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Screw Fixation versus Casting in the Treatment of Acute Jones Fracture

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Abstract

Background: Approximately 3- 10% of all metatarsal fractures are Jones fractures, defined as fractures at the base of the fifth metatarsal at the meta-diaphyseal junction.

Aim and objectives: To evaluate and assess the outcomes and results of percutaneous Screw Fixation against Casting in the Treatment of acute Jones Fracture.

Patients and methods: This was comparative research among conservative & percutaneous screw fixation in the management of acute Jones fracture type II conducted on 20 patients presenting to Elhussein Hospital and Elmounira General Hospital from September 2020 to March 2021. Patients were categorized into two groups.

Results: No significant variance was found among groups concerning comorbidities p over 0.05. no significant variance was found among groups regarding the Fracture Side (p equals 0.639). Union time was significantly less in the operative group than in the cast group p equals 0.006. AOFAS score was significantly greater in the operative group than the cast group at 1-, 2-, and 3-months $P=$ (0.026, 0.025, 0.005), respectively. There was no significant variance among the groups concerning Following surgery complications (Wound infection, Nonunion, and Sudeck's atrophy) $p =$ (0.307, 0.060, 0.307) respectively.

Conclusion: The union time was significantly lower in the operative group compared to the cast group. The AOFAS score was significantly higher in the operative group than in the cast group at 1, 2, and 3 months. So, we can conclude that Screw Fixation has efficient and better outcomes than Casting in the Treatment of acute Jones fracture.

Keywords: Screw Fixation; Casting; Acute Jones Fracture

1. Introduction

Fractures involving the meta-diaphyseal junction, known as Jones fractures, affect around three to ten percent of all metatarsal fractures. There is a high prevalence of fractures close to and further away from this, with the most common type of fracture being a proximal tuberosity fracture.¹

Often mistakenly called "pseudo-Jones" fractures, these are avulsion-type breaks in the peroneus brevis attachment. Stress fractures, on the other hand, tend to happen farther away from the diaphysis and are extremely rare, accounting for only approximately one percent of all metatarsal fractures in a substantial series.²

A Jones fracture is a fracture that occurs at the junction between the metaphysis and diaphysis of the 5th metatarsal. This fracture primarily affects the lateral part of the foot. Common signs involve pain, swelling, discoloration, and difficulty in walking

normally. Inflammation can lead to restricted ankle movement and increased pain in the lower part of the ankle, which can also radiate up the lower leg.³

Until radiographs reveal healing and the fracture site is no longer painful to touch, nonoperative therapy necessitates extended non-weight bearing, starting at least six to eight weeks. Union often occurs between fifteen and nineteen weeks during the process. Furthermore, compared to operative management, nonoperative management had a higher risk of refracture and nonunion rates nearing 30%. However, with operational management, you may return to sports sooner and with less danger of refracture, and the union rate is approximately 96 percent. On average, this occurs between 6 and 8 weeks after surgery.^{4,5}

The goal of the present research was to assess and assess the outcomes and results of percutaneous Screw Fixation against Casting in the Treatment of acute Jones Fracture.

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2. Patients and methods

This was comparative research among conservative & percutaneous screw fixation in the treatment of acute Jones fracture type II conducted on 20 patients presenting to Elhussein Hospital and Elmounira General Hospital in the period from September 2020 to March 2021. cases were split into two groups: group 1: 10 cases undergo operative technique, and group 2:10 cases undergo operative technique.

Target population and criteria for inclusion

Patients: For ten patients, the recommended treatment was a below-the-knee cast, while for ten more, percutaneous fixation with a cannulated 4.0 mm screw was recommended. The average time from injury to hospital admission was two days, although it may be anywhere from 1 to 4 days. There was a range of 4–8 months of follow-up, with an average of 6 months. Just one patient out of twenty experienced any injury. An ipsilateral Pott's fracture ankle was observed in one case.

Inclusion criteria: Age group: 15 – 60 years. Fracture type: Jones fracture type II. Sex: man & woman. Closed fractures.

Exclusion criteria: Jones fracture type I & III. Age < 15, > 60 years. Open fractures. Pathological fracture. Diabetic patients.

Methods

All cases involved in the research were subjected to the following:

Detailed history taking containing: The case provided information regarding their clinical history, including name, gender, age, occupation, address, and smoking behaviors. Comorbid conditions such as hypertension, diabetes, and cardiovascular disease. The patients were queried regarding the mechanism of injury and the presence of any concomitant injuries.

Careful clinical examination: General: Blood pressure, pulse, cardiovascular, neurological, respiration assessment. Local: Inspection: for deformity, edema, skin condition, wounds. Palpation: for tenderness. Range of motion. Neuro-vascular examination includes an examination of the dorsal pedal artery, posterior tibial artery, common peroneal nerve, and posterior tibial nerve.

Radiological evaluation: Each individual was assessed using standard X-rays, which showed lateral, oblique, and AP perspectives of the foot. Anastomosis of the tibia. Imaging prior to surgery was utilized to plan surgery and classify the individual's fractures.

Classification of the fracture: We used Dameron⁶, Lawrence & Botte⁷, and Quill⁸ classification: Tuberosity avulsion fracture in zone I. Fracture at the metaphyseal/diaphyseal junction. Proximal diaphyseal stress fractures in zone III.

Cast group

A cast was placed below the knee, and the patient was told not to put any weight on the injured area for the first six to eight weeks. After six to eight weeks, the cast was taken off, and X-rays were retaken to monitor the healing of the fracture. The patient was also instructed to use crutches to lift light objects as they felt comfortable. X-rays were done after another 3 to 4 weeks to follow the union. The American Orthopaedic Foot & Ankle Society (AOFAS) questionnaire was routinely done to assess an individual's pain and functional results.

The operative group

Consent: Standard consent was taken from the cases.

Implants: The length of the screw, which might be 45 to 60 mm, was determined by measuring the diameter of the cannula and then percutaneously implanted under the image intensifier in a direction perpendicular to the fracture line.

Surgical method

Anesthesia: Both spinal and general anesthesia were used

Position: The case was supine atop the image intensifier, with the afflicted foot on top. Thanks to this setup, we could easily access the base of the fifth metatarsal bone and acquire anteroposterior, lateral, and oblique images of the foot. Nobody used a tourniquet. I made a stab incision around half a centimeter to one centimeter from the base of the fifth metatarsal bone. Following the incision, a screw guide pin with a diameter of 4.0 mm was image-guided into the gap between the plantar fascia & peroneus brevis tendon. Following the insertion of the guiding pin, its placement was verified using an image intensifier. Multiple pictures, including AP, LAT, and oblique views, were captured to confirm that the pin was within the fifth metatarsal's intramedullary canal. A cannulated drill was utilized to access the 5th metatarsal's intramedullary canal. To make sure the screw was placed intramedullary, an image-guided procedure was used to insert a partly threaded, 4.0 mm cannulated screw over the guide pin. Regardless of the total length of the screw, every 4.0 mm screw had threads that were 16 mm wide. Following the insertion of the intramedullary screw, the guiding pin was removed. The intramedullary location and distal positioning of all threads relative to the fracture site were carefully ensured. A single stitch closes the wound.

Postoperative care

Postoperative discomfort, function, shoe needs, walking distance, aberrant gait, and alignment were all monitored in our follow-up with all patients. Overnight hospitalization was necessary, and the patient will receive prophylactic parenteral antibiotics for the first day following surgery. After the first two weeks of wearing an ankle brace,

patients were told to increase their weight bearing with crutches until week four gradually. After that, If the fracture has not been moved on radiographs after four weeks, the patient can begin carrying their entire weight without assistance. We extend the waiting period to two weeks before complete weight-bearing if we see any loosening over the screw or worsening of the fracture space. The patient was free to run and participate in contact sports after 12 weeks. The American Orthopedic Foot & Ankle Society (AOFAS) tracks progress after an injury as a clinical grading system.

Ethical consideration

All participants gave their informed permission after being briefed on the study's purpose, methodology, and any relevant objectives. The research methods had no negative side effects on either the participants or the service itself. The lead investigators securely stored all personal information. The investigators provided all expenses, so there was no additional cost for the participants.

Data Management & Statistical Analysis

Data submission, processing, and statistical analysis were conducted utilizing Statistical Package for the Social Sciences (SPSS) version 20. Significant tests were utilized, including Spearman's correlation, Kruskal-Wallis, Wilcoxon's, and Chi-square; logistic regression analysis was also employed. The data were presented and analyzed by the type of data obtained for each variable (parametric or non-parametric). P-values below 0.05 (5 percent) were deemed to indicate statistical significance. The P-value denotes the level of significance: non-significant (NS) by P above 0.05; significant (S) by P below 0.05; and highly significant (HS) by P below 0.01.

3. Results

There was no significant variance found among the groups concerning demographic data Age (p =.546), Gender (p= .531), BMI (.798). (Table 1)

Table 1. Demographic characteristics amongst the examined groups.

	CAST (N=10)	OPERATIVE (N=10)	T /χ ²	P
AGE (YEARS) MEAN ± SD	36.50 ± 9.45	34.17 ± 7.35	.615	.546
GENDER	Female	1 (10%)	.392	.531
	Male	8 (80%)		
BMI (KG/M ²) MEAN ± SD	26.12 ± 3.57	25.74 ± 2.96	.259	.798
SIDE	Right	6 (60%)	.219	.639
	Left	4 (40%)		

There was no significant variance noticed among the groups concerning comorbidities p above 0.05. (Table 2)

Table 2. Comorbidities distribution between examined groups.

	CAST (N=10)	OPERATIVE (N=10)	X ²	P
SMOKING	4 (40%)	3 (30%)	.219	.639
DIABETES MELLITUS	1 (10%)	2 (20%)	.392	.531
HYPERTENSION	2 (10%)	1 (10%)	.392	.531

Union time was significantly lower in operative group in contrast to cast group p equals 0.006. There was no significant variance among the groups concerning after surgery complications (Wound infection, Nonunion and Sudeck's atrophy) p = (0.307, 0.060, 0.307) respectively. (Table 3)

Table 3. Union time and complications amongst examined groups.

	CAST (N=10)	OPERATIVE (N=10)	T	P
UNION TIME (WEEKS) MEAN ± SD	11.41 ± 3.49	7.35 ± 2.11	3.15	.006
WOUND INFECTION	0	1 (10%)	1.1	.307
NONUNION	3 (30%)	0	3.53	.060
SUDECK'S ATROPHY	1 (10%)	0	1.1	.307

AOFAS score was significantly greater in operative group in contrast to cast group at 1-, 2-, and 3-months P= (0.026, 0.025, 0.005) respectively. (Table 4)

Table 4. Clinical evaluation amongst examined groups.

	CAST (N=10)	OPERATIVE (N=10)	T	P
AOFAS SCORE				
1 MONTH MEAN ± SD	52.31 ± 7.94	61.24 ± 8.57	2.42	.026
2 MONTHS MEAN ± SD	78.91 ± 9.43	88.26 ± 7.52	2.45	.025
3 MONTHS MEAN ± SD	89.73 ± 6.39	94.87 ± 4.82	3.22	.005

CASE PRESENTATION

Case one: A twenty-six-year-old male sustained a fracture of 5th metatarsal in zone II; the traumatic event was a motorcycle motor accident, & the injury was accompanied by an ankle sprain. The operation was performed on the third day. 3 weeks post operative patient showed incomplete union in zone II .8 weeks post operative patient showed complete healing.



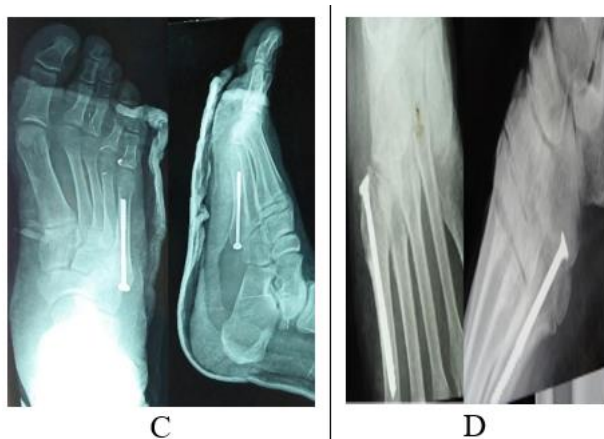


Figure 1. Shows Case one A) AP view of the case prior to operation in zone II, B) LAT. view of the case prior to operation in zone II, C) AP & LAT views of the case 3 weeks after surgery showing incomplete union in zone II, D) AP & LAT views Rt foot 8 weeks showing complete union of the case after healing.

Case two: forty years old man case had fracture LT. 5th metatarsal in zone II, the mode of trauma was direct trauma by heavy objects. He was treated conservatively in the cast. After 4 weeks, patient showed incomplete union. After 12 weeks, patient showed complete union.

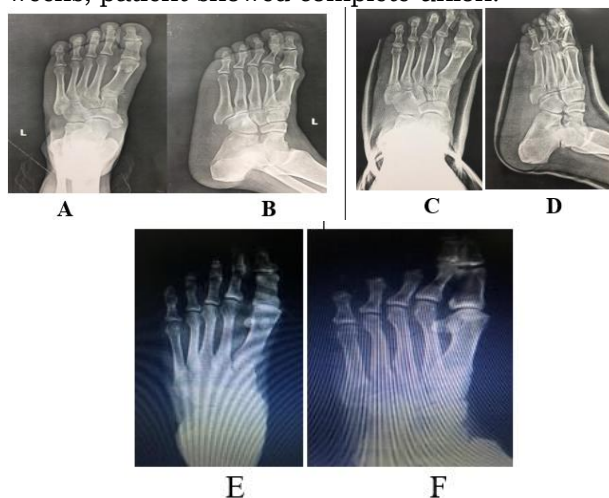


Figure 2. Shows Case two: A) AP & (B) Oblique views of the case showing zone II injury, C) AP & (D) Oblique views of the case 4 weeks after showing incomplete union, E) AP & (F) Oblique views of the case after 12 weeks, showing complete union.

4. Discussion

Jones fractures are transverse fractures that occur within 1.5 cm of the tuberosity and affect the fifth metatarsal base.⁹

The primary findings of our research were as follows:

Our results revealed that the average age of the cases in the cast group was 36.50 ± 9.45 years, 8 cases (80%) were men, and 2 (20%) patients

were females with an average BMI of 26.12 kg/m². Meanwhile, the average age of the cases in the operative group was 34.17 ± 7.35 years; 9 cases (90%) were men, and 1 (10%) was female with a mean BMI of 25.74 kg/m². No significant variance was observed among the groups concerning demographic data.

Our outcomes are consistent with Areas et al., who aimed to give an account of a return to play in national football league players after operative Jones fracture treatment, showed that the mean age for all cases was twenty-four years with a variety of twenty to thirty-one years and mean BMI was 31.0 with variety 25.8-38.8, there was no statistically significant variance among studied demographic data.¹⁰

Our results showed that, regarding the cast group, 1 patient (10%) was diabetic, 4 patients (40%) were smokers, and 2 patients were hypertensive. Regarding the operating group, 2 patients (20%) were diabetic, and 3 patients (30%) were smokers. These results showed that there were no significant variances amongst the EWB and DWB groups regarding smoking status.

Our result showed that seven patients (70%) had fractures on the right side and three patients (30%) on the left side in the cast group. Meanwhile, six patients (60%) had fractures on the right side and four patients (40%) on the left side among the operative group. No significant variance was found among the examined groups.

Additionally, Porter et al. showed that 14 left and 10 right feet were included.

Our result showed that union time was significantly less in the operative group than in the cast group.^{11,12}

Our result supported Mologne et al. that showed that the median time to clinical union in the cast group was 11.0 weeks with variety 8.0-17.0 weeks, and in the surgical group, the median time to clinical union was 7.5 weeks.¹³

Similarly, Rouche et al., aimed to evaluate management & return to sport following a Jones fracture of the fifth metatarsal and showed that the median time to clinical union was 7.5 for screws & 14.5 for casts.¹⁴

Our results showed that the AOFAS score was significantly higher in the operative group than in the cast group at 1, 2, and 3 months.

Also, Hunt et al. showed that by the four-month follow-up, the union rate in their series had reached 100%. Refracture occurred in only one patient (4 percent).¹⁵

Further, Reese et al. showed that the average score on the AOFAS midfoot scale was 94. The AOFAS midfoot scale comprises three parameters: pain, function, and alignment. The average pain rating for the injuries examined in their research was 36 out of 40. During the interviews, two-thirds of the patients reported not having any

pain at the time of the assessment, while the remaining one-third described mild aching pain that did not impede their performance. This pain level did not indicate non-union or malunion, as all the patients had radiographs indicating that the fracture site had healed.¹⁶

Our result showed that three patients (30%) showed non-union in the cast group, and one patient (10%) suffered from sundeck atrophy. Regarding the operative group, one patient (10%) suffered from wound infection, and no patients showed non-union; no significant variance was noticed among the groups.

Our result was supported by Mologne et al., who showed that five patients (28%) in the cast group developed nonunions. One patient (5.3%) had treatment failure in the surgical group. He developed a non-union.¹³ Also, Lareau et al. showed that they did not observe any non-union or other complications.¹⁰

Limitations: The present study was limited by its small sample size and short follow-up period, but we believe that it is significant because consistent findings were observed in all cases.

4. Conclusion

The union time was significantly lower in the operative group compared to the cast group. The AOFAS score was significantly higher in the operative group compared to the cast group at 1, 2, and 3 months. So, we can conclude that Screw Fixation has efficient and better outcomes than Casting in the Treatment of acute Jones fracture.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

References

1. CANATA, Gian Luigi. Sports injuries of the foot and ankle. Sports injuries of the foot and ankle: a focus on advanced surgical techniques, 2019. doi.org/10.1007/978-3-662-58704-1
2. Moser A, Kuchemüller KB, Deppe S, et al. Model-assisted DoE software: optimization of growth and biocatalysis in *Saccharomyces cerevisiae* bioprocesses. *Bioprocess Biosyst Eng.* 2021;44(4):683-700
3. Lareau CR, Anderson RB. Jones Fractures: Pathophysiology and Treatment. *JBJS Rev.* 2015;3(7):e4
4. Williamson M, Iliopoulos E, Jain A, Ebied W, Trompeter A. Immediate weight bearing after plate fixation of fractures of the tibial plateau. *Injury.* 2018;49(10):1886-1890
5. Baertl S, Alt V, Rupp M. Surgical enhancement of fracture healing - operative vs. nonoperative treatment. *Injury.* 2021;52 Suppl 2:S12-S17
6. Carreira DS, Sandilands SM. Radiographic factors and effect of fifth metatarsal Jones and diaphyseal stress fractures on participation in the NFL. *Foot Ankle Int.* 2013;34(4):518-522
7. DeVries JG, Taefi E, Bussewitz BW, Hyer CF, Lee TH. The fifth metatarsal base: anatomic evaluation regarding fracture mechanism and treatment algorithms. *J Foot Ankle Surg.* 2015;54(1):94-98
8. Gu YD, Ren XJ, Li JS, Lake MJ, Zhang QY, Zeng YJ. Computer simulation of stress distribution in the metatarsals at different inversion landing angles using the finite element method. *Int Orthop.* 2010;34(5):669-676
9. AL-ASHHAB, Mohamed; FARAG, Hossam. Kienböck's Diseases Treatment. A Novel Technique via Distal Capitate Shortening Accompanied by 3rd Metacarpal Base Fusion in Neutral Variance Ulna. *Benha Medical Journal, 2021; 38.special issue (Orthopedic Surgery): 22-33.* doi: 10.21608/bmfj.2021.46843.1329
10. Lareau CR, Hsu AR, Anderson RB. Return to Play in National Football League Players After Operative Jones Fracture Treatment. *Foot Ankle Int.* 2016;37(1):8-16
11. Porter DA, Duncan M, Meyer SJ. Fifth metatarsal Jones fracture fixation with a 4.5-mm cannulated stainless steel screw in the competitive and recreational athlete: a clinical and radiographic evaluation. *Am J Sports Med.* 2005;33(5):726-733
12. Nagao M, Saita Y, Kameda S, et al. Headless compression screw fixation of Jones fractures: an outcomes study in Japanese athletes. *Am J Sports Med.* 2012;40(11):2578-2582
13. Mologne TS, Lundeen JM, Clapper MF, O'Brien TJ. Early screw fixation versus casting in the treatment of acute Jones fractures. *Am J Sports Med.* 2005;33(7):970-975
14. Roche AJ, Calder JD. Treatment and return to sport following a Jones fracture of the fifth metatarsal: a systematic review. *Knee Surg Sports Traumatol Arthrosc.* 2013;21(6):1307-1315
15. HUNT, Kenneth J.; ANDERSON, Robert B. Fifth metatarsal fractures and refractures. *Operative Techniques in Sports Medicine, 2014; 22.4: 305-312.*
16. Reese K, Litsky A, Kaeding C, Pedroza A, Shah N. Cannulated screw fixation of Jones fractures: a clinical and biomechanical study. *Am J Sports Med.* 2004;32(7):1736-1742