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Management, Anatomical and Functional Outcomes of Malleolar Fractures at the District Teaching Hospital of Oueme-Plateau in Benin (DTH-OP)

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Abstract **Original Research Article**

***Introduction*:** Malleolar fractures are commonly treated in orthopedic traumatology. The purpose of this study was to describe the management and evaluate the anatomical and functional outcomes of these fractures. ***Patients and Methods*:** In this study, 106 patients were treated for malleolar fractures. The mean age was 41.8 years, with 70 men (66%) and 36 women (34%). Therapeutic methods were either orthopaedic (n=57; 54%) or surgical (n=49;46%). The initial anatomical results were evaluated according to Lecestre et Ramadier, criteria and the functional results were assessed using the AOFAS score. ***Results*:** Anatomical reduction was performed on 65 (61.3%) patients, of whom 28 (26.4%) were treated orthopedically and 37 (34.9%) underwent osteosynthesis. At the last follow-up, of the 79 patients (74.5%) reviewed, 41 (51.9%) had excellent functional results and 17 had good results. ***Conclusion*:** At DTH-OP, malleolar fractures are relatively common. The treatment is either orthopedic or surgical depending on the type of fracture and the patient's financial ability to bear the costs.

Keywords: Malleolar fractures, orthopedic traumatology, DTH-OP, AOFAS score.

INTRODUCTION

Malleolar fractures are commonly treated in orthopedic traumatology [1-4]. They affect all genders and ages, but are more prevalent in young males after a road traffic accident [2-6]. The treatment of these injuries can be either orthopedic or surgical [6, 7]. In developed countries, the general trend is towards surgical treatment, while in developing countries like ours, orthopedic treatment is still widely applied [8-6].

The aim of this study was to describe the management and evaluate the anatomical and functional outcomes of these fractures at the District Teaching Hospital of Ouémé Plateau (DTH-OP).

METHODS

This is a retrospective, descriptive, and analytical study covering a period of 5 years from January 1st, 2018, to December 31st, 2022. It was carried out in the surgical department at the District Teaching Hospital of Ouémé Plateau (DTH-OP). It included the medical records of patients aged 15 years or older who were admitted and treated for ankle fractures with a minimum follow-up of 6 months.

Patients under 15 years old who require pediatric surgery, patients with incomplete or unusable medical records, and patients with old ankle fractures were excluded from this study. Patients with pathological fractures, fatigue fractures, and those who left against medical advice were also excluded.

The mean age of the patients was 41.8 +/- 14.5 years (16-92). There were 70 (66%) male and 36 (34%) female patients, resulting in a sex ratio of 1.9. Fractures were caused by road accidents (RAs) in 78 cases (73.7%), home accidents (HAs) in 20 cases (18.8%), sports accidents (SAs) in 5 cases (%), and work accidents (WAs) in 3 cases (2.8%). Table I shows the distribution of fractures according to the *AO* classification. According to *Duparc et al., not*'s classification, there were 15 (14.1%) cases of type I fracture, 85 (80.2%) cases of type II fracture, and 6 (6.7%) cases of type III fracture.

Regarding the type of malleolar fracture, there were 39 (36.8%) bimalleolar fractures, 28 (26.4%) lateral malleolus fractures, 23 (21.7%) medial malleolus fractures, 10 (9.4%) equivalent bimalleolar fractures, and 6 (5.6%) trimalleolar fractures. The series included 9 (8.5%) open fractures and 15 other skin injuries classified according to *Tscherne et Götzen*. Twenty associated injuries were noted: 9 (45%) skin injuries, 5 (25%) tibio-talar dislocations, 2 (10%) tibial pestle fractures, 3 (15%) tibial diaphyseal fractures, and 1 (5%) postero-lateral tibio-talar subluxation.

Table I: Distribution of fractures according to *AO* classification

	Type	Number / Percentage	
	A1	12	11.3
Type A	A2	11	10.4
	A3	3	2.8
	B1	20	18.9
Type B	B2	15	14.1
	B3	30	28.3
	C1	9	8.5
Type C	C2	4	3.8
	C4	2	1.9
Total		106	100

Therapeutic Protocol

The orthopedic treatment consisted of initial reduction, if necessary, followed by immobilization using a femoropedic cast or a plaster boot. In the case of open fractures, this immobilization followed a parage-suture after which a window was made in the cast to facilitate local care. When this window weakened the immobilization, a cove was made to reinforce it. The femoropedic immobilization was maintained for 4 to 5 weeks, after which the knee was freed by partially removing the cast or completely removing it and applying a boot, which was worn for 2 to 3 weeks.

Fractures with significant skin lesions such as blisters were treated with an external fixator.

Open-focus surgery used a screwed plate onto the fibula and/or one or two screws on the medial malleolus. Occasionally, a tension band was used to treat the medial malleolar fracture.

Evaluation Methods

The following variables were studied: time to treatment initiation, type of orthopedic treatment, type of surgical treatment, immobilization time, complications, initial anatomical results according to *Lecestre et Ramadier* criteria (Table II), and functional results according to the *AOFAS* score (Table II).

Table II: AOFAS functional score. +++++

Results	Criteria
Good	Anatomical reduction
Fair	Displacement less than 4mm, Widening of the clamp, absence of tilting, Absence of posterior subluxation
Poor	Displacement more than 4mm, Transverse tilt, Posterior subluxation

The data collected through our survey was encoded using a data entry mask in EPI DATA version 22.1 software, following the steps below: variable coding, computer input, and result summary table setting. We also created diagrams and charts for certain variables using Microsoft Excel 2013 software. The mean and standard deviation were used to describe the quantitative variables. Statistical analyses were conducted with a 95% confidence interval. Fischer's test and chi-square test were used to compare the data.

RESULTS

The average pre-therapeutic delay for orthopedic treatment was 26 hours, ranging from 3 hours to 5 days. The average delay for surgical treatment of closed fractures was 35 hours, ranging from 18 hours to 21 days. For open fractures, the average delay was 8.2 hours, ranging from 4 hours to 72 hours.

Table III: shows the distribution of patients according to the treatment time and treatment type.

	orthopedic (%)	surgical (%)	Total (%)
Less than 24 h	31 (29.3)	10 (9.5)	41 (38.7)
24h -72h	22 (20.7)	27 (25.5)	49 (46.2)
72h -7 days	03 (2.9)	07 (6.6)	10 (9.5)
After 7 days	01 (0.9)	05 (4.6)	6 (5.5)
Total	57 (53.8)	49 (46.2)	106 (100)

Thirty-one patients (29.3%) received orthopedic treatment within 24 hours following the accident. Twenty-seven patients (25.5%) underwent surgery between the 24th and 72nd hour.

Orthopedic treatment involved primary reduction, when necessary, followed by immobilization using a femoropedic cast in 37 cases (65%), a plaster boot in 16 cases (28%), and transcalcaneal traction followed by a femoropedic cast in 4 cases (7%).

Figure 1 shows the distribution of patients based on the type of orthopedic treatment and fracture type (according to *DUPARC et al., NOT*).

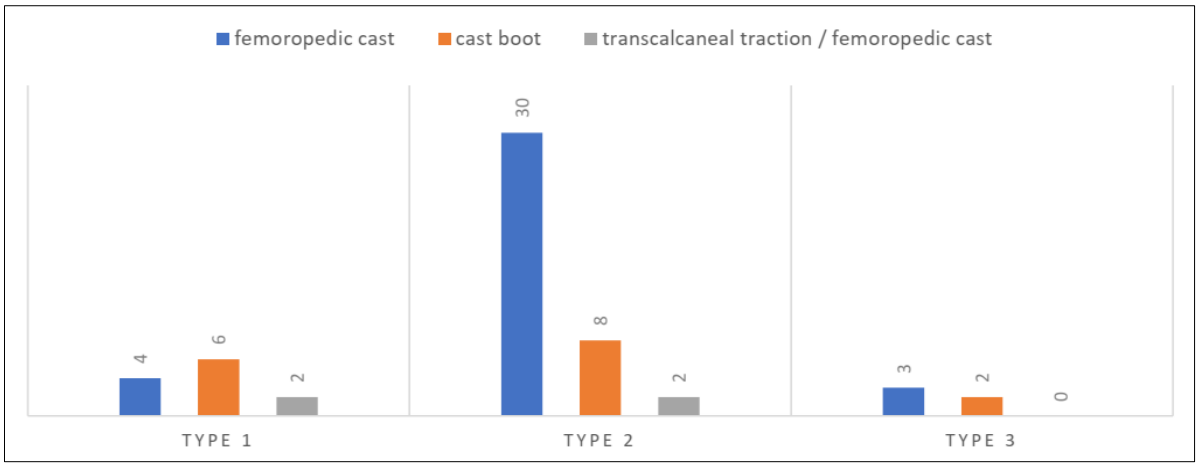

Figure 1: Distribution of patients based on the type of orthopedic treatment and fracture type

The average immobilization period was 5.9 weeks, ranging from 4 to 10 weeks. The femoropedic cast was worn for around 4 weeks and then replaced with a boot cast to free the knee.

Figure 2 shows the distribution of patients based on the type of osteosynthesis and skin condition.

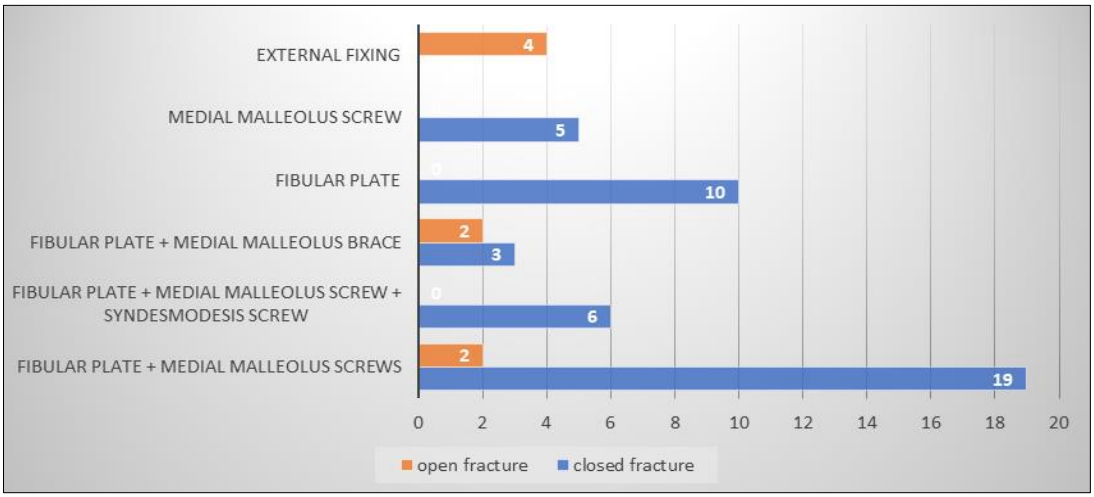

Figure 2: Distribution of patients based on the different types of osteosynthesis and skin condition

Thirty-eight (38) patients had additional immobilization with a posterior plaster splint. The average duration of immobilization was 2.1 weeks with a range of 5 days to 3 weeks. The syndesmotic screw was removed on average after 5.6 weeks with a range of 5 to 7 weeks.

Figure 3 shows the distribution of patients according to the initial anatomical results (*LECESTRE et RAMADIER* criteria).

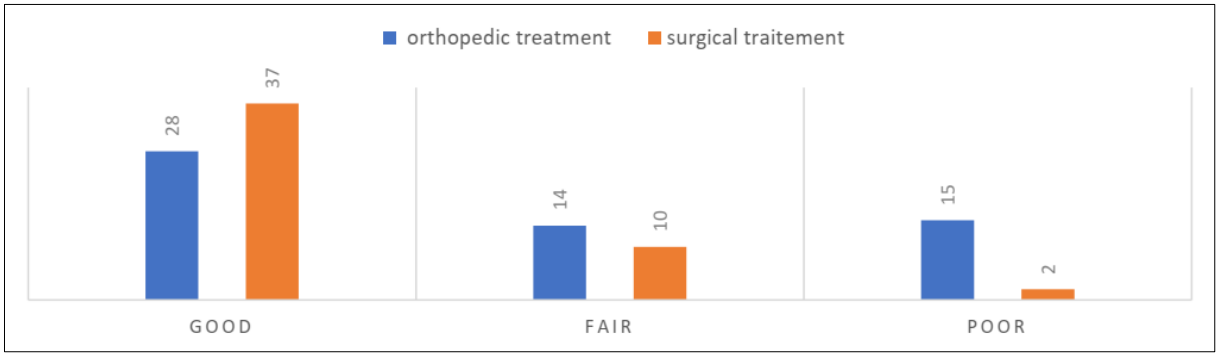

Figure 3: Initial anatomical results according to *LECESTRE et RAMADIER*.

Out of the total number of patients, 65 (61.3%) underwent anatomical reduction, 28 (26.4%) received orthopedic treatment, and 37 (34.9%) underwent osteosynthesis.

Twelve patients (11.3%) had secondary complications. These included 7 (6.6%) surgical site infections, which were successfully treated with local care and antibiotics, 3 (2.8%) cases of skin necrosis treated with local care and antibiotic therapy, 3 (2.8%) skin necroses treated with local care, chemical detersion and directed healing and 2 (1.9%) cases of secondary displacement under plaster, which were subsequently treated with osteosynthesis.

Late complications were found in 18 (17%) patients, including 10 (9.6%) cases of malunion with 2 symptomatic cases and 8 (7.5%) cases of algodystrophy.

At the last follow-up, 79 (74.5%) patients were reviewed. Figure IV shows the quality of the functional outcome (AOFAS score) according to the type of treatment.

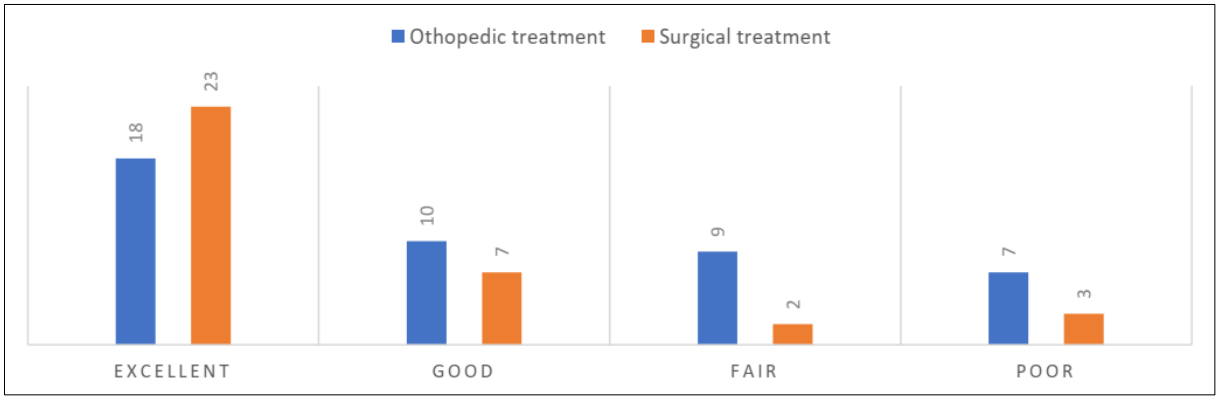

Figure 4: Distribution of patients based on aofas score at the last follow-up

Forty-one patients (51.9%) achieved excellent functional results. There was no statistically significant correlation between the quality of the final functional outcome and the type of treatment (p=0.41).

DISCUSSION

In our workplace, the treatment options for malleolar fractures are either orthopedic or surgical. While the windowed cast with cove was developed by the Cotonou school (Benin) [8], several authors have reported on the orthopedic treatment option [7], particularly in resource-limited countries [8, 9]. The surgical treatment involves open surgery with either internal or external fixation.

Ninety-five percent of *Yao*'s patients [9], received orthopedic treatment. *Chigblo* [8], reported 24 orthopedic treatments out of 41 patients, while *Lecerf*'s series [7], included 50 patients, all of whom were treated orthopedically. Orthopedic treatment is an option when patients cannot afford surgery [4-11], but also for non-displaced or reduced and stable fractures [7-4]. According to *Lecerf* [7], the most important aspect is the centering of the talus, which should not allow any imperfections during the reduction process.

The pretherapeutic delay was due to several factors. They included the patient's financial ability to pay for treatment (lack of social security), the availability of osteosynthesis material, and the open or closed nature of the fracture. Situations varied widely: some open fractures were managed 72 to 96 hours after patient admission, while some closed fractures were operated on in less than 24 hours. These difficulties, which lengthened the pre-therapeutic delay, were also reported by several authors from developing countries [9-12].

The means of orthopedic treatment were the morphopedic plate, the boot cast, or in the case of important cutaneous lesions, a transcalcanean traction and then a boot cast. The immobilization is based on an ordinary or synthetic plate. These means are those reported in the literature [5-12].

The surgical treatment was based on a screwed plate for the fibula, and screws or pins and steel wire for the medial malleolus (bracing). The damage of the tibiofibular syndesmosis was treated with a tricortical syndesmosis screw. The screw removal was scheduled around the 6th postoperative week. The management of syndesmosis is discussed in the literature [13-16].

Some fractures (open or with significant skin lesions) were treated with an external fixator. The use of this means of fixation has been reported by some authors [17-21]. Other means, such as the fibular nail, have been reported [17-23].

According to *LECESTRE et RAMADIER* [10], anatomical results were good or fair for orthopedic treatment in 42 cases out of 57 (73.7%) and in 47 cases out of 49 (85.7%) for surgical treatment. Surgical treatment gave better results. However, there was no significant statistical difference between the two

methods (p=0.41). This conclusion was shared by several authors of literature [8, 9].

Secondary complications such as surgical site infection, secondary displacement and skin necrosis were found in our series. These complications have been reported in the literature with highly variable rates [4-12]. In his series, *Heim* [24], did not find any complications.

Late complications were dominated by malunions of which few were symptomatic. Several authors in the literature have reported the frequency of malunions and their asymptomatic or minimally symptomatic nature [5-8].

According to the *AOFAS* score, results at last follow-up were excellent and good in 28 cases out of 57 (49.1%) for orthopedic treatment and in 30 cases out of 49 (61.2%) for surgical treatment. These results are similar to those reported in [25-27].

The limitations of this study are its retrospective, monocentric nature and the reduction in the size of the population at the end of the study.

CONCLUSION

In DTH-OP, the malleolar fractures are relatively frequent. Their treatment is orthopedic or surgical depending on the type of fracture, but also depending on the patient's financial ability to pay for the treatment. The surgical treatment gave better results without a significant statistical difference compared to the orthopedic treatment.

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