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TREATMENT OF TIBIAL PSEUDARTHROSIS SECONDARY TO SNAKE BITE IN PEDIATRIC AGE: CHAARIA MISSION HOSPITAL COLLABORATIVE EXPERIENCE
G. Gaido, MD, Medical Director Cottolengo Mission Hospital, Chaaria, Meru, Kenya, D. D'Aquila, MD, L. Maltesi, MD, L. Cara, MD, Struttura Complessa Ortopediae Microchirurgia Ricostruttiva, Ospedale Marino, Cagliari, Italy, Dr A. Mbungu, MO, Dr J. Makandi, MO, Cottolengo Mission Hospital, Chaaria, Meru, Kenya

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SUMMARY

In developing countries snake bites can cause necrosis and osteomyelitis, with consequent deformities, especially in children. Tibial segmental defects represent a therapeutic challenge, and are mainly due to congenital anomalies (agenesis or pseudoarthrosis), infections, post-traumatic fractures, and neoplastic lesions (6). A 13 years old girl was brought to our attention due to a severe deformity of left leg, secondary to previous osteomyelitis caused by a snake bite. The deformity was treated by osteotomy with peroneal excision and tibial synthesis with a DCP (Dynamic Compression Plate) which allowed to recover the right axis and joint rotation, allowing for a next step.

INTRODUCTION

Since 2009 snake bites are included within neglected disease defined by the World Health Organization (WHO) (1). According to recent reports in Sub Saharian Africa there approximately 1 million cases/year of poisonous snake bites, with 500.000 cases of poisoning and up to 30.000 death/year (2,3).

This represents an important health issue in most rural areas of South East Africa, where limited access to medical care causes a higher number of deaths and morbidity with serious long term sequelae and handicaps. Beyond even letal systemic effects caused by snake bites, there are also local symptoms, ranging from oedema and inflammation in the biten area, up to compartimental syndrome, deep tissue necrosis and osteomyelitis (4). In particular, the bite of snakes of Elapidis subgroup, particularly diffused in rural Kenya highlands, is a frequent cause of tissue necrosis (5).

A 13 year old girl from Kenya was brought to our attention – as she developed osteomyelitis, due to a previous snake bite, and with subsequent impact on physiological growth of tibia and fibula bone. Tibial segmental defects represent an unmet need, which are mainly due to congenital anomalies (agenesis or pseudoarthrosis), infectious agents, post-traumatic fractures, and cancer localization (6). A frequently used technique is the tibialisation of the ipsilateral fibula. This is also defined as "Fibula pro Tibia" consisting in transferring the fibula over the tibial bone, also referred as fibula centralization. However, should the deformity be particularly severe (i.e. hyperthrophy and bending of fibula) to prevent or impact on the good outcome of the above described surgical approach, other therapeutic options have to be considered.

CASE REPORT

Our patient had important deformity to her left leg, she was walking with limping and she needed Canadian crouches to support her walking. At age of 1 year she was biten by a snake, most likely from *Naja* snake family, which is quite diffused in Kenya. Following the bite, a soft tissue necrosis occurred in the medium portion of her leg, with consequent infection and involvement of the tibial bone in the diafisis portion. The young patient was treated with antibiotics and surgical debridement. Eventually a disruption of the continuity of the tibial diafisis occurred. Due to the extreme poverty or her family, no further treatment was given to recover the bio mechanical function of the leg. With the growth the alterations of tibial and fibula bones and joints involved became more prominent.

The patient presented at "Cottolengo Mission Hospital Chaaria", where we offer cure even to poorest patients. On examination, the patient presented with 18 cm shortened left leg, knee valgus, hypotrophy of tibial diafisis, a hypertrophic fibula, severely twisted in varism direction and the ankle appeared in equinism position (Figure 1 and 2). The leg deformity of our patient at presentation could be comparable to a finding of post natal tibial pseudo arthrosis (Figure 3). Post-natal pseudo arthrosis (44%), present generally within the age of 3 and are generally tight. The pathogenesis is linked to a defect of osteogenesis at endosteal and periosteal level, probably linked to a vascular issue acting in different development phases and reflecting the impact of postnatal mechanical conditions (7).

Figure 1 and 2
Clinical findings: Pre-surgery

Figure 3
X-rays, pre-surgery

In our case the necrosis induced by the cytotoxic snake venom, and the consequent infection caused an impaired development of the middle portion of the tibia, with resorption, of the extremities and consequent interruption between pseudoarthrosis edges, constituted by bone tissue and fibrous tissue with limited vasculature, while fibula was hypertrophic and axis twisted in varism.

Surgical Procedure

We performed a direct anterior access to the tibia, extended from the head of fibula up to the lateral malleolus. This allowed exposing completely the involved bones. By utilizing an oscillating bone saws we performed double osteotomy at both the proximal and distal extremities of the fibula. Excision of the peroneal diafisis allowed correction of the rotation axis of the leg. The interrupted tibial pseudoarthrosic bones were regularized and we perform a complete removal of the sclerotic bone and of the fibrous surrounding scar tissue,

up to exposing the marrow canal.

Due to the retraction of the soft tissues, involving especially tendons and nerves, we could not proceed with fibula-protibia technique to obtain the complete leg extension. Therefore we decided to align the tibial extremes of the interrupted bone and we performed fibular graft to strengthen and stabilize the correction, using a Dynamic Compression Plate DCP and screws, to obtain a better stabilization and ensure formation of the bone callous. Fixation with long plaques is more appropriate that simple osteosynthesis with pin (8) (Figure 4).

Figure 4
X-rays, post-surgery

Post-surgery Management

The limb was immobilized with femur-podalic plaster cast and the patient received antibiotic treatment and supportive care until stitches removal. Then a circular full cast was applied with a total duration of the immobilization lasting 45 days, and avoiding weight charge on the limb.

CONCLUSION

Due to the complexity of this case, during surgical planning period we decided to intervene with a two step approach. During the first step, we practiced removal of the bent and hyperthrofic fibula, which allowed regaining the normal axis and rotation of the affected limb, beyond providing a supportive insertion to the interrupted tibial bone extremities and synthesis with plaque and screws. The second step consisted in the leg extension through an Ilizarov's external fixator.

We would emphasize the complexity is mainly to ascribe to the delay in the diagnosis and cure, due to extreme poverty of the family and lack of available structures to guarantee this kind of cure to the underserved populations in rural areas in Kenya.

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