.8%). The union rate of Potts ankle fracture was 100% with mean union duration as 9 weeks. The reported postoperative complications were tenderness (9.4%), malunion (9.4%), infection (6.3%) and painful bursa (6.3%). Excellent functional rating scale represented 68.7% of Pott's fracture patients postoperatively. **Conclusions:** Percutaneous Screw fixation of Pott's ankle fracture had good outcomes.

**Keywords:** Pott's fracture; Erbil

## Introduction

Ankle fractures are common fractures which require orthopedic intervention and represent about 9% of all fractures that increased especially among elderly women<sup>1</sup>. The ankle fractures are complex fractures first classified by Sir Percival Pott (in 1768) according to number of malleoli affected, unimalleolar, bimalleolar and trimalleolar. However, this classification was unable to differentiate between stable and unstable injuries<sup>2</sup>. Pott's fracture usually involves one or two ankle malleoli caused by jump and hard sport activities developing stress on tibia, fibula and ankle joint. Pott's fractures may present alone or in combination with other fractures of ankle and leg. The common clinical features of Potts fractures are sudden severe pain, failure of weight bearing, hearing of crack, tenderness, deformity, bruising and swelling<sup>3</sup>. Diagnosis of Pott's fractures is done through history, physical examination (palpation, motion range and Kleiger test), x-ray (Ottawa ankle rules), CT-scan and MRI<sup>4</sup>. The mechanism of injury and clinical history play a great role in diagnosis of Pott's fractures<sup>2</sup>. Sometimes intra-operative x-ray is required for diagnosis confirmation and treatment planning<sup>5</sup>. Conservative treatment of Pott's fractures involved first: rest by avoiding weight bearing and physical activity like standing, walking, running and jumping<sup>6</sup>, second: immobilization of ankle in cast for weeks after repositioning of fractured ankle manually<sup>7</sup>. Surgical intervention represents the predominant therapeutic choice for orthopedics using open reduction and internal fixation (using screws, plates and bands) or open reduction and external fixation.

However, many complications were encountered after surgery such as wound infection, failure of implant, pulmonary embolism, delayed union and mortality<sup>8</sup>. Percutaneous fixation is regarded as a newly developed technique for surgical intervention of Pott's fractures. Generally, this unique technique involved percutaneous reduction of fractured Potts fracture and external fixation in order to stabilize the bones and limit the physical strain. It will minimize risk of vascular injury with preservation of soft tissue and helping in earlier perfect correction of bone deformity<sup>9</sup>.

## Patients and methods

This study was a follow-up (prospective) study conducted in the Erbil teaching hospital in Erbil city between 1st of March, 2014 to the 30th of June, 2016. Patients with ankle dislocation, deep venous thrombosis, multiple fractures, and loss of consciousness, previous Pott's fracture treated with another method, strenuous medical diseases and steroid drugs users were excluded from the study. All adult injured patients with Pott's fractures presented to emergency department during the study period and filling inclusion and exclusion criteria were included in the study. After full history, examination and resuscitation by ABC measures if required, patients were referred to the Radiology department of the hospital for anteroposterior and lateral view (the diastasis assessment has been done intraoperatively by fluoroscope) x-rays in addition to CT-scan to have an accurate diagnosis of Pott's fractures. The preoperative care of injured

patients included the preparation of fluids and blood as the surgery was conducted as soon as possible. Two patients had open fractures and managed accordingly. After spinal or general anesthesia of patients in supine, the pneumatic tourniquet applied over mid-thigh. The surgical equipment was prepared (instruments, fluoroscope and implants). Preoperative antibiotics were given for all studied patients (ceftriaxone 1gm single dose intravenously). If the fracture is displaced, manipulation under and alignment will be checked by fluoroscope in addition to the stability of ankle and tibiofibular joint (syndesmosis). The bone fixation was done firstly for the fibula then for the medial malleolus. The K wire was connected to electric power drill and inserted through small port (1cm incision length and 1 cm distal to lateral malleolus). The incision

was done by a small scalpel. The K wire was inserted over the skin along with the alignment of fibula and across the tip of lateral malleoli using cannulated drill bit (4.5 or 5mm according to the chosen -cannulated partially threaded, self-tapping- screws and washers- 5mm or 7.3 mm-) according to the size and diameter of the bone with regular monitoring done by fluoroscope from lateral view and must be compatible to line drawn from the port of insertion to alignment of K wire. The whole threads crossing the fracture and final checking performed by fluoroscope ports closed in one layer by one stitch; same technique was applied for medial malleolus and one or two screws were inserted, according to size of the fragment, Figures 1-4.

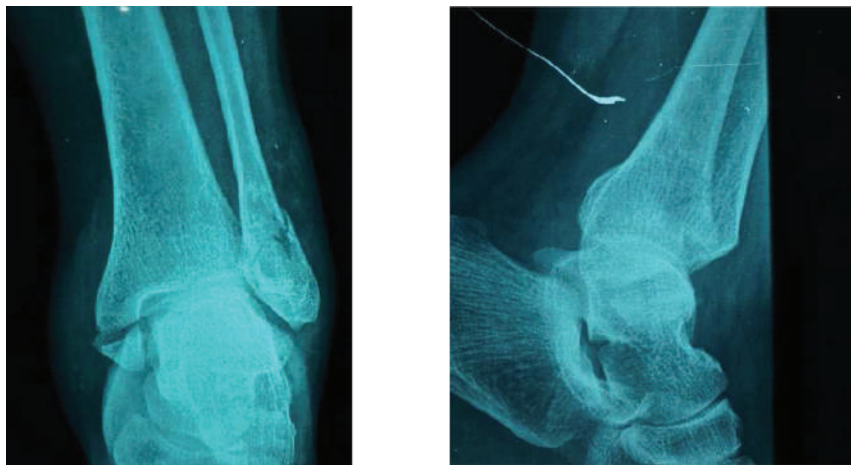


Figure (1): Pott's fracture of ankle joint.

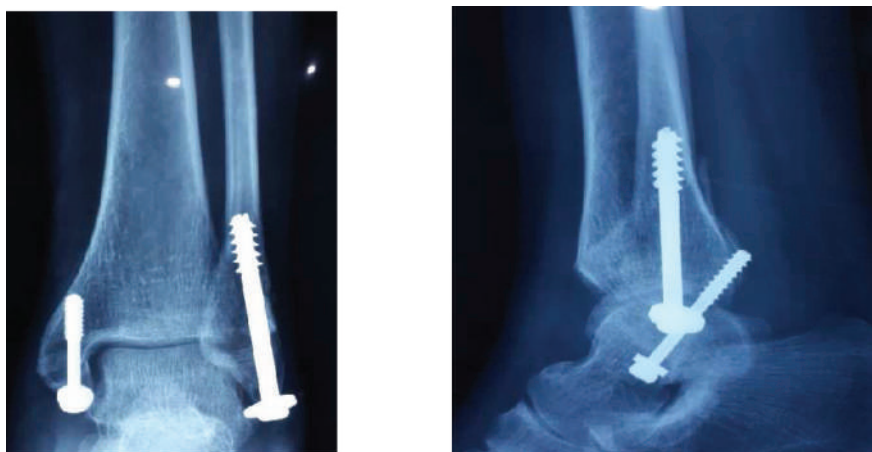


Figure (2): Screw fixation of Pott's fracture of ankle joint.

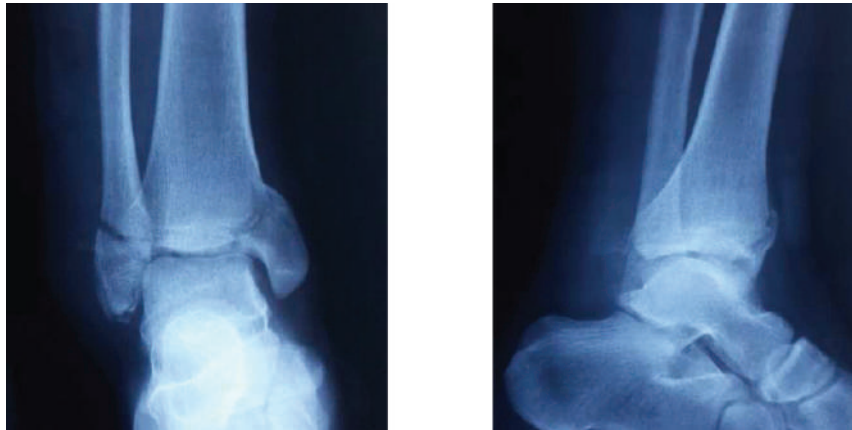


Figure (3): Pott's fracture of ankle joint (anteroposterior and lateral views).

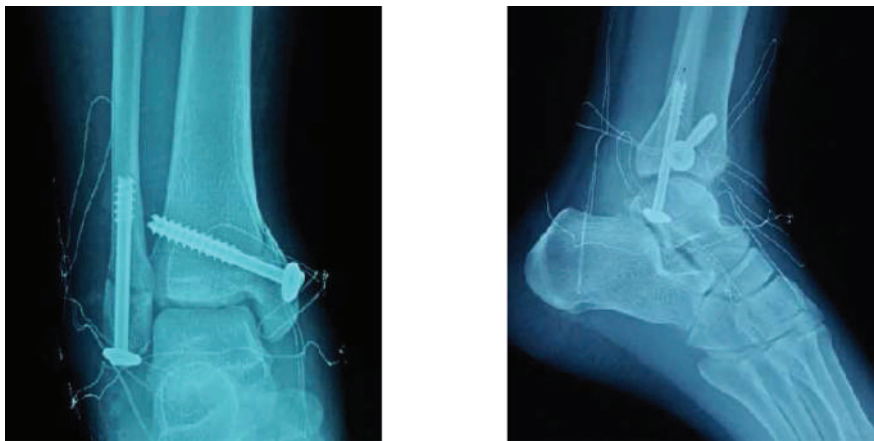


Figure (4): Screw fixation of Pott's fracture (anteroposterior and lateral views).

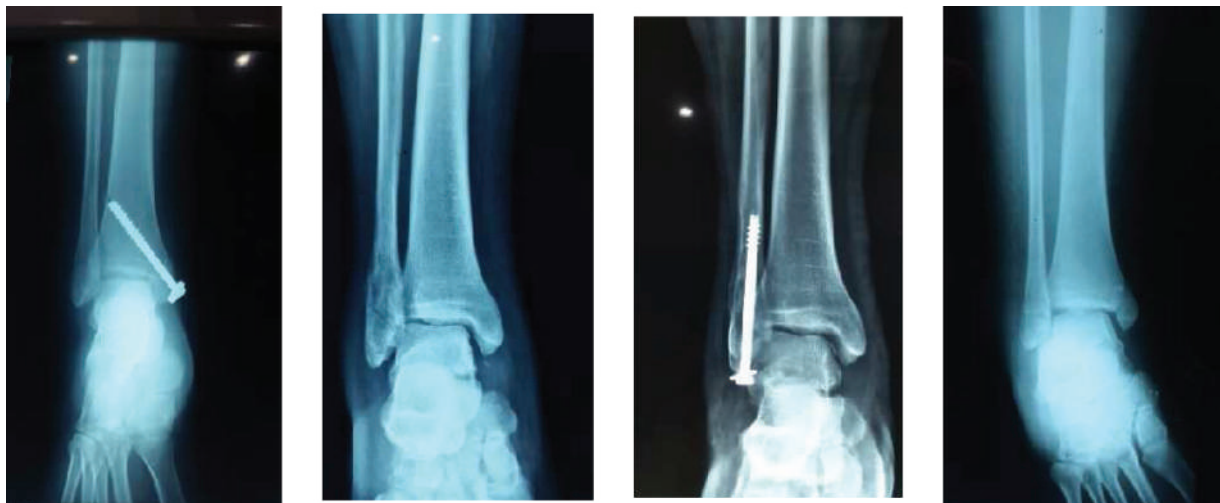


Figure (5): Screw fixation of Pott's fracture of ankle joint (isolated medial and lateral malleolar: anteroposterior view).

Postoperatively, the ports were covered by sterile gauze, cast not applied, immediately post operatively all movements allowed and elevation encouraged to avoid the swelling, full weight bearing allowed after 4 weeks. Follow up Radiographs were regularly obtained 6 weeks and 12 weeks postoperatively to check for union, and as needed after more than 12 weeks. The functional rating scale was used to evaluate the ankle joint function after surgery and it was categorized to excellent (normal range of motion without pain or stiffness and normal return to activity), good (normal range of motion without stiffness and normal return to activity but with occasional pain), fair (low range of motion with occasional pain) and poor (low range of motion with occasional pain and stiffness). This study was approved by the research ethics committee of the college of medicine-Hawler medical university. An informed

verbal consent was obtained from each patient before being enrolled in the study. The statistical analysis was conducted by using Statistical Package for Social Sciences (SPSS) version 23. Multiple contingency tables were performed.

**Results:**

Thirty two patients with Pott's fractures were included in the study with mean age of 43.3±14.6 years; 34.4% of them were in age group ≥50 years. Male patients constituted 53.1% of the patients. The common ankle fracture type was A (68.8%) with V pattern of medial malleolus in 78.1% of patients and T pattern of lateral malleolus in 71.9% of patients. In 19 (59.4%) patients, the fracture was in right side and open fractures were observed among 6 (18.8%) patients. The main mechanism of injury was fall from height (53.1%), followed by direct blow (9.4%), RTA (6.3%) and others (31.2%), Table 1&2.

**Table (1): General characteristics of Pott's fractures patients.**

Variable	No (%)
Age (mean±SD=43.4±14.6 years)	
<30 years	9 (28.1)
30-39 years	4 (12.5)
40-49 years	8 (25.0)
≥50 years	11 (34.4)
Gender	
Male	17 (53.1)
Female	15 (46.9)
Fracture side	
Right	19 (59.4)
Mechanism of injury	
FFH	17 (53.1)
Direct blow	3 (9.4)
RTA	2 (6.3)
Others	10 (31.2)
Open fractures	
Yes	6 (18.8)

**Table (2): Patterns of Pott's fracture patients.**

Variable	No (%)
Fracture type	
A1	22 (68.8)
Fracture pattern of medial malleolus	
V	25 (78.1)
Fracture pattern of lateral malleolus	
T	23 (71.9)

The percutaneous fixation surgery of Pott's fractures were done within 1-3 days in 62.5% of patients with mean duration of 29±8 minutes; in 52.1% of patients, the surgery duration was more than 25 minutes. The

fluoroscopy C-arm shoots were 30±13 shoots; 62.5% of patients received ≤30 shoots. The reduction on fluoroscopy was good in 30 (93.8%) Pott's fractures, Table3.

**Table (3): Surgical characteristics of Pott's fracture patients.**

Variable	No (%)
Surgery performed within	
1-3 days	20 (62.5)
Surgery duration (mean±SD=29±8 minutes)	
>25 minutes	17 (53.1)
Fluoroscopy C-arm shoots (mean±SD=30±13 shoots)	
≤30	20 (62.5)
Reduction on fluoroscopy	
Good	30 (93.8)

Postoperatively, gap at fracture site was detected among 3 (9.4%) patients. The postoperative partial weight bearing mean was 5±1 weeks while full weight bearing mean was 8±1 weeks. All patients started physiotherapy after surgical operation and mean time to return to previous activity postoperatively for studied Pott's fracture patients was 12±2 weeks. The mean duration of Pott's fracture union after surgery was 9±2 weeks. The union rate was 100% with no reported delayed

union. The main postoperative complications were tenderness (hard ware symptom) (9.4%), malunion (9.4%), infection (6.3%) and bursitis (6.3%). The postoperative functional rating scale was excellent in 68.7% of the patients; good in 25% of them and fair in 6.3% of them with no reported poor outcome for patients in this study, Table 4&5.

**Table (4): Early outcome and functional rating scale of percutaneous fixation of Pott's fracture patients.**

Variable	No (%)
Gap at fracture site	
Present	3 (9.4)
Partial weight bearing (mean±SD=5±1 weeks)	
<5 weeks	23 (71.9)
Full weight bearing (mean±SD=8±1 weeks)	
≤8 weeks	24 (75.0)
Time to return to previous activity (mean±SD=12±2 weeks)	
>9 weeks	29 (90.6)
Postoperative physiotherapy	
Yes	32 (100.0)
Union duration (mean±SD=9±2 weeks)	
≥9 weeks	21 (65.6)
Functional rating scale	
Excellent	22 (68.7)
Good	8 (25.0)
Fair	2 (6.3)

**Table (5): Late outcomes of percutaneous fixation of Pott's fracture**

Variable	No (%)
Implant failure	
None	32 (100.0)
Tenderness	
Yes	3 (9.4)
Infection	
Yes	2 (6.3)
Painful bursa	
Yes	2 (6.3)
Malunion	
Yes	3 (9.4)
Nonunion	
None	32 (100.0)
Delayed union	
None	32 (100.0)
Conversion to internal fixation	
None	32 (100.0)

## Discussion

Pott's fractures are common ankle fractures affecting distal end of leg bones treated conservatively and surgically. The surgical outcomes in some displaced ankle fractures are not better than conservative treatment outcomes especially when surgery complicated<sup>10</sup>. High proportion of Pott's fracture patients in present study was elderly. This finding is similar to reports of Singh et al<sup>2</sup> study in UK which stated that Pott's fracture is common among elderly population due to risk osteoporosis, in addition to high rates of postoperative complications. Males with Pott's fracture were more than females in our study. This is consistent with results of Sahu study in India<sup>11</sup> which found high proportion of males were affected by lower third of fibular fractures than females. However, this is inconsistent with findings of many studies that the elderly females were more affected by Pott's fractures attributed to hormonal changes and osteoporosis<sup>12</sup>. This difference is explained as more than half of Pott's fracture cases in our study were caused by fall from height with 18.8% of them as open fractures which clarified the violent causes that are prevalent among male gender. Lash et al<sup>13</sup> documented that fall from height represented the most common mechanism of Pott's fractures. Mean surgery duration of studied fractured patients was 29 minutes with mean fluoroscopy C-arm shoots of 30 shots and most of Pott's fracture patients had good reduction after fluoroscopy. These surgical characteristics are better than findings of Latif et al<sup>14</sup> study in UAE. This difference may be due to variation in surgeon experience and Pott's fracture status. The union duration mean of Pott's fracture after percutaneous fixation in current study was 9 weeks. This rate is better than union duration reported by Mohammed

et al<sup>15</sup> study as 11.8 weeks by tension band wiring and 9.4 weeks by screw fixation. Time to return to physical activity in this study was 12 weeks; partial and full weight bearing times were 5 and 8 weeks, respectively. These findings are within normal range reported by an American literature<sup>9</sup>, although many authors recommended early ankle movement to avoid postoperative thromboembolism<sup>16</sup>. The union rate of Pott's fracture after percutaneous fixation in our study was 100% that is higher than that of Sahu study in India<sup>11</sup> who reported a union rate of 94.2%. The union rate of this study is similar to union rate of intramedullary fixation technique reported by Jain et al<sup>17</sup> in UK. However, intramedullary fixation technique is associated with higher chance of complications like fibular shortening, metal problems and posttraumatic arthritis<sup>18</sup>. The postoperative complications of tenderness, malunion, infection and painful bursa were reported in present study. These complications are lower than complications reported by Latif et al<sup>14</sup> studies in UAE using percutaneous fixation and Motwaniet al<sup>19</sup> study in India using open reduction and internal fixation. Mehta et al<sup>20</sup> stated that percutaneous fixation of ankle fractures had the lowest incidence rate of postoperative complications. This surgical technique is preferred to be used for patients at risk like elderly patients, severe systemic diseases and complicated open fractures<sup>14</sup>. The postoperative functional rating scale in this study was excellent in 68.7%, good in 25% and fair in 6.3% of patients. These findings are higher than results of Latif et al<sup>14</sup> in UAE which showed excellent functional scales of 54.3%.

## Conclusions

Current study showed better outcomes (according to postoperative functional rating scale) of percutaneous fixation of Pott's fractures in comparison to other literatures using the same and other surgical techniques regarding union rate, functional rating scale and postoperative complications.

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