

Open Fractures of Limbs by the Bite of Domestic Donkeys: An Unusual Aetiology

Mohamed Sidibé^{1*}, Mohamed Lamine Bah², Fodé Mahamoud Sylla², Tafsir Camara², Serge Ntungwanayo¹

¹Orthopedic-Traumatology Department of the Tambacounda Regional Hospital, Tambacounda, Senegal ²Orthopedic-Traumatology Department of the Ignace Deen National Hospital in the Republic of Guinea, Conakry, Guinea Email: *besidi42@gmail.com

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Abstract

Introduction: The aim of this study is to describe the epidemiological, lesional, therapeutic and evolutionary profile of open fractures of limbs by bites of domestic donkeys. Patients and Methods: This is a prospective descriptive study over 28 months made in the Orthopedics-Traumatology department of the Tambacounda Regional Hospital in Senegal, concerning patients bitten by donkeys, resulting in an open fracture of the thoracic and pelvic limbs. Results: Twelve male patients were included. The average age was 10.50 years \pm 2.60. The most common circumstance was the bite when two donkeys were separated. The thoracic limbs were the most affected by the occurrence of the arm. Cauchoix-Duparc type II and AO A2 and B2 were predominant. The essential trimming/osteosynthesis was carried out within 24 hours of the bite. Serovaccination was systematic, but on the other hand, a single dose of anti-rabies serum was administered. Pinning was the most commonly used bone synthesis. Complications were mainly infectious, followed by a case of radial nerve palsy and non-union on pins. Conclusion: The typical profile of an open donkey bite fracture is a male child/adolescent who is bitten during the separation of two fighting donkeys. The lesions are most often found in the thoracic limbs with a predominance of Cauchoix-Duparc type II and type A2 and B2 fractures of the AO, whose treatment consisted of trimming and pinning. The infectious complications of the soft tissues marked the evolution.

Keywords

Open Fractures, Limbs, Bite, Donkeys

1. Introduction

Animal bites are a significant cause of morbidity and mortality worldwide and

represent a significant public health burden [1] [2]. About 85% - 90% of human bites are from dogs, 5% - 10% by cats, and 2% - 3% by humans and rodents [1]. Although bites caused by cattle, donkeys and camels have been described in the literature, their proportion remains relatively low [3] [4]. Open limb fractures caused by donkey bites are a rare or exceptional aetiology.

Tambacounda is an agro-pastoral region located in eastern Senegal. In this region, as in most African regions south of the Sahara, equids (donkeys and domestic horses) and dromedaries are used to transport people and their goods. They play an essential role in fieldwork and in transporting crops. The cohabitation between humans and these animal species is often not without consequences, and children are the layer that pays the heaviest price.

Our work aimed to describe the epidemiological, lesional, therapeutic and evolutionary profile of open fractures of limbs by bites of domestic donkeys.

2. Patients and Methods

This was a 28-month prospective descriptive study (May 2019 to October 2021) carried out in the Orthopedics-Traumatology department of the Tambacounda Regional Hospital. However, biting from animals has became more and more frequent in our milieu, taking cutaneous and bone damage; we decided to undertake this study in order to make a view of these lesions and how to manage them according to our medical realities.

We included in this study all the patients with an open fracture of the limbs following a donkey bite, diagnosis established on the basis of clinical and radiological elements. Excluded were bites that did not lead to a solution of bone continuity and wounds caused by hoof kicks.

Our data was collected as we received the cases. They were analyzed manually after obtaining oral consent.

The parameters studied were epidemiological, radio-clinical, therapeutic and evolutionary. We expressed the qualitative variables as a percentage and the quantitative variables as a mean plus or minus standard deviation.

3. Results

3.1. Epidemiological Aspects

During this study, 12 patients were recorded as victims of bites from Donkeys.

The average age of our patients was 10.50 years \pm 2.60 with extremes of [7 years and 16 years]. All patients were male. The average consultation time was less than 24 hours (n = 9). The left side was affected seven times. The most reported circumstances were six times during the separation of the donkeys, three times during the raising of the animal after a fall, twice a bite secondary to provocation and a bite following abuse during animal traction.

3.2. Radio-Clinical Aspects

The thoracic limb (n = 9) was the predominant seat of the bites, with respective-

ly three times the arm and twice the elbow, the forearm and the wrist.

Cauchoix and Duparc type II (n = 7) (Figure 1(a)) was the most observed, followed a type I (n = 3) and III (n = 2) (Figure 1(b)).

The fractures were classified according to AO A1 (n = 1), A2 (n = 4) represented by **Figure 2(a)**, A3 (n = 2), B2 (n = 4) represented by **Figure 2(b)** and **Figure 2(c)**,



Figure 1. (a) Clinical aspect of an open fracture of the 02 bones of the forearm type 2 Cauchoix-Duparc; (b) Clinical aspect of an open humeral fracture type 3 of Cauchoix and Duparc.



Figure 2. (a) Fracture of the 02 leg bones (42A2); (b) Distal femur fracture with angulation (32A2); (c) Radiological appearance of an oblique overlapping humeral fracture (12B2); (d) Radiological appearance of a fracture of the 02 bones of the forearm (22B3).

B3 (n = 1) represented by (**Figure 2(d)**).

3.3. Therapeutic Aspects

The average operating time was more than 24 hours in six patients. On admission, all patients received anti-tetanus serovaccination and a single dose of rabies vaccine.

They were admitted to the operating room under general anaesthesia; trimming was performed on all patients. It consisted of much washing of the wound using 0.9% isotonic dirty serum and dermal Betadine initially. Exploration of the wound and excision of necrotic or necrotic tissue constituted the second phase. The last stage consisted of repairing the injured tissues and bone fixation either by pinning (n = 5) (**Figure 3(a)**) or by screwed plate (n = 4) (**Figure 3(b)**) or by plaster cast support (n = 3).

Postoperatively, local care was performed according to the type of opening. The analgesic was used every 6 hours in all our patients. Antibiotic prophylaxis was instituted for five days in all our patients.

The average duration of hospitalization was seven days with extremes of [1 and 19 days].

3.4. Evolutionary Aspects

The postoperative course was simple in nine patients (wound healing, no surgical site infection).

We noted superficial (n = 3) and deep (n = 1) infection-type complications (Figure 4(a)). A case of radial nerve palsy (Figure 4(b)) associated with pseudoarthrosis of the humerus was observed (Figure 4(c)).

All the demographic data, the characteristics of the initial management, and







Figure 4. (a) Infection of the deep soft tissues of the arm; (b) Paralysis due to radial nerve damage; (c) Pseudarthrosis on the humeral pin.

the complications are summarized in Table 1.

4. Discussion

This study is the very first in sub-Saharan Africa, to my knowledge. Open fractures are solutions of bone continuity whose fracture site communicates with the surrounding external environment through a wound. The greater the degree of opening, the greater the risk of contamination [5]. Their aetiology is dominated by road traffic accidents followed by sports accidents, work accidents and ballistic trauma [6].

However, animal bites constitute a significant aetiology due to their rare and infectious nature.

In general, donkey bite is observed in children during the first two decades of life. [7] In our context, we found that the donkey only bites male children. This situation could be explained by their small size, their turbulence, their naivety and above all, by the fact that they are the actors involved in fieldwork, unlike the young girls who stay with their mothers for domestic chores.

The bite during the separation of two donkeys was the most found circumstance. Some authors have already reported it in their work [7].

However, one circumstance caught our attention. It is an open fracture of the femur caused by a donkey bite during animal traction practised by three children. The bitten held the donkey by the rope in front, the second pushed the plough back and the last next to the second, beat the animal to speed up the pace of work. Suddenly, under the effect of the lashes from behind, the donkey bit the

No	Age in years	Segment Achieved	Type of Cauchoix- Duparc	Line and location of the fracture (AO)	Circumstances of occurrence	Operating time	type of treatment	Duration hospi in days	Complications
1	10	Arms	Π	Lower 1/3 of the humerus (12B2)	Separation of donkeys	Less than 24 hours	Trimming + screwed plate	04	Deep soft tissue infection
2	11	Thigh	Ι	Lower 1/3 of the femur (32B2)	Bite as a result of abuse	Less than 24 hours	Trimming + screwed plate	05	None
3	10	Leg	Ι	Middle 1/3 of the leg bones (42A2)	Bearing donkey	72 h	Trimming + screwed plate	03	None
4	07	Elbow	Π	Humeral pallet (12A2)	Raising the donkey	48 h	Trimming + screwed plate	09	None
5	12	Forearm	Π	Middiaphyseal of 02 bones (22B3)	Separation of donkeys	Less than 24 hours	Trimming + Spitting	09	Superficial soft tissue infection
6	08	Forearm	Π	Lower 1/3 (22A3)	Separation of donkeys	96 h	Trimming + Spitting	03	None
7	07	Leg	III	Lower 1/3(42A2)	Provocation bite	72 h	Trimming + Boot splint	19	None
8	13	Elbow	Π	Humeral paddle (12A2)	Separation of donkeys	72 h	Trimming + Racking	08	None
9	12	Wrist	Π	1/4 distal of the 02 bones (22A3)	Separation of donkeys	Less than 24 hours	Trimming + Racking-in	10	None
10	08	Arms	II	Lower 1/3 of the humerus (B2)	Bearing donkey	Less than 24 hours	Trimming + BABP splint	02	None
11	16	Wrist	Ι	1/4 distal of the ulna (22A1)	Separation of donkeys	72 h	Trimming + Cuff Splint	01	Superficial soft tissue infection
12	12	Arms	III	Midshaft of the humerus(12B2)	bite suite provocation	Less than 24 hours	Trimming + Racking-in type hacke tall	16	Radial nerve palsy + superficial skin infection

Table 1. Summary of patients' epidemiological, anatonoclinical, therapeutic and evolutionary data.

one holding him by the rope. We believe this is the first description made in the literature.

Usually, donkey bites are in the thoracic limbs.

However, no part of the body can be spared. They can involve the cephalic extremity, the pelvic limbs and sometimes even the external organ genitals of young boys [7] [8] [9].

One of the main consequences of animal bites is the traumatic loss of skin substance, muscle, tendon or nerve damage and bone fractures. Three types of forces can be incriminated in the mechanics of the bite [10]:

- The shearing forces are related to the sharpness of the teeth. They cause a blunt section lesion comparable to a scalpel blade. Low energy is thus transmitted to the injured tissues, and the devitalization is most often minimal.
- The tensile forces are responsible for the detachment of the skin from the subcutaneous tissue and tearing or tearing of the muscles.
- The compressive forces at the origin of the crushing of the tissues and gener-

ate swelling, ischemia and necrosis. Compression of the skin by the teeth can lead to puncture wounds or crush injuries, depending on the type of teeth involved. Sufficiently large compressive forces can cause bone fractures. They are the cause of the fractures of our patients. The biting donkey holds the bitten segment in a vice and the compression exerted is responsible for the fracture.

Sometimes, specific traction or subtraction manoeuvres of the bite may be responsible for the aggravation of the lesion.

On the therapeutic level, we trimmed all the patients by respecting the various stages. They all received anti-tetanus serotherapy. On the other hand, they received only one dose of anti-rabies serum contrary to the World Health Organization (WHO) recommendations, which are divided into five intramuscular injections on days d0, d3, d7, d14, d30 with an optional reminder at d90. In our context, this is justified by the fact that the burden of treatment falls on parents who generally have limited financial means. The choice of fixation technique after trimming was guided by the parents' ability to honour the intervention, the availability of the implants and the operator's preferences. In front of these contaminated open fractures.

The complications to be feared in the bites of donkeys and those of other animals are infectious. This is because bite wounds carry a risk of infection, which often occurs within the first 48 hours after injury. Infectious organisms most commonly originate from the bite's mouth but can also originate from the bite's flora or environment. In addition to the infectious complications noted, one patient presented a case of paralysis of the radial nerve following the bite. He also presented with septic pseudarthrosis of the humerus, which we attributed to rehabilitation.

The relatively low number of cases is a limitation of this study. However, recruitment may be extended to specific regions to conduct a multicenter study with higher data.

5. Conclusion

The typical profile of an open donkey bite fracture is a male child/adolescent who is bitten during the separation of two fighting donkeys. The lesions are most often found in the thoracic limbs with a predominance of Cauchoix-Duparc type II and type A2 and B2 fractures of the AO, whose treatment consisted of trimming and pinning. Infectious complications of the soft tissues marked the evolution. Therefore, we suggest early and rigorous management of these fractures to minimize the risk of complications.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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