CLINICAL REPORT

Paediatric open tibiofibular fractures following a donkey bite. A report of two cases

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KEYWORDS
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Summary Open tibiofibular fractures resulting from domestic animal bites are exceptional. We report two such cases, in patients of 11 and 13 years of age, and discuss the etiological, pathogenic, anatomic, and clinical aspects of these injuries. These were type III fractures according to the Cauchoix and Duparc classification. The fractures were treated with emergency wound care, wound dressing, and conservative orthopaedic treatment using a long leg cast for immobilization. Preventive parenteral antibiotics were also given. Evolution was favorable in both cases and the patients returned to their normal activities with no substantial disability.

Introduction

Open fractures of the leg are serious and are a medical emergency because they are responsible for many vascular, infectious, and compartmental complications. Children are subject to the same complications as adults but present certain particularities: excess growth and the modification of the tibial axis during growth, which manifests through progressive angular deviation of the tibial axis or the correction of an angular malunion [1].

Despite the progress made in managing open fractures of the leg, restoration of function after these lesions remains a problem [2].

The most frequent etiologies reported are traffic accidents [1,3]. Domestic animal bites are exceptional.

The association of a donkey bite and open leg fracture requires particular attention because of the very high risk of infection, notably of transmission of tetanus and particularly rabies, which leads to lethal encephalitis.

We report two cases of leg fractures resulting from a donkey bite in two children with a discussion of the etiological, pathogenic, anatomical, clinical, and progression factors.

Observations

Observation no. 1

Patient no. 1, a 13-year-old boy, no longer in school, was referred on 25 February 2003 from the Koutiala health center (500 km from Bamako) after emergency treatment (bandaging + antibiotics) on Day 2 after an open injury resulting from a donkey bite. He had been bitten in attempting to separate two donkeys fighting. At admission, the patient was
in good general condition, conscious and apyretic. He presented an open Cauchoix Duparc III fracture with a 3.5-cm contusion wound on the anterior third of the left leg with no vascular or nerve damage. AP and lateral X-rays of the left leg showed a type A3.3 transversal fracture at the middle third of tibia and fibula according to the AO classification [4], with a lateral translation.

Surgical exploration under general anesthetic found a contusion wound revealing the medial tibia with tearing of the periosteum and extension outside of the wound of the anterior tibial muscle aponeuropsis and superficial tissue damage. After cleaning the wound with physiological solution and debridement of the wound edges and devitalized tissue, the periosteum was sutured with Monocryl 4-0® and the aponeurosis left open. Despite subcutaneous detachment of the wound edges, the wound was only partially closed with loose, light-tension stitches. A paraffin dressing was applied, followed by a posterior full-leg cast. The physiological solution and the antitetanus vaccination were administered simultaneously. Parenteral amoxicillin antibiotics (1 g × 2 for 6 days) was initiated and then replaced by per os antibiotics for 10 days. The antirabies vaccination was begun on the fifth day after injury on Days 0, 3, 7, 14, and 30. A circular full-leg cast with a window at the wound was fit on Day 20, with the patient followed on an outpatient basis from this time. Radiographic follow-up took place one month later (Day 50) and showed bone consolidation but with tibiofibular synostosis (Fig. 1). The full-leg cast was replaced with a plaster boot, thus freeing the knee, and partial weight bearing was authorized. The cast was removed two weeks later on postoperative Day 65.

At eight months after surgery, walking was painless and without limping, the wound was healed but poor quality, invaginated and adherent to the medial aspect of the leg. The knee and the ankle were painless and had normal range of movement. The length of the two legs was identical and there was no axial deformation. The donkey causing the fracture had not been put down and remains alive without having bit another individual.

**Observation no. 2**

Patient no. 2, an 11-year-old schoolboy residing in Bamako consulted on 28 March 2003, two hours after his accident. He had been bitten by a donkey at the distal third of his left leg. The donkey reportedly dragged the child for several meters and was thereafter killed. At admission the child was conscious, in good general condition, and apyretic. He presented an open Cauchoix Duparc 3 fracture with two 3.5-cm contusion wounds on the distal third of the leg that were anteromedial and lateral, symmetrical in relation to the tibial crest with no vascular or nerve damage. He also presented dermabrasions on the lateral side of the right arm, forearm, and scapula. The radiological examination showed an oblique A2.3 fracture of the two bones of the left leg at the distal third according to the AO classification [4] (Fig. 2).

Surgical exploration found exposure of the tibial periosteum at the medial tibial wound. The anterolateral wound involved the skin, subcutaneous tissue, as well as the anterior intermuscular septum, and partial section of a few muscle fibers of the hallucis longus extensor muscle. After cleaning with physiological solution and excision of the contused muscular fibers and skin edges, subcutaneous detachment at the wound edges, the skin edges were sutured with loose stitches under slight tension. Paraffin dressing was then applied followed by immobilization with a full-leg cast. Parenteral amoxicillin antibiotic therapy (1 g × 2 for 6 days) was initiated, followed by per os treatment for another seven days. Physiological solution and the antitetanus vaccine were administered at admission. The antirabies vaccination was begun at Day 7 after injury, as for the first patient.
Table 1  Limb fractures by a donkey bite: review of the literature.

<table>
<thead>
<tr>
<th>Authors (year/city/reference)</th>
<th>Patient sex/age</th>
<th>Environment</th>
<th>Lesion area</th>
<th>Fracture</th>
<th>C&amp;D type</th>
<th>Initial treatment</th>
<th>Complications</th>
<th>Secondary treatment</th>
<th>Time to consolidation</th>
<th>Sequelae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloch (1976, Tel Aviv, [10])</td>
<td>M/2.5</td>
<td>?</td>
<td>Entire body</td>
<td>2 leg bones</td>
<td>?</td>
<td>Wound care + orthopaedic treatment</td>
<td>Death</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1st metatarsal</td>
<td>?</td>
<td></td>
<td>Wound care +?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Right forearm</td>
<td>2 forearm bones</td>
<td>?</td>
<td>Wound care + pins</td>
<td>Infection (soft tissue and bone)</td>
<td>Bone graft + plate and screw fixation</td>
<td>?</td>
<td>Wrist and finger stiffness</td>
</tr>
<tr>
<td>Our cases (2003, Bamako)</td>
<td>M/13</td>
<td>Rural</td>
<td>Leg</td>
<td>2 leg bones</td>
<td>III</td>
<td>Wound care + orthopaedic treatment</td>
<td>—</td>
<td>—</td>
<td>70 days</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>M/11</td>
<td>Urban</td>
<td>Leg</td>
<td>2 leg bones</td>
<td>III</td>
<td>Wound care + orthopaedic treatment</td>
<td>—</td>
<td>—</td>
<td>70 days</td>
<td>—</td>
</tr>
</tbody>
</table>

C&D type: Cauchoix and Duparc fracture type.
The search for Negri bodies (a rabies marker) in the donkey's brain were positive. Progression was favorable, with wound healing obtained at Day 28, when below, the knee cast was made. Partial weightbearing was authorized at Day 45. Radiographic follow-up on Day 70 showed bone healing. Nine months after surgery, the patient had resumed his daily activities, with no pain or limping; no limitation in mobility of the knee or the ankle was noted. There was no axial deviation and both lower limbs were identical in length.

**Discussion**

**Frequency**

Animal bites are frequent lesions. Smith et al. [5] estimated that half of Americans are bitten by an animal or a human in their lifetime. These bites are a public health problem in developed countries [5,6], with dog bites the most frequent (80—90%) [6—8], followed by cat and then human bites, with donkeys and horses only rarely biting humans [5,6].

One case of open fracture of both bones of the forearm in a single patient bit by a donkey [9] and another case with both bones of the leg and the first metatarsal in a child [10] have been reported (Table 1). To our knowledge, the case reported by Toovey et al. [11] in 1976 is the only case of an open fracture of both bones of the lower leg caused by a donkey bite.

**Severity**

Donkey bites, like other animal bites, are serious. The severe functional and esthetic consequences are added to the risk of rabies transmission (one of the donkeys reported herein was rabid). The association of this bite with bone involvement is an aggravating factor because it increases the risk of rabies transmission and exposes the patient to bone infection. The vital prognosis can be put in danger: Bloch [10] reported the death of a 2.5-year-old child bit by a donkey in less than 24 hours, whose autopsy revealed massive cerebral embolism.

**Lesions**

Bite lesions for the most part involve the soft tissues with predominantly cutaneous lesions. Different types and stages of severity can be encountered depending on the animal, the age of the victim, and the lesion area.

The young age of our patients may explain the fractures observed. The observation reported by Toovey et al. [11] in which a 44-year-old woman was bitten on the leg by a zebra and had significant cutaneous lesions but no bone involvement supports this hypothesis.

The tibiofibular synostosis observed is the probable consequence of breaking the tibiofibular interosseous membrane or the direct section of the aponeurosis by the bite. Donkey bites can therefore be considered high-energy injuries. Goldstein [12] estimates the biting force of large dogs to be approximately 32 kg/cm².

**Mechanism**

We believe that in the first case the fracture was related to the power of the donkey bite, as demonstrated by the tibiofibular synostosis. In the second case, however, two mechanisms were involved: the power of the bite itself and the indirect injury caused by the attempts to remove the child from the attack, confirmed by the dermabrasions observed on the child’s body.

**Lesion area**

In general, domestic animal bites involve the upper limb, notably the hand [13]. The horse usually bites the upper limb or the hand [14]. We believe that the victim’s position (lying down, sitting, or standing) when the bite occurs as well as the victim’s size intervene in where the bite is found. A herbivore, the donkey may tend to bite areas near the ground, explaining the bite on the leg in both cases.

**Treatment**

The initial management followed the recommended treatment for animal bites, i.e., careful wound care with excision of all contusion and devitalized tissues. The wounds were partially closed by loose stitches [5,6]. We opted for orthopaedic treatment of the fractures and dressing of the wounds because of the high risk of infection after an animal bite and after internal osteosynthesis for an open fracture. Despite good surgical wound care, Stavrev [9] noted the onset of an infection that was difficult to eliminate after internal fixation, thus compromising the functional prognosis.

Administration of antitetanus serum and vaccine depending on the patient’s condition is also recommended, as is preventive broad-spectrum antibiotic treatment. Antirabies vaccination should be done following the World Health Organization guidelines, which are identical in adults and children: five intramuscular injections on Days 0, 3, 7, 14, and 30 with an optional booster on Day 90. It was begun late in our patients because of the parents’ financial situation, given that the vaccine and the care are the responsibility of the patient.

Putting down the donkey should not be systematic; instead the animal should be placed in observation with a veterinarian who will make the decision based on the signs presented by the animal. In the second observation, the donkey was killed by the crowd, with the circumstances of the bite as well as the fury of the animal motivating the search for Negri bodies.

**Conclusion**

The association of a donkey bite and an open fracture of the leg is exceptional and serious because of the high risk of infection, notably the transmission of rabies (acute encephalitis that is consistently mortal), and major sequelae. In addition to serotherapy and antitetanus vaccination, this requires immediately initiating antirabies vaccination and the antirabies serum. Orthopaedic nonoperative treatment is our choice for these fractures in children.
Conflicts of interest

None.

References