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Open leg fractures: Clinical, therapeutic and evolutionary aspects of 30 cases collected at the Dalal Jamm National Hospital Center in Guédiawaye

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Abstract
Introduction: Open leg fractures are the most common long bone fractures. It is a medical-surgical emergency which requires early treatment which can improve the functional prognosis of the limb. They are often caused by high energy trauma.
Materials and Methods: this is a retrospective descriptive study over a period of 2 years (from January 1, 2023 to December 31, 2024) at CHN Dalal Jamm. We studied the epidemiological, anatomo-clinical, therapeutic and progressive aspects of open leg fractures.
Results: In total, 30 patients were collected. Traffic accidents represented the most frequent cause (76.66%). The left leg was the most affected (56.66%). More than half (56.66%) of the patients had a type III opening of the Gustilo and Anderson classification. Twenty-one (21) patients, or 70%, had associated lesions. Osteosynthesis by external fixation was performed in 16 patients or 53.33%. Nine patients (09) had intramedullary nailing. Two patients had fasciocutaneous and pedicled flaps. There were two (02) cases of trans-femoral amputation. Complications were dominated by infections (23.33%).
Conclusion: Open leg fractures represent a major trauma emergency requiring rapid and multidisciplinary care. Accurate assessment and appropriate treatment, including trimming, stabilization and soft tissue coverage, are essential to optimize results.

Keywords: Fracture, open, leg, treatment

1. Introduction
An open leg fracture is a disruption of osseous continuity of the tibia and/or fibula, located 5cm below the femorotibial joint line and 5cm above the tibiotalar joint line, which communicates with the external environment through a cutaneous opening [1].
The leading cause of this type of fracture is road traffic accidents [2]. Several classifications have been used to categorize these injuries. The Gustilo and Anderson classification allows for a quantitative assessment of the soft tissues and takes into account periosteal injury, whereas the Cauchoix and Duparc classification assesses only the soft tissues [3]. The lack of a direct correlation between bone and soft tissue injuries demonstrates that there is no single pattern; for example, severe cutaneous damage can be associated with a simple transverse fracture, and conversely, a highly comminuted fracture can be associated with a simple skin opening.
The cutaneous opening defines the severity of this injury, which can lead to debilitating sequelae, potentially culminating in amputation [4, 3]. This increases the risk of infection and jeopardizes the functional prognosis due to delayed union and nonunion [5].
The management of open leg fractures remains a genuine challenge.
The open leg fracture is a medical-surgical emergency par excellence, requiring multidisciplinary management. This treatment must be prompt, comprehensive, and definitive.

2. Materials and Methods
2.1 Study Type and Period
This was a retrospective and descriptive study conducted over a two (02)-year period, from

January 1, 2023, to December 31, 2024, on patients admitted to and treated for open leg fractures in the Orthopedics and Traumatology Department of Dalal Jamm Hospital.

2.2 Materials

2.2.1 Inclusion Criteria

Patients admitted to and treated (orthopedically and surgically) in the department for an open diaphyseal leg fracture were included in the study.

2.2.2 Exclusion Criteria

Patients with epiphyseal-metaphyseal fractures, those with unusable medical records, and patients lost to follow-up were excluded.

2.2.3. Study Population

In total, 30 cases of open leg fractures (OLF) were included in the study.

3. Results

3.1 Anatomic-clinical data

3.1.1 Distribution by circumstance (Table I)

Road traffic accidents were the most frequent cause (63.33%).

Table I: Distribution by circumstance

Circumstance	Frequency	Percentage
Road traffic accidents(RTA)	19	63,33%
Work Accidents	4	13,33%
Pedestrian-Vehicle accidents	4	13.33%
Domestic accidents	3	10%
Total	30	100%

3.1.2 According to the Gustilo-Anderson classification (Table II) (Figure 1).

Type III fractures predominated (17 cases = 56.66 %).

Table II: According to the Gustilo-Anderson classification

TYPE	Frequency	Percentage
III A	13	43,33%
II	8	26,67%
I	5	16.67%
III B	3	10%
III C	1	3.33%
Total	30	100%

Fig 1: Open leg fracture Gustilo & Anderson type III A (CHNDJ)

3.1.3 Distribution by fracture site

Tibia (Table III)

The distal third was most affected (63.33 %), and we had one segmental fracture and one double fracture

Table I: Distribution by fracture site

Site	Frequency	Percentage
Distal 1/3	19	63,33%
Middle 1/3	13	43.33%
Proximal 1/3	3	10%

Fibula (Tableau IV)

Oblique fractures (53,33%) were also the most commonw (n=16)

Table IV: Répartition selon le siège de la fracture au niveau de la fibula

Site	Frequency	Percentage
Distal 1/3	16	53,33%
Middle 1/3	9	30%
Proximal 1/3	4	13.33%

3.1.4 Distribution by fracture pattern

Tibia: Oblique fractures were the most frequent (43.33 %), followed by transverse and comminuted types.

Tibia (Table V)

Table V: Distribution by fracture pattern on the tibia

Fracture pattern	Frequency	Percentage
Oblique	13	43,33%
Transverse	7	23,33%
Comminuted	7	23.33%
Spiral	3	10%
Butterfly fragment	1	3.33%
segmental	1	3.33%

Fibula (Tableau VI)

Oblique fractures (36.67 %) were also the most common.

Table VI: Distribution by fracture pattern on the fibula.

Fracture pattern	Frequency	Percentage
Oblique	11	36,67%
Transverse	7	23.33%
Comminuted	6	20%
Butterfly fragment	2	6.67%
Spiral	1	3.33%

3.1.5 Laterality
The left leg was most frequently affected (53.33 %), the right leg in 43.33 %, and one bilateral case was observed.

3.1.6 Associated injuries
Associated injuries were found in 21 patients (70 %), mainly fractures of other limb segments.

Table VII: Associated injuries

Type of injury	Frequency	Percentage
Muscular	20	66,67%
Vascular	1	3,33%
Ankle wound	1	3.33%
Left bimalleolar equivalent fracture	1	3.33%
Right closed ankle fracture	1	3.33%
Traumatic brain injury and closed leg fracture	1	3.33%
Left bimalleolar fracture with associated tibiotalar dislocation.	1	3.33%
Traumatic Brain Injury with initial loss of consciousness.	1	3.33%
Polytrauma	1	3.33%

3.2 Therapeutic data
3.2.1 Medical Treatment
All patients received:
- Analgesics
- Antibiotics
- Anticoagulants
- Anti-tetanus vaccination

3.2.2 Orthopedic treatment
Three patients (10 %) were treated orthopedically (2 plaster casts, 1 plaster boot).

3.2.3 Surgical Treatment (Table VIII) (Figure 2)
Twenty-seven patients (90 %) underwent surgery. All patients underwent surgical debridement.

Table VIII: Distribution according to surgical treatment of choice.

Surgical Treatment	Frequency	Percentage
External fixator	16	53,33%
Intramedullary nailing	9	30%
Fibular pinning	8	26,67%
Amputation	2	6,67%

Fig 2: External fixator on an open leg fracture (CHNDJ)

3.2.4 Average surgical delay: 2.5 days (range 1 - 9).
The average time to surgical management is 2.5 days, with a range of 1 to 9 days.

3.3 Follow-up Data (Figure 3) (Tables IX and X)
Twenty-four (24) patients had no immediate complications.
Seventeen (17) patients had no secondary complications.
Twenty-six (26) patients had no late complications.

In our series, the average skin healing time was 67.4 days, with a range of 15 days to 90 days.
The average time for bone consolidation was 195.1 days, with a range of 57 to 556 days.

Fig 3: Open leg fracture undergoing consolidation (CHNDJ)

Immediate Complications
One immediate complication was noted: ischemia, which required an amputation.

Secondary Complications
- Seven (07) patients (23.33%) developed post-operative infections.
- Three (3) patients (10%) had secondary displacement in the cast.
- We did not find any cases of thromboembolic disease.

Table IX: Breakdown of secondary complications

Secondary Complications	Frequency	Percentage
Infection	30	23,33%
Secondary displacement	16	10%
Skin tissue loss	9	6,66%
Chronic wounds	8	3,33%

Late Complications
Late complications were noted in 4 patients, consisting of 2 cases of nonunion (pseudarthrosis), 1 case of ankle stiffness,

and 1 case of malunion. Table X summarizes the distribution of these complications.

Table X: Distribution of late complications

Late complications	Frequency	Percentage
Nonunion	**2**	**6,67%**
Stifness	**1**	**3,33%**
Malunion	**1**	**3,33%**

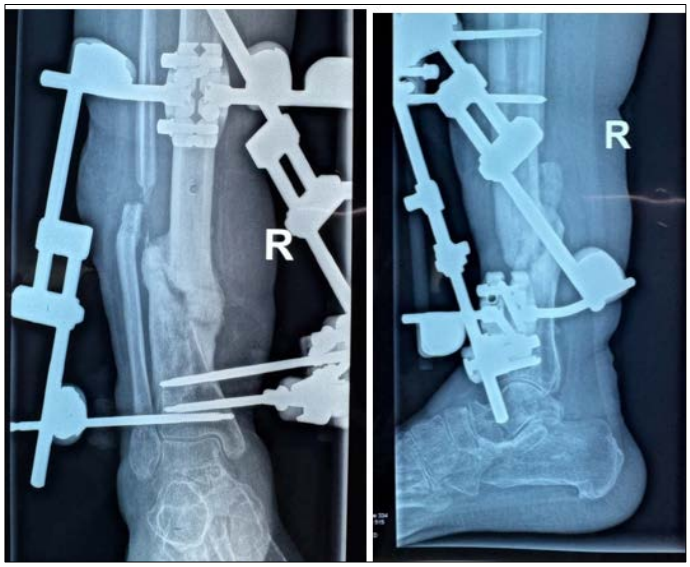

Fig 4: Malunion of the tibia and nonunion of the fibula on an external fixator (CHNDJ)

4. Discussion

4.1 Clinical and Anatomical Features

Regarding the circumstances

Road traffic accidents were the most frequent cause (76.66%), due to the large number of scooters in circulation and a disregard for traffic laws. The unregulated use of sidewalks in the city of Dakar by both street vendors and some parked cars forces pedestrians to use the roadway. Camara [6], Wani *et al.* [7], and Seck [8] also reported a predominance of road traffic accidents with rates of 73%, 64.1%, and 80%, respectively.

Regarding the Gustilo and Anderson classification

In our series, type III open fractures were predominant, with 17 cases (56.66%). This predominance of type III could be attributable to the severity of the trauma. This result is similar to that of Franken [9], whereas Camara [6] and Razafimahandry [10] found a predominance of Gustilo type II.

Regarding the fracture location

The majority of open leg fractures were located in the distal third (63.33% for the tibia and 53.33% for the fibula). These results could be explained by the area of lower structural resistance that the junction of the middle and distal thirds of the leg represents anatomically, notably the "Quadrilatère maudit de Vilain"*. Seck [8] and Camara [6] found 39.5% and 58.3% of open leg fractures, respectively, to be located in the distal third.

Regarding the affected side

In our series, the left side was the most affected, with 56.66% of cases. The work of Camara [6] and Wani [7] yielded the same results, with 71.9% and 53.3%. However, other authors, including Najeb Y [11] and Abdelaal M. A [12], reported a predominance of right-sided open fractures.

We did not identify any factors favoring the involvement of one side over the other.

Regarding associated injuries

Associated injuries were noted in 21 patients, representing 70% of our cases. These associated injuries increased the patients' length of hospital stay. They could worsen the prognosis: this was the case for craniocerebral injuries (2 cases in our series). This result is similar to that of Seck [8] and Garcia-Lopez *et al.* [13], who found associated injuries in 38% and 50% of cases, respectively. Be *et al.* [3] found a 64.2% association between open leg fractures and polytrauma. Ribault L *et al.* [15] found 40% associated polytrauma in their series.

4.2 Therapeutic Aspects

Medical Treatment

Medical treatment was instituted for all patients, namely: analgesics, antibiotics, anticoagulants, and tetanus prophylaxis. This treatment is justified by the fact that open leg fractures must be considered contaminated due to the communication between the fracture site and the external environment. This antibiotic therapy should be prescribed upon the patient's admission, according to Bonnevialle [4]. Zalavras *et al.* [16], Melving *et al.* [17], and Patzakis *et al.* [18] have recommended the use of prophylactic antibiotics in open leg fractures.

According to Bonneville [4], tetanus prophylaxis is mandatory for any open leg fracture, except in cases of immunization within the last 5 years that is duly proven by a vaccination record. In our series, tetanus vaccination was administered systematically to all our patients, as it is rare

for adults to know their vaccination status or to receive a tetanus booster every 10 years.

Orthopedic Treatment

Orthopedic treatment was performed in 3 patients (10%). In all cases, these were Gustilo type I fractures with a stable fracture site; additionally, the patients lacked financial resources.

Surgical Treatment

Debridement was performed on all surgically treated patients. According to Le Nen [19], debridement is unanimously recognized as effective and represents the crucial factor in the initial treatment that influences the final outcome.

In our series, the majority of patients (90%) underwent surgical treatment. External fixation was the type of osteosynthesis we performed most often (16 cases or 53.33%) as it was indicated for type II and III open leg fractures according to the Cauchoix and Duparc classification. Numerous authors [20, 21, 11, 10] use this method of osteosynthesis as a first-line treatment, considering it to be less invasive. External fixation allows for rapid fracture stabilization and management of soft tissue injuries. It also facilitates care for the skin coverage, according to Bonnevialle [4].

Coverage flaps were performed in two patients (6.66%). The impossibility of covering the tibial fracture site with skin sutures in Cauchoix and Duparc stage III cases led us to perform coverage flaps. Fasciocutaneous flaps are useful when the area to be covered is small. They can restore sensation to the affected area when they are innervated, according to Zalavras [16]. This led us to perform two pedicled neuro-fasciocutaneous flaps harvested from the posterior aspect of the leg. The timing of coverage should be delayed, as was done in our study; this finding is similar to that of Kirk [22] and Heaton *et al*. [23].

In our series, we performed two cases of transfemoral amputation (6.67%). One was performed immediately due to a Gustilo and Anderson type IIIc open fracture, and the other was secondary to wet gangrene.

4.3 Outcomes / Follow-up

Skin healing was achieved in all our patients with an average time of 67.4 days, with a range of 15 to 90 days.

Bone consolidation was achieved in 28 patients with an average time of 195.1 days, with a range of 57 to 556 days.

Complications were dominated by infections (23.33%). This result is similar to that of Seck [8], who noted an infection rate of 21% in his study. Camara [6] reported a 13.5% infection rate in his series. Kakar and Tornetta [24] and Najeb [11] had fewer infectious complications.

We had a 3.33% rate of malunion in our study. This result is similar to that of Abdelaal [12], who reported a 7.3% rate of malunion in his study. In contrast, Camara [6] reported a malunion rate higher than ours at 29.88%. Garcia-Lopez *et al*. [13] had a 21% rate of malunion.

Nonunion accounted for 6.67% of cases in our series. Abdelall [12] and Camara [6] had rates of 5.5% and 5.7% in their series, respectively. Gracia-Lopez *et al*. [13] had noted a higher rate of nonunion in their study, at 26%.

All of these complications could be explained by the frequent location of open leg fractures in the distal third in our series. This area is poorly vascularized, which increases the risk of infection and nonunion.

Furthermore, the delay in treatment beyond 6 hours and the lack of resources to purchase medication may also be implicated.

Conclusion

Open leg fractures represent a major trauma emergency requiring rapid and multidisciplinary care. Accurate assessment and appropriate treatment, including trimming, stabilization and soft tissue coverage, are essential to optimize results.

References

1. Diao S. Les fractures ouvertes de jambe au Centre Hospitalier Universitaire Aristide Le Dantec [Thèse de doctorat en Médecine]. Dakar: UCAD/FMPO; 2014. No. 259.
2. Court-Brown C, McBirnie J. The epidemiology of tibial fracture. J Bone Joint Surg Br. 1995;77:417-421.
3. Cauchoix J, Lagneau P, Boulez P. Traitement des fractures ouvertes de jambe. Paris: Mém Acad Chir; 1964. p. 1520-1532.
4. Bonnevialle P. Indications chirurgicales dans le traitement des fractures ouvertes de jambe. Conf Enseig Sofcot. 2000;73:91-104.
5. Duparc J, Huten D. Conférences d'enseignement de la Sofcot. 1992;42:133-144.
6. Camara EHS. Fractures ouvertes de jambe à Dakar à propos de 666 cas [Thèse de doctorat en Médecine]. Dakar: Université de Dakar; 1985.
7. Simon JP, Hoogmartens M. The value of posterolateral bone-grafting for non-union of the tibia. Acta Orthop Belg. 1984;50:557-564.
8. Rouvière H, Delmas A. Anatomie humaine. Paris: Masson; 2022.
9. Edwards CC, Simmons SC, Browner BD, Weigel MC. Severe open tibial fractures: results of treating 202 injuries with external fixation. Clin Orthop. 1988;230:98-115.
10. Netter FH. Atlas d'anatomie humaine. Paris: Masson; 2009.
11. Bhandari M, *et al*. Treatment of open fractures of the shaft of the tibia: a systematic overview and meta-analysis. J Bone Joint Surg Br. 2001;83-B:62-68.
12. Abdelaal MA, Kareem S. Open fracture tibia treated by unreamed interlocking nail: long experience in El-Bakry General Hospital. [Unpublished manuscript].
13. Garbuio P, Tropet Y. Fractures ouvertes de jambe type III B avec perte de substance osseuse: intérêt de la greffe osseuse en urgence contemporaine de la fixation interne du squelette et de la couverture. [Unpublished data].
14. Be J, Agoh S, Coulibaly A, Kone S, Bana A, Toure S. L'enclouage centromédullaire des fractures ouvertes de jambe stade II au-delà de la 6e heure (étude prospective à propos de 42 cas). Rev Maroc Chir Orthop Traumato. 2001;4:33-37.
15. Ribault I, Gournier JP. Bilan de quatre années d'orthopédie et de traumatologie dans un CHR africain. Rev Chir Orthop. 1989;75:195-199.
16. Stotts NA, Wipke-Tevis D. Co-factors in impaired wound healing. In: Krasner D, Kane D, editors. Chronic

wound care. Health Management Publications; 1997. p. 64-72.
17. Masquelet AC, Bégué T, Court C. Fracture ouverte de jambe. EMC [Internet]. 1995 [cité 2024 avr 9]. Disponible sur: www.em-consulte.com/article/8208
18. Najeb Y, Abkari I, Massous A, Kechkar T, Latifi M, Essadki B. Résultats du traitement des fractures de jambe par un fixateur externe low cost d'adaptation locale. [Unpublished data].
19. Kirk NUS. War Department Army Service Forces. Office of the Surgeon General; 1943.
20. Anand J, Thakur J, Patankar J. Open tibial fractures treated with uniplanar external fixation and early bone grafting. J Bone Joint Surg Br. 1991;73-B:448-451.
21. Le Nen D. Fractures ouvertes de jambe: vingt ans d'expérience d'ostéosynthèses et de chirurgie des lambeaux. Mém Acad Natl Chir. 2011;10:25-32.
22. Karlström G, Olerud S. External fixation of severe open tibial fractures with the Hoffman frame. Clin Orthop. 1983;180:68-77.
23. Gustilo RB, Mendoza RM, Williams DN. Problems in the management of type III (severe) open fractures: a new classification of type III open fractures. J Trauma. 1984;24:742-746.
24. Jones KJ, Barnett HC. Cancellous bone grafting for non-union of the tibia. J Bone Joint Surg. 1955;37:1250-1260.

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