

# Percutaneous Fixation of 5<sup>th</sup> Metatarsal Fracture by 4.5mm Cannulated Steel Screw - A Single Institution Experience

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## ABSTRACT

**Aim:** To assess the efficacy of 4.5mm cannulated screw fixation in achieving union in fracture of base of 5<sup>th</sup> meta tarsal bone of foot

**Methods:** This descriptive case series study was carried out in the Department of Orthopedic, Ch. Rehmat Ali Memorial Hospital Lahore from 1<sup>st</sup> January 2013 to 31<sup>st</sup> December 2014. One hundred and sixty three patients of either sex with radiological diagnosis of proximal fracture of 5<sup>th</sup> Metatarsal were treated with percutaneous cannulated screw fixation. Radiological union was assessed at 12<sup>th</sup> week.

**Results:** There were 103(63.2%) were males and 60(36.8%) were females with mean age of 41.8±13 years. One hundred and forty seven patients (90.2%) achieved radiological union at 12<sup>th</sup> weeks, 16 patients (9.8%) were unable to achieve. Gender, age distribution and time taken for partial and full weight bearing were similar in both groups with and without radiological union.

**Conclusion:** It is concluded that radiological union is quite good (90%) in patients of proximal 5<sup>th</sup> metatarsal fracture being treated with percutaneous cannulated screw.

**Keywords:** Proximal fracture of 5<sup>th</sup> metatarsal, percutaneous cannulated screw fixation,

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## INTRODUCTION

Proximal fifth metatarsal fractures occur commonly in athletes<sup>1</sup>. These fractures, first described by Jones in 1902, occur within 1.5 cm of the metatarsal tuberosity and extend towards or into the intermetatarsal joint.<sup>2-6</sup> Fractures in this area generally result from an acute injury. Although treatment options include both conservative treatment and surgery, the latter is often recommended due to the long treatment period in cast and high incidence of complications associated with conservative treatment like skin problems, muscle wasting, joint stiffness, regional osteoporosis, chances of displacement in cast and high rate of nonunion<sup>7,8,9</sup>. There is no consensus regarding the optimal surgical procedure<sup>4,5,10-14</sup>.

Different treatment options used are conservative method with cast application, percutaneous fixation with cannulated screw either made up of steel or titanium, open fixation with malleolar screw with or without bone grafting<sup>12,13</sup>. In a study to determine union rate after fixation with either cannulated titanium screws or cannulated stainless steel screws of patients with Fifth Metatarsal Fractures, the overall union rate came out 14/16 (88%) at 12 weeks<sup>6</sup>.

Usually we prefer conservative management in our setting due to cost effectiveness and feasibility.

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The available data for percutaneous fixation with 4.5mm cannulated screw is for younger athletes and for those who require early recovery only and bone union is not studied in older population. Our population differs regarding bone mass density and nutritional status which are strong predictors of early healing<sup>7,6,11,14</sup>.

As this procedure has not been studied in our population so the current study may help us determine the efficacy of percutaneous fixation with cannulated screw. Conservative treatment modalities being used for treatment of base of fifth metatarsal fractures in our hospitals but no local data is available about the functional outcome of either option. Percutaneous fixation with 4.5mm cannulated screw is a cost effective technique but at same time there is indecisiveness regarding conservative management or fixation. The outcome of union rate may help end this confusion and may help in decision making in treatment of fifth metatarsal fractures.

## PATIENTS AND METHODS

This descriptive case series was carried out to determine bone union after percutaneous fixation of proximal 5<sup>th</sup> metatarsal fracture by 4.5mm cannulated steel screw. Using consecutive sampling, all patients of either sex with age ranging from 16 to 60 years with isolated closed fracture of Fifth Metatarsal Fractures presenting within 72 hours of fracture were included. The fracture was defined as disruption of continuity of base and shaft of fifth metatarsal and determined by plain x-ray foot. Patients having previous surgery or intervention for

proximal 5th metatarsal fracture or evidence of infected wound by clinical examination or advanced osteoporosis as diagnosed by x ray, multiple fractures of other bones of same foot as diagnosed by x-ray or any history of connective tissue disorders e.g. rheumatoid arthritis and SLE were excluded. Power calculation was done. The calculated sample size came out 163 cases, with 5% margin of error and 95% confidence level taking expected percentage of radiographic union (88%).

Our outcome measure was bone union which was defined as radiological evidence of fracture union by X-ray at 12<sup>th</sup> week after opinion of consultant radiologist. After an informed consent from 163 subjects coming to Orthopaedics Department, Ch. Rehmat Ali Memorial Hospital, Lahore, fulfilling the inclusion criteria were taken from outdoor and emergency department within 72 hours of fracture. Questionnaire containing background information i.e. age, sex, date of operation and contact was used as research instrument and data was recorded by researcher himself. A uniform protocol of surgery was adopted and patients were followed for 12<sup>th</sup> week to determine the radiological union by X-ray foot. Time of partial and full weight bearing (in weeks) and mode of presentation i.e., emergency and outdoor was treated as effect modifier and data was stratified subsequently.

Data collected was entered and analyzed in the SPSS version 17. Results were projected using descriptive statistics e.g., mean with standard deviation in case of continuous variables like age and percentages and frequency in case of categorical variables like gender, and union of fracture. Time of partial and full weight bearing was used to stratify data in groups. Chi square test or Fischer exact test was used for categorical variables post stratification while independent sample t test was used for mean age and mean time for partial and full weight bearing. A p value ≤0.05 was labelled significant.

**RESULTS**

One hundred and sixty three patients with fracture of 5<sup>th</sup> metatarsals were included in the study. One hundred and three (63.2%) were male while rest were female. One hundred and thirty five patients (82.8%) presented through emergency while 28(17.2%) presented through outdoor. One hundred and forty seven patients while treated with 4.5mm cannulated screw achieved radiological union at 12 weeks (90.2%) while 16 patients (9.8%) were unable to achieve. Mean age of the sampled population was the 41.8±13 ranging from 18 to 60 years. Mean time for partial weight bearing was 6.5±1.7 weeks ranging from 4 to 10 weeks while mean time to achieve full

weight bearing was 10.2±2.8 weeks ranging from 6 to 14.

When we cross tabulated the radiological union with gender there was a non-significant difference. Similarly, opposite to this the mode of presentation was significant factor determining the radiological union of the sampled population as patients presenting through emergency has a better radiological union (P<0.01). When we applied independent sampled population T test on mean distribution of age in the sampled population with and without union we found a non-significant difference. Similarly, mean time for partial weight bearing was equal in patients with and without union. Mean time distribution for full weight bearing in both groups was almost equal when we applied independent T test P value came out were non-significant (p value= 0.91).

Table 1: Descriptive statistics of patients (n = 163)

Variable	n	%age
<b>Gender</b>		
Male	103	63.2
Female	-	36.8
<b>Presentation</b>		
Emergency	135	82.8
Outdoor	28	17.2
Weight bearing (weeks)	6.54±1.664	
Age (years)	41.79±13.00	

Table 2: Cross-tabulation between different factors and outcome

Variable	Bone union		P value
	Yes	No	
Mean age (yrs)	41.2±12.8	47.1±13.7	0.83*
<b>Gender</b>			
Male	91	12	0.416**
Female	56	4	
<b>Presentation</b>			
Emergency	133	2	<0.001*
Outdoor	14	14	
Partial weight bearing	6.53±1.681	6.63±1.54	0.08*

\*Assuming equal variances, using independent sample t test  
 \*\*Using Fisher's Exact Test

**DISCUSSION**

Radiological union achieved in 90% individuals which is quite good and it is comparable with DeVries et al<sup>6</sup> who showed 88% union. Sixteen persons i.e. almost 10% sampled population was unable to achieved radiological union factor may be multiple.<sup>13</sup> In our sampled population almost 2/3<sup>rd</sup> were male while rest were female showing a more physical activity in male counterpart as compare to female counter part and decreased in stress fracture of proximal 5<sup>th</sup> metatarsal. This also determines the health seeking behaviour in our community in which male are more

prone to the fracture although this fracture is usually not due to sports activity only.

Similarly, to our surprise, the patients presenting in the emergency i.e. acutely with early treatment were more almost 82%. It shows that the health determinants and health seeking behaviour is changing in our population more people complaints to the emergency of a tertiary care hospital. In our sampled population mean age was about 40 years but ranging from 18 to 40 years. It means there are early chances of stress fractures in 5<sup>th</sup> metatarsal bone. Partial weight bearing is quite good almost most of the patients achieved partial weight bearing within 10 weeks and full weight bearing in 14 weeks. To our surprised gender did not affect the radiological union i.e. the radiological union was similar between male and female although it is purposed that it vitamin D deficiency and poor bone marks density is present in our female population due to local customs and decrease in calcium intake but to our surprise it was equal in both but as the patients early in the emergency treated early as compare to patient presenting to outdoor within 72 hours of fractures we got a significant difference.

## CONCLUSION

It is concluded that radiological union is quite good (90%) in patients of proximal 5<sup>th</sup> metatarsal fracture being treated with 4.5mm percutaneous cannulated screw. We hereby recommend its use in all types of proximal 5<sup>th</sup> meta-tarsal fracture and it should be performed as early as possible. Limitation of current study is that we have not assessed the nutritional status and mode of injury in our population.

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