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## Results of internal osteosynthesis of open fractures type I and II Gustilo and Anderson: About 125 cases

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### Abstract

**Purpose:** To report the results of internal osteosynthesis of Gustilo and Andersson type I and II open fractures in our department.

**Materials and Method:** This was a prospective study, descriptive type, carried out at the Traumatology-Orthopedics and Reconstructive Surgery department of the Niamey National Hospital in Niger; from August 1, 2022 to January 1, 2023 (5 months). All patients of both sexes admitted for open fracture type I or II of the Gustilo and Anderson classification and treated with internal osteosynthesis during our study period were included. The parameters studied were epidemiological, clinical, paraclinical, therapeutic, and evolutionary.

**Results:** In 5 months, the frequency of Gustilo and Anderson type I or II open fractures treated by internal osteosynthesis was 10.99%. There was a male predominance of 84.80% (n= 106) and a sex ratio of 5.58. The average age of the patients was 31.12 years; with extremes of 5 years and 75 years. Road traffic accidents were the first circumstance to occur in 79.20% (n=99). The majority of fractures were Gustilo and Anderson type II, 71.20% (n=129). The pelvic limb was mainly affected 81.75% (n=148). The fracture line was simple in 80.66% (n=146) and complex in 19.34% (n=35) of cases. Therapeutically, the treatment was in all cases surgical, and consisted of internal osteosynthesis; which was postponed in 71.20% (n=129) and carried out urgently in 28.80% of cases (n=52), the screwed plate was the most used material in 60.97% (n=110). The results were mostly satisfactory 93.60%. Infection (10 cases) and nonunion (2 cases) were noted.

**Conclusion:** Gustilo and Andersson type I or II open fractures of the limbs are common at the Niamey National Hospital. Road traffic accidents constitute the first circumstance in which these traumas occur. Internal osteosynthesis was the surgical modality used to treat these fractures and the results were mostly satisfactory.

**Keywords:** Open fractures, internal osteosynthesis, results, Niamey

### Introduction

The open fracture is a solution of bone continuity whose fracture site communicates with the outside via a soft tissue wound. It is called type I of the Gustilo and Anderson classification, when the skin opening is clean, and less than 1 cm in size, healthy adjacent tissues, without crushing, it is low energy, the line is simple and of type II, when the skin opening is greater than 1 cm without significant damage, loss of substance or avulsion. With slight comminution and moderate contamination. It is medium energy. These type I and II open fractures are common and represent 3.70% to 14.64% of all fractures <sup>[1, 2]</sup>. These fractures constitute a medical-surgical emergency <sup>[3]</sup>. Internal fixation using an external fixator is the most common surgical treatment for open fractures. The aim of this work is to report the results of internal osteosynthesis of Gustilo and Anderson type I and II open fractures in our department.

### Materials and Methods

This was a prospective study, descriptive type, carried out at the Traumatology-Orthopedics and Reconstructive Surgery department of the Niamey National Hospital in Niger, over a period of 5 months from August 1, 2022 to January 1 2023. Were included in the study patients of both sexes, of any age admitted for open fracture type I or II of the classification of Gustilo and Anderson <sup>[4]</sup> and treatment by internal osteosynthesis. The parameters studied were epidemiological, clinical, paraclinical, therapeutic, and evolutionary.

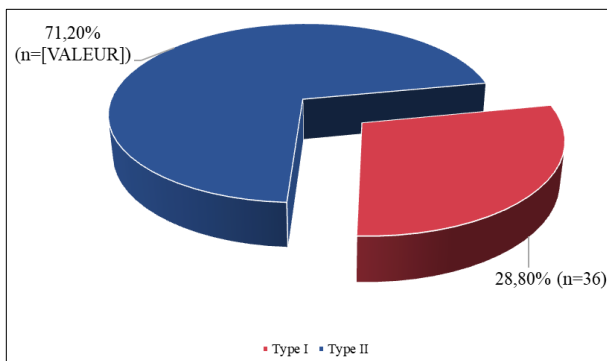
The functional result was judged, after fracture union, on the basis of clinical and functional criteria by the DASH Quick score [5] for the thoracic limb and the LEFS (Lower Extremity Functional Scale) criteria [6] for the lower limb. . The score obtained made it possible to classify patient results into excellent, good, average and poor.

Results In 5 months we recorded 1137 patients in the Orthopedic Traumatology and Reconstructive Surgery department of the Niamey National Hospital, including 125 cases of open fractures type I and II of Gustilo and Anderson having benefited from internal osteosynthesis, i.e. frequency of 10.99%. There were 106 men (84.80%) and 19 women (15.20%) or a M/F sex ratio of 5.58. The average age was 31.12; with extremes of 5 years and 75 years. The age group of 15-30 was the most represented with 48.80% (n= 61). Clinically, road traffic accidents were the first circumstance to occur in 79.20% (n=99). Table I reports the circumstances of occurrence of Gustilo and Anderson type I and II open fractures

**Table 1:** Distribution of patients according to the circumstances of occurrence

Circumstances of the trauma	Workforce(n)	Pourcentage (%)
Road traffic accident	99	79,20
Work accident	9	7,20
Assault by firearm	7	5,60
Domestic accident	4	3,20
Playful accident	3	2,40
Assault by stabbing	3	2,40
Total	125	100

The average time to admission was 3 hours 95 minutes, extremes of 15 minutes and 7 days. Type II fractures were the most represented 71.20% (n=89). Figure 1 gives the distribution of open fractures according to type I and II of the Gustilo and Anderson classification.



**Fig 1:** Distribution of patients according to the two types (I and II) of the Gustilo and Anderson classification.

Radiologically, the fracture line was simple in 72.00% (n=90) and complex in 28.00% (n=35) of cases, and in 79.69% (n=102) the fracture was located to the pelvic limb. Fractures of the two bones of the leg were the most represented 42.19% (n=54), followed by fractures of the femur 19.53% (n=25), on the thoracic limb open fractures of the hand were the most frequent with 7.82% (n=10).

Therapeutically, the treatment was medico-surgical. Medical treatment consisted of the administration of step 2 analgesic (tramadol), antibiotic prophylaxis (3rd generation cephalosporin and metronidazole combination), anticoagulant (low molecular weight heparin) and

prevention of tetanus according to vaccination status. of the patient.

Surgical treatment consisted of careful debridement of the wound in all patients, reduction of the fracture and osteosynthesis by internal fixation, immediately carried out in 28.80% (n=36) of cases and deferred. in 71.20% (n=89).

It consisted of a screwed plate in 60.20% (n=76), a pinning in 28.80% (n=36); intramedullary nailing in 4.88% (n=6). Table II shows the distribution of patients according to the equipment used.

**Table 2:** Distribution according to the osteosynthesis material used

Ostéosynthesis means	Workforce (n)	Pourcentage (%)
Screwed plates	76	60,20
Broches	36	28,80
Intamédullary nail	6	4,88
screw	5	3,68
Stay	2	2,93
Total	125	100

The average length of hospitalization was 15.82 days, range 2 and 65 days. The surgical consequences were simple in 84.80% (n=106) and complicated in 19 cases (19.20%), mainly infection of the surgical site 8% (n=10). The average duration of bone union was 5 months and 20 days and follow-up at 7 months noted 7 cases of pseudarthrosis and 6 cases of osteitis. According to the functional scores of DASH Quick and LEFS (Lower Extremity Functional Scale), the results were classified as excellent in 84% (n=105) of patients, good in 9.60% (n=12); average in 3.20% (n=4) and poor in 3.20% (n=4).

**Discussion**

Gustilo Anderson type I and II open fractures are common and represent 10.99% of patients treated in our department. The frequency of Gustilo Anderson types I and II noted in our study is higher than those reported by de Court-Brown C. [1], Sha A [7] and Nivoarivony N. [8] which are respectively 3.70% ; 6.94% and 7.47% but lower than that of Moyikoua A. [2] in Congo, who obtained 14.64%. In our context, this can be explained by the increase in two-wheeled vehicles, the state of the roads and the recklessness of users. In our series the average age was 31.12 years with extremes of 5 years and 75 years. The age group of 15 to 30 years old was the most represented with 48.80% (n= 61). There is a male predominance, with 106 men (84.80%) and 19 women (15.20%), i.e. a M/F sex ratio of 5.58. These epidemiological data can be superimposed on those reported by certain African authors [9, 10, 11]. The male predominance found in our study was also reported by Ralahy F. [11] in Madagascar 2018 and Odoyoh D. [12] in Nigeria/2019. This predominance of young male subjects could be explained by the fact that in countries, such as Niger, young adult males go out to look for something to provide for the family's needs, and use two-wheeled vehicles more. , are reckless and are therefore more exposed than women to road traffic accidents. Just as in our study (79.20%), road traffic accidents constituted the first occurrence of type I and II open fractures of the limbs in the series carried out by Da S. [13] and Kouassi K. [14]. In terms of injury, Gustilo and Anderson type II open fractures were the most represented 71.20% (n=89), the predominance of type II was found by Moyikoua A.I. [15], This could be explained by the violence of the shock in road traffic accident trauma. In 79, 69%

(n=102) the fracture was in the pelvic limb, the leg bones were the most affected in 42.19% (n=54). Our results are comparable to those reported by Mba C. [16], Sanogo A. [17] and Court-Brown C. [3], with respectively 52.40%; 54.55% and 44.70 this is explained by the fact that the leg is very exposed and is just covered by the skin on the anterior surface which receives the pus from the shocks. Surgical treatment consisted of careful debridement of the wound in all patients, reduction of the fracture and osteosynthesis by internal fixation, immediately carried out in 28.80% (n=36) of cases and deferred. in 71.20% (n=89). As in our series for Melvin's team [18], internal fixation was used exclusively. For him, the external fixator increases the risk of infectious complications occurring. On the other hand, for Dubrana [19], the external fixator constitutes the method of choice for stabilizing open fractures. During our study, the screwed plate was the most used osteosynthesis material with 60.97% of cases (n=125). Our result is similar to that of Ndayisaba G [20] in Africa, with 49%; but different from that of authors from the North including those of Avilucea F. [21] in the United States, Laigle M. [23] in France and Cinalli E. [23] in Argentina who found respectively 83.33%; 100% and 100% use of intramedullary nailing. This difference is explained by a difference in technical platform. The postoperative course was simple in 84.80% (n=106) and complicated in 19 cases (19.20%), mainly infection of the surgical site 8% (n=10). Our results are superimposable to those of Badio S. [24] and Handy E. [25] who found 21.62% and 13% complications respectively. They are higher than those of Wang J-P [26] who found 4%, and much lower than those of Diallo M. [27] who found 45.46%. This fluctuation in the complication rate is multifactorial (patient and plateau). The average duration of bone union was 5 months and 20 days and the follow-up at 7 months noted 7 cases of pseudarthrosis and 6 cases of osteitis. The evaluation of the care according to the functional scores of DASH Quick and LEFS (Lower Extremity Functional Scale), classified the patients as excellent in 84% (n=105), good in 9.60% (n=12); average in 3.20% (n=4) and poor in 3.20% (n=4) of cases. Our results are superior to those of Diallo M. [27] and Joshi D. [28] who found 74% and 85.70% good results respectively. They are superimposable to those of Faseeh S. I [29], Wang J-P. [26]; Traoré A. [30]; Agrawal A. [31] and Kone S. [32], who obtained 91% respectively; 92%; 92.30% and 93.40%. Our results are lower than those of Laigle M. [23] and Kaushik [33] who found respectively; 97.60% and 100%. These excellent results recorded in our series could be explained by the early treatment of our patients and the choice more focused on internal fixation.

## Conclusion

Type I and type II open fractures of the limbs are common at the Niamey National Hospital and predominate in young male subjects. Road traffic accidents constitute the first circumstance in which these traumas occur. Internal fixation was the only surgical modality. In the vast majority of cases, post-surgical results were good.

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