

ISSN (P): 2521-3466
ISSN (E): 2521-3474
© Clinical Orthopaedics
www.orthoresearchjournal.com
2025; 9(1): 06-09
Received: 05-10-2024
Accepted: 10-11-2024

Nevil Stève Ngona Gampio Mvili
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Yves Girineza Ndabereye
Department of Orthopaedic and
Traumatological Surgery, Cote Congo
Hospital, Haut-katanga Province,
Democratic Republic of Congo

Thierry Tshamba
Department of Orthopaedic and
Traumatological Surgery, Cote Congo
Hospital, Haut-katanga Province,
Democratic Republic of Congo

Nganzi Fusu
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Larissa Prudence Mabela Bassoumba
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Kevin Parfait Bienvenu Bouhelo-Pam
¹ Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo
² Faculty of Health Sciences, Marien
Nguabi University, Brazzaville, Republic
of Congo

Zifa Francis Nzengui
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Marc Fabrice Nkoua
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Moïse Radam Ellah
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Arnauld Sledje Wilfrid Bilongo-Bouyou
¹ Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo
² Faculty of Health Sciences, Marien
Nguabi University, Brazzaville, Republic
of Congo

Marius Monka
¹ Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo
² Faculty of Health Sciences, Marien
Nguabi University, Brazzaville, Republic
of Congo

Corresponding Author:
Nevil Stève Ngona Gampio Mvili
Department of Orthopaedic and
Traumatological Surgery, Brazzaville
University Hospital, Republic of Congo

Functional result of open fractures of the metatarsals treated by axial pinning: About 13 cases at the brazzaville university hospital center

Nevil Stève Ngona Gampio Mvili, Yves Girineza Ndabereye, Thierry Tshamba, Nganzi Fusu, Larissa Prudence Mabela Bassoumba, Kevin Parfait Bienvenu Bouhelo-Pam, Zifa Francis Nzengui, Marc Fabrice Nkoua, Moïse Radam Ellah, Arnauld Sledje Wilfrid Bilongo-Bouyou and Marius Monka

DOI: <https://doi.org/10.33545/orthor.2025.v9.i1.A.459>

Abstract

Objective: Metatarsal fractures are among the most common foot injuries, accounting for approximately 5 to 6 percent of all fractures encountered in consultation. A combination of bone and soft tissue injuries can lead to foot instability. The aim of this study was to evaluate the functional outcome of open fractures of the metatarsals treated by axial pinning at the University Hospital Center of Brazzaville (CHUB).

Patients and Methods: This is a retrospective study that was carried out on 13 patients who had an open fracture of the neck and body of the metatarsals of the foot classified as type II according to Cauchoix-Duparc at CHUB between January 2023 and June 2024, i.e. a period of 18 months. 13 patients were evaluated, including 04 women and 09 men. There were 05 cases of open fracture of the neck of the last 4 metatarsals, 04 cases of open fracture of the body of the 5 metatarsals, and 04 cases of bifocal open fracture of the 05 metatarsals. These fractures did not benefit from any cover flap, just directed healing. The mean age of the study was 40 years, with a standard deviation of ± 11.29 , with extremes: of 23-58 years.

Results: Thirteen patients with an open fracture of the neck and body of the metatarsals classified as type II according to Cauchoix-Duparc had a very excellent functional result with an AOFAS score of 90 points. The average for pain, function, and alignment was 40/40, 35/45, and 15/15.

Conclusion: Crush injuries are serious injuries leading to prolonged morbidity, and medical care should focus on the repair of soft tissue injuries and bone stabilization.

Keywords: Open fracture, metatarsals, function, axial pinning

Introduction

Metatarsal fractures are among the most common foot injuries, accounting for approximately 5-6 percent of all fractures seen in clinics ^[1, 10]. Crush injuries to the foot are classified as serious injuries and can potentially result in amputation. A combination of the bony (multiple fractures of the tarsal and metatarsal bones) and soft tissue injuries can result in foot instability. Initial medical care includes wound, anatomical reduction of the foot, stabilization with internal fixation hardware (Kirschner wires, screws, and plates), and soft tissue coverage ^[1, 2, 3]. Anatomical reduction of all associated fractures and dislocations with stable fixation can minimize long-term morbidity and accelerate soft tissue healing ^[3, 4, 5].

In our context, the circumstances of occurrence were the reception of a mass on the foot, in particular the reception of a vehicle wheel on the foot causing multiple fractures. Or even crushing during road traffic accidents.

Traditionally, fractures and dislocations have been induced by open methods and maintained by several smooth Kirschner wires and reinforced by plaster immobilization ^[3, 4, 5]. However, these methods are associated with certain limitations such as inadequate fixation, loss of reduction, migration of the pins and infections.

Anatomical reduction and stable fixation of the severely injured foot associated with complete treatment are key elements for good healing of soft tissue injuries and consolidation. Stabilization procedures intended to save the foot and improve function have a lower rate of soft tissue complications if medical care is done early, avoiding amputations and persistent pain. Medical care for severe foot injuries with external fixation is minimally invasive, reducing devascularization^[3, 5], and helps maintain alignment. Soft tissue medical care and early joint motion are the two basic elements of good-directed healing^[3, 5, 7, 8]. External fixation can be combined with internal fixation to achieve additional stability. When used with a dynamic device, minor postoperative corrections can also be achieved. The objective of this study was to evaluate the functional outcome of open fractures of the metatarsals treated by axial pinning at the University Hospital Center of Brazzaville (CHUB).

Patients and Methods

This is a retrospective study that was carried out on all patients who had an open fracture of the metatarsals at CHUB between January 2023 and June 2024, i.e. a period of 18 months, longitudinal with a minimum postoperative follow-up of six (06) months. Included in the study were all patients who had an open fracture of the metatarsals (neck and diaphysis) of the foot classified as type II according to Cauchoix-Duparc and whose files included at least one complete clinical observation, an operative report, a preoperative and postoperative x-ray. Not all patients who had a closed fracture of the metatarsals of the foot were included in the study.

During the study period, ninety-eight (98) patients had a metatarsal fracture, including fifty-eight (58) or 59.18% a closed metatarsal fracture, twenty-seven (27) an isolated fracture of a single metatarsal or 27.56% and thirteen (13) an open metatarsal fracture classified as type II according to Cauchoix-Duparc or 13.26%. The latter constituted our study series.

These 13 patients were seen and re-evaluated, including four (4) women and nine (9) men constituted our series. These were five (05) cases of open fracture of the neck of the last 4 metatarsals, four (04) cases of open fracture of the diaphysis of the 5 metatarsals, and four (04) cases of bifocal open fracture of the five (05) metatarsals (figure 1 and 2). All these fractures were classified type II according to the Cauchoix-Duparc classification and did not benefit from any bone coverage, just directed healing. The mean age of the study was 40 years, with a standard deviation of ± 11.29 , with extremes: of 23-58 years.

Surgical technique and post-operative care protocol

The patient was placed in the supine position on a regular table with a cushion under the buttock, with the lower limb to be operated on extended. A pneumatic tourniquet was placed at the root of the limb and a block was placed under the ankle. The entire lower limb was included in the field and free of any movement during the operation.

The approach was a dorsal approach to the foot via a zig-zag or Z incision widening the post-traumatic wound by approximately 4 to 5 cm.

1st tage: Trimming^[7, 8, 9, 10]

Excision of devitalized tissues and tissues destined for necrosis after abundant washing with isotonic saline, hydrogen peroxide and red Betadine.

On exploration: Displaced fracture of the neck of the last 4 metatarsals, and a total rupture of the tendons of the long extensor of the toes.

2nd stage: Repair

The anatomical reduction was obtained using forceps and then placement of 12/10th Kirschner pins at the level of the 4 metatarsals in a back-and-forth motion fixing the tarsometatarsal and metatarsophalangeal joint (figure 3). Control deemed satisfactory by external manoeuvre of the reduction and bone stabilization. Then tendon repair using 4/0 PDS thread by U-shaped or frame stitches reinforced by peritendinous stitches. Release of the tourniquet, control of hemostasis deemed satisfactory then closure of the operative and traumatic wound under tension, dry and sterile dressing and lastly placement of a splint boot, ankle at 90°.

Postoperative care and follow-up

In the immediate postoperative period, morphine allowed effective pain control. Administration of low molecular weight heparin to avoid thromboembolic complications and 3rd generation cephalosporins associated with fucidic acid to prevent infections. The first dressing changes on the 2nd day if the dressing is not soiled. Standard X-rays of the operated foot from the front and side allowed the positioning and orientation of the pins to be assessed. The pins were removed 8 weeks after surgery and complete unloading was authorized without the use of crutches. No cover flap was performed, all patients benefited from directed healing for 6 weeks and functional rehabilitation to restore mobility of the metatarsophalangeal joint and gain in amplitude.

Objective assessment

The objective assessment was made on clinical and radiological criteria.

- **Clinical criteria:** In the postoperative period and as elaborated at the follow-up, the objective assessment was made on the basis of the AOFAS score (American Orthopaedic Foot and Ankle Society).
- **Radiological criteria:** At the follow-up, the X-ray included images of the foot (front, profile). The elements studied were: consolidation or malunion.

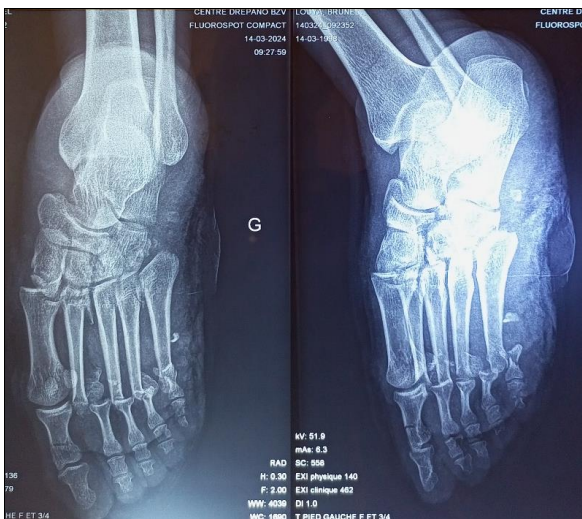
Results

Functional results

All our 13 patients with an open fracture of the neck and body of the metatarsals classified as type II according to Cauchoix-Duparc, had a very excellent functional result with an AOFAS score of 90 points at the mean follow-up after 8 weeks of functional rehabilitation. The average for pain, function and alignment was respectively 40/40, 35/45 and 15/15 (Table 1).

Table 1: Distribution of patients according to the AOFAS score

Patient	Pain /40	Function/45	Alignment/15
1	40	35	15
2	40	35	15
3	40	35	15
4	40	35	15
5	40	35	15
6	40	35	15
7	40	35	15
8	40	35	15
9	40	35	15
10	40	35	15
11	40	35	15
12	40	35	15
13	40	35	15
Average	40/40	35/45	15/15
AOFAS score very excellent		90/100	

**Fig 1:** Open fracture of the last 4 metatarsals**Fig 2:** X-ray image of the open fracture of the neck of the last 4 metatarsals**Fig 3:** X-ray image of the axial pinning of the last 4 rays of the foot

Discussion

Our indications took into account the data from the literature. Indeed, of the 13 patients who presented an open fracture of the metatarsals classified as type 2 according to Cauchoix-Duparc, there were four (4) women and nine (9) men. These were five (05) cases of open fracture of the neck of the last 4 metatarsals, four (04) cases of open fracture of the diaphysis of the 5 metatarsals, and four (04) cases of bifocal open fracture of the five (05) metatarsals. All these fractures were classified as type II according to the Cauchoix-Duparc classification and did not benefit from any bone coverage (cover flaps), just directed healing. The mean age of the study was 40 years, standard deviation of ± 11.29 , (range: 23-58 years). All our 13 patients had a very excellent functional results at mean follow-up with an AOFAS score of 90 points.

Our results were identical to those of Dewar *et al.* [1] in a study on percutaneous screw fixation of proximal fractures of the fifth metatarsal found an excellent functional result at the last follow-up, Wang *et al.* [3] in a study on fractures of the base of the 5th metatarsal associated with a fracture of the fibular bone found an excellent functional result at the mean follow-up. Stodler *et al.* [4] in a study on open reduction and internal fixation of acute Lisfranc fracture-dislocation using dorsal bridging plates found an excellent functional result, then Myerson *et al.* [6] in a study on the medical care of compartment syndrome of the foot after open tarsometatarsal fractures found an excellent functional result at the last follow-up, similarly Chandran *et al.* [7] in a study on the medical care of complex open fracture due to severe midfoot injury with an external fixation on 10 patients (11 feet). The mean age of patients was 38 years with a range of 25 to 55 years, and 90% were male. Had an excellent functional result after 1 month of follow-up.

Georgiakay *et al.* [8] in a study carried out on the reconstruction of a gunshot wound of the foot from side to side with a comminuted open fracture of the 3rd, 4th, and 5th metatarsal about one (01) case found an excellent functional result at the last follow-up. Arnez *et al.* [9] in a study carried out on the reconstruction of the support zone of the foot with a chimeric osteocutaneous fibular flap with an acute open fracture of the foot of the second, third, fourth and fifth metatarsals about one case had found an excellent functional result after 1 year of follow-up. Similarly, Egrise *et al.* [10] in a study carried out on the treatment of two or more metatarsal fractures on 165 patients including 123 men and 42 women with a mean age of 38 years, extreme of 16-82 years found an excellent functional result with an AOFAS score of 78 points.

Conclusion

Crush injuries are serious injuries with prolonged morbidity, and medical care should focus on soft tissue repair and bone stabilization. The use of external fixation and even internal fixation with Kirschner wires in some cases may be necessary because it is less invasive, can achieve adequate stability and provides excellent functional outcomes and good access to medical care for infected wounds. However, early, appropriate and well-conducted medical care minimizes the risk of complications. Thus, our study allowed us to evaluate the functional outcome of open metatarsal fractures treated with axial pinning.

Conflict of Interest

Not available.

Financial Support

Not available.

Reference

1. Dewar CP, O'Hara GN, Roebke LJ, McKeon J, Martin KD. Fixation percutanée par vis des fractures proximales du cinquième métatarsien. *JBJS Essent Surg Tech.* 2024 Nov 15;14(4):E23.00078. DOI: 10.2106/JBJS.ST.23.00078. PMID: 39554542; PMCID: PMC11567698.
2. Devalentine SJ. Lésions épiphysaires du pied et de la cheville. *Clin Podiatr Med Surg.* 1987 Jan;4(1):279-310. PMID: 2880652.
3. Wang ZD, Li H, Li L, Dong QY, Ding XH. Fifth metatarsal base fracture combined with fracture of the os peroneum. *J Am Acad Orthop Surg Glob Res Rev.* 2022 Oct 6;6(10):e22.00172. DOI: 10.5435/JAAOSGlobal-D-22-00172. PMID: 36201675; PMCID: PMC9542830.
4. Stodle AH, Nilsen F, Molund M, Ellingsen Husebye E, Hvaal K. Open reduction and internal fixation of acute Lisfranc fracture-dislocation with use of dorsal bridging plates. *JBJS Essent Surg Tech.* 2019 Nov 1;9(4):e39.1-2. DOI: 10.2106/JBJS.ST.19.00009. PMID: 32051784; PMCID: PMC6974315.
5. Martin Oliva X, Viladot Voegeli A. Nécrose osseuse aseptique (avasculaire) du pied et de la cheville. *EFORT Open Rev.* 2020 Oct 26;5(10):684-690. DOI: 10.1302/2058-5241.5.200007. PMID: 33204511; PMCID: PMC7608575.
6. Myerson MS. Prise en charge des syndromes logétiques du pied. *Clin Orthop Relat Res.* 1991 Oct;(271):239-48. PMID: 1680591.
7. Chandran P, Puttaswamaiah R, Dhillon MS, Gill SS. Prise en charge des fractures ouvertes complexes du médio-pied avec fixation externe. *J Foot Ankle Surg.* 2006 Sep-Oct;45(5):308-315. DOI: 10.1053/j.jfas.2006.06.002. PMID: 16949528.
8. Georgia Kay B, Kandamany N. Don't shoot yourself in the foot: Reconstruction d'une blessure par balle du pied de part en part. *Plast Reconstr Surg Glob Ouvert.* 2019 Jul 26;7(7):E2314. DOI: 10.1097/GOX.0000000000002314. PMID: 31942346; PMCID: PMC6952136.
9. Arnež ZM, Troisi L, Colavitti G, Papa G, Leuzzi S, Stocco C, et al. Reconstruction de la zone d'appui du pied avec lambeau fibulaire ostéocutané chimérique vascularisé: un rapport de cas. *J Foot Ankle Surg.* 2020 Jan-Feb;59(1):128-130. DOI: 10.1053/j.jfas.2018.10.006. PMID: 31882136.
10. Egrise F, Bernard E, Galliot F, Pidhorz L, Mainard D. Traitement de deux fractures métatarsiennes ou plus. *Orthop Traumatol Surg Res.* 2024 Feb;110(1):103285. DOI:

10.1016/j.otsr.2022.103285. Epub 2022 Apr 22. PMID: 35470118.

How to Cite This Article

Mvili NSNG, Ndabereye YG, Tshamba T, Fusu N, Bassoumba LPM, Bouhelo-Pam KPB, et al. Functional result of open fractures of the metatarsals treated by axial pinning: About 13 cases at the brazzaville university hospital center. *National Journal of Clinical Orthopaedics.* 2025;9(1):06-09.

Creative Commons (CC) License

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.