

Outcome of Early Weight Bearing Cast for the Treatment of Jones Fracture

Faaiz Ali Shah, Mian Amjad Ali, Naeemullah Dawar, Mian Javed Iqbal

ABSTRACT

Objective: To determine the radiological and functional outcome of acute Jones fracture treated conservatively in early weight bearing cast.

Study Design and Setting: This study was conducted in Orthopaedic Division Lady Reading Hospital Peshawar. The duration of study extended from 25th August 2018 to 13th November 2022.

Methodology: All patients of both gender and age 18 years and above with isolated Jones fracture fulfilling the inclusion criteria were treated in below knee early weight bearing cast. Radiological union was assessed by noting callus and obliteration of fracture line. The functional outcome was determined using American Orthopaedic Foot and Ankle Score(AOFAS) after cast removal.

Results: This study included a total of 319 patients of Jones fractures who were treated in early weight bearing cast, the mean age was 34.41±4.29 years. Female patients were 245(76.80%) while male were 74(23.19%). Right foot was involved in 211(66.14%) patients and left in 108(33.85%). The average union time was 6.2±1.2 weeks. Majority(99.0%,n=316) of our patients achieved union. Non union was reported in only 3(0.94%) patients. Excellent functional outcome was documented in our patients as indicated by mean AOFAS score 99.1±1.1. Comparison of AOFAS score for gender, side and type of fracture did not reveal any significant difference.(p>0.05)

Conclusion: Early weight bearing cast is an effective modality of conservatively treating acute Jones fractures as shown by higher union rate and excellent functional outcome in majority of our patients

Keywords: Bone, Bony Callus, Conservative Treatment, Fracture Healing, Metatarsal, Surgical Casts, Weight-Bearing

How to cite this Article:

Shah FA, Ali MA, Dawar N, Iqbal MJ. Outcome of Early Weight Bearing Cast for the Treatment of Jones Fracture. J Bahria Uni Med Dental Coll. 2023;13(3):176-80 DOI: <https://doi.org/10.51985/JBUMDC2022153>

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INTRODUCTION:

Fractures of the base of fifth metatarsal of the foot at metaphyseal diaphyseal junction and 0.75 inches from the base of fifth metatarsal is called “ Jones” fracture, first reported by Sir Robert Jones in 1902 in four patients.¹ Lawrence² denoted Jones fractures as distinct zone II fractures of the metaphyseal diaphyseal junction of the fifth metatarsal extending to the fourth and fifth inter metatarsal articulation but distal to cuboid and base of fifth

metatarsal articulation. Lawrence was of the opinion that stress fracture of the 5th metatarsal diaphysis should not be confused with Jones fracture and treatment should be individualized. These fractures are transverse or oblique fractures sustained due to forceful foot abduction with ankle in plantar flexed position.³ Jones fractures have less healing potential and greater risk of delayed union and non union because of presence of vascular watershed area between the metaphyseal blood supply proximally and diaphyseal blood supply of the nutrient artery distally.⁴ Fractures of the base of 5th metatarsal accounts for about 30% of all metatarsal fractures and the estimated prevalence of Jones fracture is 26.3%.⁵ Although fractures of the fifth metatarsal fractures are one of the commonest fractures of the foot, the term Jones fractures have been used inconsistently in the literature and no consensus has been achieved yet regarding the exact terminology or uniform nomenclature, classification and optimum treatment of Jones fractures.⁶ Lack of uniform and agreed terminology has resulted in reporting of different results for the same fracture.⁵ Various treatment options exist for Jones fractures but location of the fracture, anatomy and general health of the patient are the most important factors in decision making.⁷ Undisplaced or minimally displaced Jones fractures can be treated with non operative treatment modalities like non weight bearing cast, posterior splint,

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Received: 24 Nov 2022
Accepted: 19 Jun 2023

elastic bandage, below knee walking cast, hard sole shoe and cam walker-boot.⁸ Prolonged non weight bearing cast for Jones fractures has adverse effects and poor functional outcome while operative treatment has variable risks.⁹ Nerve damage, infection, tendon rupture, impingement by hardware, delayed union and non union has been reported with surgical fixation of Jones fracture.⁷ Although no definite principles exist for the type and duration of weight bearing cast,¹⁰ studies have documented fracture union rate of 82.4% in patients treated with non weight bearing cast in contrast to union rate of 96% to 100% in patients treated with early weight bearing cast.^{9,10} Furthermore conservatively treated Jones fractures had prompt and full functional recovery with comparable American Orthopaedic Foot and Ankle Score(AOFAS) than surgically treated Jones fractures.⁵

Keeping in mind the reported issues of traditional treatment of Jones fractures conservatively with prolonged non weight bearing we conducted this study by applying below knee plaster cast to acute Jones fractures and permitted the patients to early weight bearing as tolerated. The purpose of our study was to determine the radiological and functional outcome of this treatment protocol. Our hypothesis was that early weight bearing cast for Jones fracture would result in excellent radiological and functional outcome and less complication rates. This will be the first study on this topic from our institution and from Pakistan. We believed that our study will help to overcome the controversy and misconception of treating Jones fractures conservatively with early weight bearing cast.

METHODOLOGY:

This cross sectional study was conducted in Orthopaedic Division Lady Reading Hospital Peshawar. The duration of study extended from 25th August 2018 to 13th November 2022. Patients of both gender and age 18 years and above with isolated undisplaced or minimally displaced(<2mm) closed Jones fracture(fracture in Zone II)² presenting within seven days to Out Patient Department (OPD) and Accident and Emergency Department(A&E) were included in this study. All patients of Jones fracture non union, delayed union, surgically treated Jones fractures and Jones fractures associated with poly trauma requiring intervention or admission for other injuries were excluded. This research study was approved by Institutional Review Board(IRB) Lady Reading Hospital Peshawar (Ref: No. 528/LRH/MTI). Informed written consent was taken from all the study participants for treatment and publication of results. Our study sample size was 298 calculated with the help of Naing and Winn formula.¹¹ Adding the possible drop out or lost to follow up in our study (10%,n=30) the total sample size was adjusted to 328. In the included subjects complete history, physical examination and radiographs(AP, Lateral and 30 degrees internal oblique) were taken. Below knee, plaster of paris cast(Gypsona BSN®) reinforced with Dynacast Plaster(BSN®) was applied and the patient was

instructed to start weight bearing as tolerated. The follow up visits were scheduled every fortnightly till 12th weeks initially and then monthly for six months. In each visit radiographs were used for radiological union by noting callus and obliteration of fracture line. The clinical union was assessed by patient ability to bear weight without any pain or discomfort. The functional outcome was determined using American Orthopaedic Foot and Ankle Score(AOFAS) after plaster cast removal when radiological and clinical union of the fracture was ensured.¹² The American Orthopaedic Foot and Ankle Score(AOFAS) is a 100 point scoring system consisting of nine questions in three categories for assessing pain(40 points),functions(50 points) and alignment(10 points).The higher score(range 0 to 100) indicates better functional outcome.

The data was analyzed with SPSS version 23.Frequencies and percentages was calculated for qualitative variables like fracture side while mean and standard deviation was calculated for quantitative variables like patient age and union time. Chi square test and independent sample-t test was used for statistical significance between important study variables. *P* value <0.05 will be considered significant. Data was presented in table where appropriate.

RESULTS:

A total of 328 patients were enrolled in this study. The final analysis however included 319 patients because 9(2.74%) patients were lost to follow up and excluded from analysis. The mean age was 34.41±4.29 years. Female patients were 245(76.80%) while male were 74(23.19%). Right foot was involved in 211(66.14%) patients and left in 108(33.85%). Majority(56.11%,n=179) of our patients had minimally displaced Jones fracture while undisplaced Jones fracture was present in 140(43.88%) patients. The mean follow up was 7.3±4 months(range 6.1 to 10.3 months).The average union time was 6.2±1.2 weeks(range 5.2 to 8.1 weeks).We achieved union in 316(99.0%) patients. Non union was reported in only 3(0.94%) patients as shown in pie chart I. The mean American Orthopaedic Foot and Ankle Score(AOFAS) score was 99.1±1.1(range 92.3 to 100). No other complication was noted in our series. No significant difference was noted in AOFAS score when comparison was made for gender, side and type of Jones fracture(*P*>0.05)

Pie Chart I: The frequency and percentage of fracture union and non union in our study

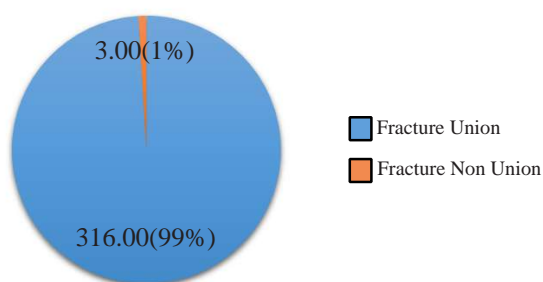


Table 1: Lawrence and Botte classification of fractures of the 5th metatarsal

Fracture Zone	Anatomical location	Chronicity	Radiographic Features
Zone I	Avulsion of the tuberosity (Styloid process fracture)	Acute fracture	Extra-articular fracture may extend into Cuboid and 5 th Metatarsal articulation
Zone II (Jones)	Metaphysis-Diaphysis Junction	Acute fracture	Metaphysis Diaphysis Junction with extension into the 4 th and 5 th Intermetatarsal articulation
Zone III	Proximal Diaphysis (Stress Fractures)	Chronic fracture	Proximal Diaphysis of the 5 th metatarsal

Table 2: Literature review showing comparison of union rates of acute Jones fractures treated with early weight bearing casts

Primary author	Year of publication	Number of Jones fractures	Average Follow up(months)	Union rate (%)
Monteban P ¹⁴	2018	49	37.5	100
Biz C <i>et al</i> ¹⁶	2018	42	15	100
Baumbach SF ¹⁷	2017	16	22	100
Marecek GS ⁹	2016	27	--	89
Choi YN ¹⁵	2011	13	13.5	100
Konkel KF ¹⁸	2005	10	32.4	100
Our study	2022	319	7.3	99.05

DISCUSSION:

Fractures of the base of 5th metatarsal have been classified by Lawrence and Botte² into three types as shown in Table 1. Lawrence proposed that majority of these fractures can be treated non operatively and surgical intervention is only indicated in intra-articular fractures, displaced fractures, delayed union and non union.

Our thorough literature search revealed that no consensus or established guidelines exists regarding the ideal method of immobilization, optimum duration of immobilization and effective load bearing protocols for conservatively treated Jones fractures when treated conservatively.^{10,11-13} We treated acute Jones fractures with early weight bearing casts and documented union in 316(99.05%) patients. Our results are consistent with previous studies reported in the literature(table 2) but our study had shorter follow up period. The longer follow up period in other studies can be attributed for detecting any re fracture after conservatively treating Jones fractures. Furthermore majority of the studies in the literature included all fractures of the fifth metatarsal including Jones fracture. The strength of our study however is the larger sample size than any of these studies and with the inclusion of Jones fracture(zone II fractures) exclusively.

Contrary to the above studies Look and Reisnauer¹⁹ treated 47 Jones fractures in early weight bearing walking boot and 8 were treated in non weight bearing cast. The mean follow up period of both groups was 6.4 months and 15.5 months respectively. In weight bearing group 3(6.4%) patients developed nonunion and required surgery. Similarly in non weight bearing cast group 3(37.5%) patients were operated because of nonunion. These authors concluded that best

treatment of Jones fracture is still controversial as similar outcome can be achieved by treating acute Jones fractures with early weight bearing boot or non weight bearing cast.

We determined functional outcome of our patients with American Orthopaedic Foot and Ankle Score(AOFAS) and noted the mean score of 99.1±1.1(range 92.3 to 100) after plaster removal. Choi¹⁵ reported AOFAS score of 99.7 and Biz C *et al*¹⁶ 97.5. Bernardino²⁰ treated 25 Jones fractures with below knee cast and 17 with functional elastic bandage without any weight bearing restriction. At 15 months follow up all fractures achieved union with AOFAS score of 97.5 in cast group and 92.5(p>0.05) in functional bandage group. This author concluded that weight bearing restrictions and follow up are not mandatory for treating Jones fractures conservatively. Park *et al*²¹ treated 3(12.5%) patients of zone II fractures with early weight bearing protocol(3 days after cast immobilization) and 2(10%) patients of zone II fractures conservatively with late weight bearing(after 6 weeks). Clinical union was noted in 6.8 months and 7.9 months in early and late weight bearing patients respectively. The mean AOFAS score at 6 months was 97.8 in early weight bearing patients and 94.7 in late weight bearing patients. The VAS score was 0.6 and 0.3 at six months follow up in early and late weight bearing patients respectively. Delayed union was noted in one patient in each group. These authors concluded that although no significant difference was noted in AOFAS and VAS score at final follow up, early weight bearing patients had faster fracture healing than delayed weight bearing patients. All patients of Jones fractures with underlying diseases should be treated with early weight bearing cast. Rikken²² reviewed 32 relevant articles including

one randomized controlled trial, seven perspective studies and twenty four retrospective studies and documented that out of 518 Jones fractures 318(61.4%) were treated non operatively and 200(38.6%) were treated operatively. The rate of union was 77.4% in conservative versus 96.3% in surgically treated Jones fractures. The average union time was 11 weeks in conservative and 9.4 weeks in operative group while refracture rate was in 2.4% in conservative and 2.1% in operative group. The overall mean AOFAS score was 95.5(range 92.5 to 97.5) in the conservative group and 92.5(range 90 to 94.2). The non weight bearing cast group(n=64) had mean AOFAS score 7.5 while weight bearing boot or shoe(n=35) had mean AOFAS 92.5.

Other studies reported functional outcome using different scores. Baumbach²³ treated 43 patients of Zone I and Zone II fractures conservatively. The mean follow up was five years. This author treated all patients without immobilization and permitted early weight bearing. Excellent outcome was noted as assessed with Visual Analog scale for Foot and Ankle(VAS FA) and Quality of Life Score SF-12. This author concluded that excellent patient reported functional outcome can be achieved with early weight bearing irrespective of fracture types and characteristics. Vorlat²⁴ treated six Jones fractures with non weight bearing cast for 17 days and noted union in 3 patients.

The global ankle score was 82/100 with 2 patients having mild shoe wearing problems and one had big problem in shoe wearing. Vorlat concluded that non weight bearing was the most significant predictor of poor functional outcome and should be minimized to avoid complications. Ruta DJ²⁵ was of the opinion that sedentary patients with Jones fractures can be managed non operatively while Jones fractures in professional athletes should be offered surgery because superior results have been reported with surgical fixation in terms of higher union rates and early return to sports than with conservative treatment. According Ruta polytrauma can be a relative indication of surgery for Jones fracture aiming to early mobilize the patient and enhance recovery. In our study however, no professional athlete was included and polytrauma with Jones fractures were excluded.

Our study had few limitations. Our follow up period was short. Further studies are recommended to verify the efficacy of early weight bearing cast for treating acute Jones fractures.

CONCLUSION:

Early weight bearing cast is an effective modality of conservatively treating acute Jones fractures as shown by higher union rate and excellent functional outcome in majority of our patients. This technique has higher patient satisfaction and compliance with minimal complications. We therefore recommend early weight bearing cast as treatment of choice for un displaced or minimally displaced acute Jones fractures (zone II fractures).

Authors Contribution:

Faaiz Ali Shah: conception and design, or acquisition of data, or analysis and interpretation of data;
Mian Amjad Ali: Final approval of the version to be published.
Naemullah Dawar: Drafting the article or revising it critically for important intellectual content;
Mian Javed Iqbal: Data Collection

REFERENCES:

1. Jones R. I. Fracture of the Base of the Fifth Metatarsal Bone by Indirect Violence. *Ann Surg.* 1902;35(6):697-700.
2. Lawrence SJ, Botte MJ. Jones' fractures and related fractures of the proximal fifth metatarsal. *Foot Ankle Int* 1993;14(6) :358-65. DOI: 10.1177/107110079301400610
3. Coleman MM, Guyton GP. Jones Fracture in the Nonathletic Population. *Foot Ankle Clin.* 2020;25(4):737-751. DOI: 10.1016/j.fcl.2020.08.012.
4. Smith JW, Arnoczky SP, Hersh A. The intraosseous blood supply of the fifth metatarsal: implications for proximal fracture healing. *Foot Ankle* 1992; 13(3):143-52. DOI: 10.1177 /107110079201300306
5. Herterich V, Baumbach SF, Kaiser A, Bocker W, Polzer H. Fifth metatarsal fracture-a systematic review of the treatment of fractures of the base of the fifth metatarsal bone. *Dtsch Arztebl Int* 2021; 118: 587-94. DOI: 10.3238/arztebl. m2021 .0231.
6. Chloros GD, Kakos CD, Tastsidis IK, Giannoudis VP, Panteli M, Giannoudis PV. Fifth metatarsal fractures: an update on management, complications, and outcomes. *EFORT Open Rev.* 2022;7(1):13-25. DOI: 10.1530/EOR-21-0025.
7. Albloushi M, Alshantqiti A, Qasem M, Abitbol A, Gregory T. Jones type fifth metatarsal fracture fixation in athletes: A review and current concept. *World J Orthop.* 2021;12(9):640-650. DOI: 10.5312/wjo.v12.i9.640.
8. Choi YR, Kim BS, Kim YM, Park JY, Cho JH, Kim S, Kim HN. Hard-Soled Shoe Versus Short Leg Cast for a Fifth Metatarsal Base Avulsion Fracture: A Multicenter, Noninferiority, Randomized Controlled Trial. *J Bone Joint Surg Am.* 2021;103(1):23-29. DOI: 10.2106/JBJS.20.00777.
9. Marecek GS, Earhart JS, Croom WP, Merk BR. Treatment of Acute Jones Fractures Without Weight bearing Restriction. *J Foot Ankle Surg.* 2016;55(5):961-4. DOI : 10.1053/j.jfas. 2016.04.013.
10. Sung KS, Koh KH, Koo KH, Park JC. Conservative treatment of nondisplaced fifth metatarsal base zone I and II fractures. *J Korean Foot Ankle Soc.*2008;12(2):185-188.
11. Naing L, Winn T, Rusli BN. Practical Issues in Calculating the Sample Size for Prevalence Studies. *Archives of Orofacial Sciences* 2006; 1: 9-14.
12. Ceccarelli F, Calderazzi F, Pedrazzi G. Is there a relation between AOFAS ankle-hindfoot score and SF-36 in evaluation of Achilles ruptures treated by percutaneous technique? *J Foot Ankle Surg.* 2014;53(1):16-21. DOI: 10.1053/j.jfas. 2013.09.005.
13. Chuckpaiwong B, Queen RM, Easley ME, Nunley JA. Distinguishing Jones and proximal diaphyseal fractures of the fifth metatarsal. *Clin Orthop Relat Res.* 2008;466(8):1966-70. DOI: 10.1007/s11999-008-0222-7.
14. Monteban P, van den Berg J, van Hees J, Nijs S, Hoekstra H. The outcome of proximal fifth metatarsal fractures: redefining treatment strategies. *Eur J Trauma Emerg Surg.* 2018;44(5): 727-734. DOI: 10.1007/s00068-017-0863-x.

15. Choi YN, Choi YR, Seo JH, Lee HS, Kim SW, Jeong JJ. Results of non-operative treatment of the zone I, II fifth metatarsal base fracture. *J Korean Foot ankle Soc.* 2011; 15(4):207-2011.
16. Biz C, Zamperetti M, Gasparella A, Dalmau-Pastor M, Corradin M, de Guttry G, et al. Early radiographic and clinical outcomes of minimally displaced proximal fifth metatarsal fractures: cast vs functional bandage. *Muscles Ligaments Tendons J.* 2018;7(3):532-540. DOI: 10.11138/mltj/ 2017. 7.3.532.
17. Baumbach SF, Prall WC, Kramer M, Braunstein M, Bocker W, Polzer H. Functional treatment for fractures to the base of the 5th metatarsal - influence of fracture location and fracture characteristics. *BMC Musculoskelet Disord.* 2017;18(1):534. DOI: 10.1186/s12891-017-1893-6.
18. Konkel KF, Menger AG, Retzlaff SA. Nonoperative treatment of fifth metatarsal fractures in an orthopaedic suburban private multispeciality practice. *Foot Ankle Int.* 2005;26(9):704-7. DOI: 10.1177/107110070502600907.
19. Look N, Reisenauer CR, Gorman MA. Conservative management of Jones fractures with immediate weight-bearing in a walking boot demonstrates healing. *Foot (Edinb).* 2022;50:101870. DOI: 10.1016/j.foot.2021.101870.
20. Bernardino S. Non randomised retrospective study of jones fractures treated by conservative treatment. *Phys Med Rehabil Res.* 2019. DOI: 10.15761/PMRR.1000193
21. Park JY, Kim HN, Hyun YS, Park JS, Kwon HJ, Kang SH, et al. Effect of Weight-Bearing in Conservative and Operative Management of Fractures of the Base of the Fifth Metatarsal Bone. *Biomed Res Int.* 2017;1397252. DOI: 10.1155/2017/ 1397252.
22. Rikken QGH, Dahmen J, Hagemeyer NC, Sierevelt IN, Kerkhoffs GMMJ, DiGiovanni CW. Adequate union rates for the treatment of acute proximal fifth metatarsal fractures. *Knee Surg Sports Traumatol Arthrosc.* 2021;29(4):1284-1293. DOI: 10.1007/s00167-020-06072-8.
23. Baumbach SF, Urresti-Gundlach M, Bocker W, Vosseller JT, Polzer H. Results of Functional Treatment of Epi-Metaphyseal Fractures of the Base of the Fifth Metatarsal. *Foot Ankle Int.* 2020;41(6):666-673. DOI: 10.1177/1071100720907391.
24. Vorlat P, Achtergael W, Haentjens P. Predictors of outcome of non-displaced fractures of the base of the fifth metatarsal. *Int Orthop.* 2007;31(1):5-10. DOI: 10.1007/s00264-006-0116-9.
25. Ruta DJ, Parker D. Jones Fracture Management in Athletes. *Orthop Clin North Am.* 2020;51(4):541-553. DOI: 10.1016/j.jocl.2020.06.010.