Scientific Research Publishing

Open Journal of Orthopedics, 2025, 15(3), 141-149
https://www.scirp.org/journal/ojo
ISSN Online: 2164-3016
ISSN Print: 2164-3008

Closed Tibial Centromedullary Nailing without Image Intensifier at Donka University Hospital: A Case Report of 15 Patients

Diallo Ibrahima Gallé[1*], Diallo Alpha Mamadou Felah[1], Sidimé Sory[1], Barry Alhassane[1], Mansaré Mohamed[2], Diallo Mamadou Moustapha[1], Sidibé Mamadou Saliou[1], Lamah Léopold[1]

[1]Department of Orthopaedics and Traumatology, Donka National Hospital, Conakry, Republic of Guinea
[2]Traumatology and Orthopaedics Department, Conakry Military Hospital, Conakry, Republic of Guinea
Email: *ibagalley16@gmail.com, mamadoufelahdiallo@gmail.com, sidimesidex@yahoo.fr, barryalhasilndin67@gmail.com, mansaremohamed608@gmail.com, mustodjinkan8@yahoo.fr, mssidibe95@gmail.com, leolamah@yahoo.fr

How to cite this paper: Gallé, D.I., Felah, D.A.M., Sory, S., Alhassane, B., Mohamed, M., Moustapha, D.M., Saliou, S.M. and Léopold, L. (2025) Closed Tibial Centromedullary Nailing without Image Intensifier at Donka University Hospital: A Case Report of 15 Patients. *Open Journal of Orthopedics*, **15**, 141-149.
https://doi.org/10.4236/ojo.2025.153015

Received: February 17, 2025
Accepted: March 15, 2025
Published: March 18, 2025

Abstract

Summary: Objectives, contributed to improving the management of leg fractures in the Orthopaedic and Traumatological Surgery Department at Donka University Hospital. Methodology: This was a prospective cross-sectional descriptive study lasting two years, from 1 January 2019 to 31 December 2020. It included all patients admitted with closed leg fractures during the study period. Results: Closed-focus centromedullary nailing of the tibia without an image intensifier was 3.71% compared with other types of osteosynthesis. The age group 32 to 42 (mean age 39, 60) was the most affected, at 46.67%, with a sex ratio of 2.75. The aetiologies were dominated by MVA (93.33%) and the average 1/3 was the elective site (73.33%). Pain and functional impotence were the main reasons for consultation, and the left leg was affected in 53.33% of cases. Kuntscher's nail was involved in 86.67% and Grosse and Kempf's in 13.33%. Our results were excellent in 40% of cases and good in 60%, according to the Lysholm score. Conclusion: Centromedullary nailing is the reference osteosynthesis technique for the treatment of tibial diaphyseal fractures. It is a reliable, reproducible, but demanding technique that provides effective stabilisation of the fracture site, facilitates early return to weight-bearing and is less restrictive for the patient.

Keywords

Leg Fracture, Closed Focus, Centromedullary Nailing, Without Amplifier, Donka

1. Introduction

Centromedullary nailing is an osteosynthesis technique that involves placing an internal stent in the bone shaft, with the aim of obtaining a solid, stable construct that allows rapid recovery of function, immediate mobilisation and early return to weight-bearing [1]. Tibial shaft fractures account for 36.7% of long bone fractures and more than 2% of all fractures [2] [3]. Management has changed considerably over the last thirty years, with the advent of centromedullary nailing combined with reaming and/or locking [4]. The percutaneous approach and closed reduction allow the periosteum to be respected and the fracture haematoma to be preserved, thus promoting consolidation [5].

There are many advantages to this approach, which can overcome the health problems in developing countries: minimal risk of infection, minimally invasive approach with reduced transfusion requirements, early rehabilitation with immediate joint mobilisation [6].

However, it remains controversial for distal third fractures [7]. There are many advantages to this approach, which may overcome the health problems in developing countries: minimal risk of infection, minimally invasive approach with reduced transfusion requirements, early rehabilitation with immediate joint mobilisation [8]. The percutaneous approach and closed reduction make it possible to respect the periosteum while preserving the fracture haematoma, thus promoting consolidation. A prospective study carried out in France by P. Boyer *et al.* [9] in 2014 reported 41 cases of fractures of the distal third of the tibia treated by centromedullary nailing with locking and angular stability at the Department of Orthopaedic and Traumatological Surgery, Bichat Hospital, Paris Diderot University. In Cameroon, a 2015 study by M.L. Guifo *et al.* [10], reported 34 mixed cases, including 20 femur fractures and 14 tibia fractures, all treated by locked ECM without image intensifier at Yaoundé University Hospital. The ECM technique requires the use of an image intensifier to monitor the entrance, the crossing of the fracture site and the level of the nail in relation to the overlying and underlying joint. In our context, this technique was performed without an image intensifier. In Guinea, no previous studies have been carried out according to the literature review.

The aim of our study was to assess the technique used for closed-focus centromedullary nailing of the tibia without an amplifier and to analyse our results.

2. Patients and Method

This was a prospective, single-centre, continuous observational study lasting 2 years, from 1 January 2019 to 31 December 2020. Recent closed diaphyseal tibial fractures and open Gustilo and Anderson type I fractures were included in our study.

Our exclusion criteria were open Gustilo and Anderson type II and III fractures, open nailing because of the difficulties encountered, proximal or distal epiphyseal-metaphyseal fractures, patients lost to follow-up and old displaced fractures.

All patients underwent a pre-operative assessment with a radiograph of the leg

in front and in profile. The length of the nail was measured from the anterior tibial tuberosity to 2 cm above the medial malleolus, and the diameter was assessed where the canal was narrowest on full-size digital or standard films (100%).

1-Surgical technique and post-intervention follow-up protocol:

The patient was positioned on a standard operating table in the supine position, under spinal anaesthesia, with a minimum 3 to 5 cm approach centred on the patellar tendon, identifying the pre-spinal area; Farraboeufs retractors were inserted, followed by trephination with a square tip and then a pigtail, with the knee flexed to 90˚ on a makeshift support. Reduction was achieved by progressive and continuous traction on either side of the fracture site, combined with varus or valgus and internal or external rotation, depending on the displacement of the fragments. The nail and reduction guide is mounted on a tight T-wrist and is inserted and advanced through the canal of the distal fragment, as evidenced by the grinding against the medial cortex. We then place a hollow alignment nail mounted on the guide, with the knee flexed to 120˚ (Figure 1), using hammer blows to progress, followed by removal of the guide once the nail has reached the desired level in the canal of the distal fragment. Control of the nail at the knee to avoid conflict with the patellar tendon and at the ankle by flexion and extension without any notion of cracking, which demonstrates freedom of movement of the ankle. Closure of the operating knee wound plane by plane, followed by bandaging.

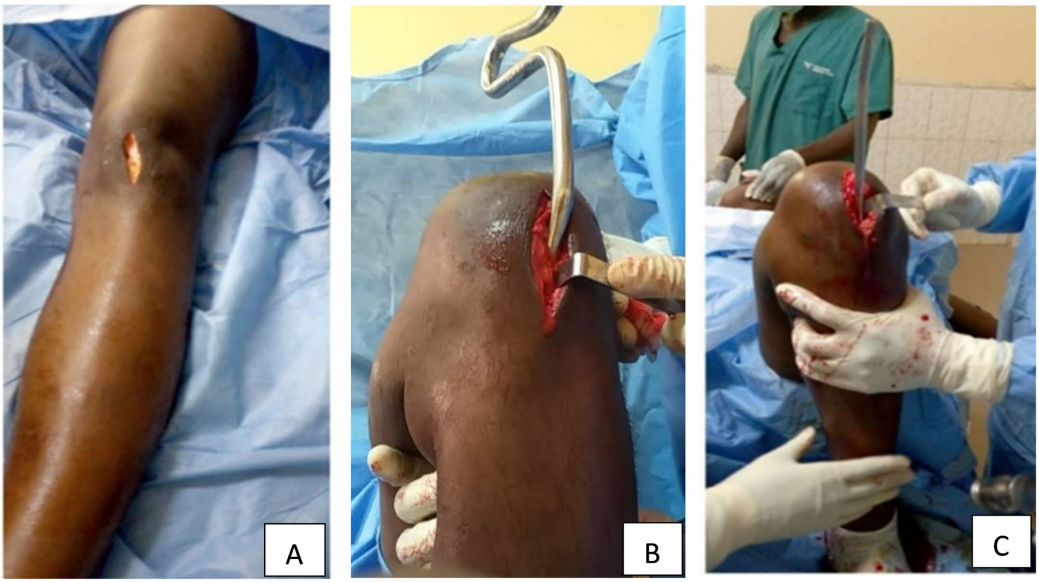

Figure 1. Intraoperative clinical image: (A) Images of the trans-patellar approach to the knee, (B) trephination of the pre-spinal area at the pigtail, (C) Kuntscher nail placement.

Overlap of more than 2 cm, muscular interposition and incarceration of a fragment in the distal canal, which prevented passage of the nail or the centromedullary guide, were the main difficulties we encountered in 5 of our patients. A 2 - 3 cm incision allowed the guide to be oriented in the distal fragment.

All our patients were treated by nailing without reaming, however, this technique

must comply with a certain number of criteria, namely clinical measurement of the length of the alignment nail and its diameter on a life-size radiograph, the choice of the point of introduction of the nail and the passage of the centromedullary guide through the distal fragment. Our patients received a double course of antibiotics intra- and postoperatively, analgesics and low molecular weight heparin 6 hours after surgery.

Physiotherapy begins the day after the operation. The session begins with exercises in bed: activating blood circulation by making gentle flexion and extension movements of the knee to combat flaccidity, isometric contractions of the quadriceps and flexor and extensor muscles of the foot by flexing and extending the ankle and toes. The next day's menu consists of getting up for the first time and learning to walk using crutches. Walking distance gradually increases over the following days. If progress is slower, a stay in a physiotherapy centre is advisable.

3. Method of Analysis

Each patient benefited from a protocolised follow-up with a systematic consultation at D 45 and D 120, including a radiographic assessment (face and profile), and a handwritten record of all incidents and complications. We reviewed and assessed our patients according to functional criteria and the Lysholm scoring system [11]. The data were entered into Excel.

4. Results

We operated on fifteen patients. The mean age at the time of surgery was 39.6 years (18 - 56). There were 11 men and 4 women, with a sex ratio of 2.7.

The main cause of the fractures was road traffic accidents in 14 cases (93.3%) and one case of an accident at work (6.7%). Ten cases involved closed fractures (66.7%), including one case of tibia fracture with intact fibula (6.7%) and five cases of Gustilo and Anderson type I open fractures (33.3%). Associated injuries included head trauma in 7 cases (46.7%), fracture of the acetabulum in 1 case (6.7%), open dislocation of the ankle in 1 case (6.7%), fracture of the thoracic limb in 2 cases (13.3%) and fracture of the pelvic limb in 3 cases (20%).

No immediate intra- or post-operative complications were detected. During the radio-clinical check-ups, we noted two mechanical complications: a torsion of the nail due to early weight-bearing, resulting in a slight varus angulation of the tibia, and an ascension of the nail at 6 months with a risk of shearing the patellar tendon, which we removed after radiographic check-ups. Both cases constituted the adverse events of the study.

The main epidemiological characteristics are summarised in Table 1.

Table 1. Summary table of patients treated by centromedullary nailing without image intensifier.

Age	Sex	Tissue status	Gustilo Anderson	AO	Associated lesions	Implant	Complication	Evaluation
35	M	Closed	---	A1-3	---	Grosse/Kempf	Ascent nail	Good

Continued

18	F	Open	Type I	A2-2	TC	Kuntscher	---	Lost from sight
20	F	Closed	---	B2-2	TC	Kuntscher	---	Good
40	M	Closed	---	B3-3	TC, wound Leg D	Kuntscher	---	Lost from sight
21	M	Closed	---	B1-2	TC	Kuntscher	---	Lost from sight
55	M	Closed	---	A2-2	MCT; LEFORT type III/Open type II D leg	Grosse/Kempf	---	Excellent
36	F	Open	Type I	B2-2	Wound thigh D	Kuntscher	---	Good
25	M	Closed	---	B1-2	TC	Kuntscher	---	Lost from sight
56	F	Open	Type I	A1-2	---	Kuntscher	---	Excellent
30	M	Closed	---	A3-2	Open type IIIb leg D	Kuntscher	---	Excellent
35	M	Closed	---	B2-1	Wound left leg	Kuntscher	Nail twist	Lost from sight
40	M	Open	Type I	B1-2	G olecranon, G forearm, G acetabulum	Kuntscher	---	Good
38	M	Closed	---	A1-3	Left knee wound	Kuntscher	---	Excellent
35	M	Closed	---	B2-2	Open choppart dislocation G/Internal Lisfranc fracture-luxation G/Pedal artery section G	Kuntscher	---	Good
55	M	Open	Type I	C2-2	---	Kuntscher	---	Good

The entry point of the nail was judged to be good in 14 cases (93.3%) and the nail was driven in 13 cases (86.7%), with 2 cases (13.3%) in which the nail was short but had a stable focus. The overlying and underlying joints were free in all our patients, *i.e.*, 100% (Table 2).

Table 2. Positioning of the alignment nail and evaluation of homologous points.

Parameters	Evaluation Eff.	Percentage
Nail entry point	Good: 14	93.3
Driving the nail	Good: 13	86.7
Gap between fragments	Absent: 0	0
Joints (knee/ankle)	Free: 15	100

Partial weight-bearing was achieved after 45 days, and on average at 3 months. Consolidation was achieved in the first instance in all our patients (100%). We reviewed and assessed our patients according to the functional criteria and the Lysholm grading, and our results were considered excellent in 4 cases (40%) and good in 6 cases (60%) (Figure 2 and Figure 3).

Figure 2. Initial leg x-ray (F/P): (**A)** Radiographic incidence from the front, fracture with a short oblique line of the tibia and 3 fragments, with a transverse line of the fibula with translation of 2 leg bones to the middle 1/3; (**B)** Radiographic incidence in profile, transverse fracture of the tibia and fibula with little displacement, 2 leg bones at the middle 1/3.

A 22-year-old student victim of a road traffic accident (motorbike) with a diaphyseal fracture of the 2 leg bones "and a medio-diaphyseal fracture of the two (02) leg bones on X-ray".

Figure 3. Follow-up X-ray of the leg at 10 months postoperatively. (A) Radiographic incidence from the front with a good consolidation of the fracture 2 leg bones on Kuntscher nail lateralized at the top and medialized at the bottom; (B) Radiographic incidence from the profile with a good consolidation of the fracture 2 leg bones on Kuntscher nail well centralized.

5. Discussion

Rigorous interpretation of these results means that shortcomings and biases must be taken into account. This study presents limitations and difficulties, firstly because of its retrospective nature, but also because of the absence of an image intensifier, a locked nailing ancillary and an orthopaedic table, making it difficult to perform centromedullary nailing. Despite these limitations, we have described the technique and results of centromedullary nailing of the tibia without an image intensifier.

Closed-focus centromedullary nailing without an image intensifier is acknowledged to be rare and delicate, but has been performed by certain authors such as Guifo *et al.* [10], who reported 34 mixed cases, including 20 cases of femur fractures and 14 cases of tibia fractures treated by static locked centromedullary nailing without an image intensifier.

Comparing our results (mean age= 39.6 years) with the various series in the literature [3]-[5], we note that these are fractures of young adults, 35 years old for Guifo *et al.* [10]; 36 years old for Omar Margad *et al.* [12] and 38.58 years for Paul-Henri Bauwens *et al.* [13].

With regard to gender in our series, we noted a male predominance of 73.33% with a sex ratio of 2.75. This result is similar to those of Guifo *et al.* [10].

We noted a predominance of type B of the AO classification in 53.34%, in particular type B2 (26.67%). The results vary according to the data in the literature. Nevertheless, our data are much higher than those of Andrieu [14] 32.5%, Bonnevialle [15] 29% and Bellmore [16] 28.9%. Regarding the types of fracture in our series, we recorded a predominance of closed fractures, with 9 cases or 60.00%, followed by open type I fractures with 5 cases or 33.33%, and finally, one case of isolated tibial fracture or 6.67%.

The Kuntscher nail was the most commonly used type of osteosynthesis implant in our study, used in 13 cases (86.67%), followed by the non-locking Grosse et Kempf nail in 2 cases (13.33%). The osteosynthesis material implanted (Kuntscher or Grosse and Kempf nails in our study) had an average diameter of 9.5 millimetres. In contrast, in the Bonnevialle series [15], the Grosse et Kempf nail was used exclusively, with an average diameter of 10.6 mm.

We reviewed and assessed our patients after an average follow-up of 12 weeks according to the criteria of functional elements and the Lysholm grading. We obtained 4 excellent results (40%) and 6 good results (60%). We believe that this may be due to the technical skills of the surgeons and the good behaviour of the patients. In fact, ascension and torsion of the material were found. Early weight-bearing after osteosynthesis surgery of the lower limb is controversial. According to Houben *et al.* [17], delayed re-weighting of nailed tibial fractures is associated with poor results. Furthermore, immediate weight-bearing after placement of a statically locked intramedullary nail in simple tibial shaft fractures does not alter the time to healing [18].

Conversely, Bhandari *et al.* [19] show that early weight-bearing after tibial

nailing confers an increased risk of adverse events.

6. Conclusions

Centromedullary nailing is a reliable, reproducible, but demanding technique that provides effective stabilisation of the fracture site, facilitates early resection with protected weight-bearing and is less restrictive for the patient.

It is a philosophy that adopts the principle of closed focus, as opposed to conventional open-focus plate osteosynthesis. It requires rigour, technical skill and constant attention. Anticipating problems starts with a quality installation, and at this price and after particular concentration on each stage, nailing will keep all its promises.

Conflicts of Interest

The authors declare that they have no links of interest.

References

[1] Kempf, I., Grosse, A. and Lafforge, D. (1978) L'apport du verrouillage dans l'enclouage centromé-dullaire des os longs. *Revue de Chirurgie Orthopedique et Réparatrice de l'Appareil Moteur*, **64**, 635-651.

[2] Court-Brown, C.M. and Caesar, B. (2006) Epidemiology of Adult Fractures: A Review. *Injury*, **37**, 691-697. https://doi.org/10.1016/j.injury.2006.04.130

[3] Papakostidis, C., Kanakaris, N.K., Pretel, J., Faour, O., Morell, D.J. and Giannoudis, P.V. (2011) Prevalence of Complications of Open Tibial Shaft Fractures Stratified as per the Gustilo-Anderson Classification. *Injury*, **42**, 1408-1415. https://doi.org/10.1016/j.injury.2011.10.015

[4] Bertani, A., Mathieu, L., Rongiéras, F. and Chauvin, F. (2016) Fracturas de la pierna en adultos. *EMC-Aparato Locomotor*, **49**, 1-20. https://doi.org/10.1016/s1286-935x(16)79142-8

[5] Lefèvre, C. (2007) L'enclouage centro-médullaire des membres chez l'adulte. *Revue de Chirurgie Orthopédique et Réparatrice de l'Appareil Moteur*, **93**, 26. https://doi.org/10.1016/s0035-1040(07)79373-x

[6] Phillips, J., Zirkle, L.G. and Gosselin, R.A. (2012) Achieving Locked Intramedullary Fixation of Long Bone Fractures: Technology for the Developing World. *International Orthopaedics*, **36**, 2007-2013. https://doi.org/10.1007/s00264-012-1625-3

[7] Iqbal, H.J. and Pidikiti, P. (2013) Treatment of Distal Tibia Metaphyseal Fractures; Plating versus Intramedullary Nailing: A Systematic Review of Recent Evidence. *Foot and Ankle Surgery*, **19**, 143-147. https://doi.org/10.1016/j.fas.2013.04.007

[8] Phillips, J., Zirkle, L.G. and Gosselin, R.A. (2012) Achieving Locked Intramedullary Fixation of Long Bone Fractures: Technology for the Developing World. *International Orthopaedics*, **36**, 2007-2013. https://doi.org/10.1007/s00264-012-1625-3

[9] Boyer, P., Charles, P., Loriaut, P., Alkhaili, J., Mylle, G., Pelissier, A., *et al.* (2014) Enclouage centro-médullaire et verrouillage à stabilité angulaire des fractures du tiers distal du tibia. *Revue de Chirurgie Orthopédique et Traumatologique*, **100**, 650-654. https://doi.org/10.1016/j.rcot.2014.10.004

[10] Guifo, M.L., Muluem, O.K., Farikou, I., Ngongang, F.O., Tekpa, B. and Ndoumbe, A. (2016) Enclouage centromédullaire verrouillé sans amplificateur de brillance au CHU

de Yaoundé: À propos de 34 cas. *Revue de Chirurgie Orthopédique et Traumatologique*, **102**, 101-106. https://doi.org/10.1016/j.rcot.2016.01.004

[11] Lysholm, J. and Gillquist, J. (1982) Evaluation of Knee Ligament Surgery Results with Special Emphasis on Use of a Scoring Scale. *The American Journal of Sports Medicine*, **10**, 150-154. https://doi.org/10.1177/036354658201000306

[12] Margad, O., Boukhris, J., Sallahi, H., Azriouil, O., Daoudi, M. and Koulali, K. (2017) Intérêt de l'enclouage centromédullaire dans les fractures du quart distal de la jambe: À propos de 30 cas. *Pan African Medical Journal*, **28**, Article 176. https://doi.org/10.11604/pamj.2017.28.176.10261

[13] Bauwens, P., Malatray, M., Fournier, G., Rongieras, F. and Bertani, A. (2021) Risk Factors for Complications after Primary Intramedullary Nailing to Treat Tibial Shaft Fractures: A Cohort Study of 184 Consecutive Patients. *Orthopaedics & Traumatology: Surgery & Research*, **107**, Article 102877. https://doi.org/10.1016/j.otsr.2021.102877

[14] Bonnevialle, P., Andrieu, S., Bellumore, Y., Challé, J.J., Rongières, M. and Mansat, M. (1998) Troubles torsionnels et inégalités de longueurs après enclouage à foyer fermé pour fracture diaphysaire fémorale et tibiale. *Revue de chirurgie orthopédique et réparatrice de l'appareil moteur*, **84**, 397-410.

[15] Bonnevialle, P., Carivan, P., Bonnevialle, N., Mansat, P., Verhaeghe, L. and Mansat, M. (2003) Fractures bifocales de jambe. *Revue de Chirurgie Orthopédique et Traumatologique*, **89**, 423-432.

[16] Girard, D., Pfeffer, F., Galois, L., Traversari, R., Mainard, D., Delagoutte, J.-P. (2003) Non Reamed Centromedullary Nailing in Leg Fractures: About 106 Cases. *Revue de Chirurgie Orthopédique et Traumatologique*, 59-89.

[17] Houben, I.B., Raaben, M., Van Basten Batenburg, M. and Blokhuis, T.J. (2018) Delay in Weight Bearing in Surgically Treated Tibial Shaft Fractures Is Associated with Impaired Healing: A Cohort Analysis of 166 Tibial Fractures. *European Journal of Orthopaedic Surgery & Traumatology*, **28**, 1429-1436. https://doi.org/10.1007/s00590-018-2190-2

[18] Greenhill, D.A., Poorman, M., Pinkowski, C., Ramsey, F.V. and Haydel, C. (2017) Does Weight-Bearing Assignment after Intramedullary Nail Placement Alter Healing of Tibial Shaft Fractures? *Orthopaedics & Traumatology: Surgery & Research*, **103**, 111-114. https://doi.org/10.1016/j.otsr.2016.09.019

[19] The SPRINT Investigators (2008) Study to Prospectively Evaluate Reamed Intramedually Nails in Patients with Tibial Fractures (S.P.R.I.N.T.): Study Rationale and Design. *BMC Musculoskeletal Disorders*, **9**, Article No. 91. https://doi.org/10.1186/1471-2474-9-91