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Chronic Tibial Osteomyelitis; Use of Biactive Glass as an Alternative of Treatment. Report of a Case

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Background:
Chronic osteomyelitis is a disease usually of infectious origin. The main cause is post-traumatic, it affects the bone tissue and surrounding tissue, the most frequent causative agent is Staphylococcus aureus. The most affected bone is the tibia. **Case description:** A 42-year-old male with a diagnosis of chronic tibia osteomyelitis, with sequelae of previous surgical interventions, multiple antibiotic treatments, and type IV B classification by Cierny-Mader. **Methods:** Two-stage surgical management was chosen. Firstly, extensive bone and soft tissue debridement, placement of cement beads medicated with amikacin in the medullary cavity and osteoclast system for irrigation with vancomycin. In the second stage, free fibular bone grafting, fixation and stabilization with screws, bioactive glass placement in areas of interface between stabilized fibula and posterior tibial cortex. **Results:** Before a multitratada chronic osteomyelitis it is necessary to individualize and evaluate treatment alternatives, in this case the surgical management in two time, the use of medication beads, bone graft and the use of bioactive glass, achieved a complete eradication of the infection and favorable clinical evolution with optimal functional recovery of affected limb.

Key words: Chronic osteomyelitis, Tibia, Bioactive glass.

I. Introduction

Osteomyelitis is defined as an inflammation of the bone caused by an infectious agent.[1] The main cause of chronic osteomyelitis is Staphylococcus aureus.[2,3] Lee and Waldvogel classify osteomyelitis as acute, subacute and chronic, hematogenous or contiguous, and with or without vascular deficiency.[4] The Cierny-Mader classification includes pathological and impermeable approaches.[5]
The incidence of osteomyelitis is variable. Hilal et al indicate 21.8 cases per 100,000 person-years.6 It affects men in a greater percentage, mean age is 52 years, the most frequently affected bone is the tibia, the most common cause was post-traumatic.[5,6,7,8]

The diagnosis of osteomyelitis is based on the clinical history, physical examination, result of laboratory and imaging studies.[8,9] Surgical treatment should include radical debridement, removal of dead tissue, soft tissue reconstruction, and restoration of bone stability.[10] Current surgical treatment of chronic osteomyelitis is commonly with surgical implantation of polymethylmethacrylate (PMMA), mixed with antibiotics, in the affected anatomical area, after extensive debridement and pulse lavage. These PMMA beads are removed in a

second surgical procedure.[11,12,13,16] The gold standard for bone defect restoration is still considered autologous bone grafting.

But it is not free of complications.[15] Bone graft substitutes are commonly used to replace and regenerate bone loss due to trauma, infection, disease, or to provide stability around implanted devices.[14,15.] In this context, bone graft biomaterials current generation are an alternative treatment and are designed to stimulate specific cellular responses at the cellular and molecular level.[17,21] Characteristics of biomaterials: Bioactivity any interaction or effect that the materials have on cells. Biocompatibility, absence of cytotoxic, genotoxic effects or immune response. Osteoconductive and osteoinductive involves exchanges of ions with biological fluids that allow the formation of a mineral layer, a direct biological coupling between the biomaterial and the bone.[13,14,20]The release of biomaterials will stimulate the incorporation and proliferation of stem cells, resulting in the differentiation and proliferation of osteoblasts.[15] The release of ions such as sodium, calcium, and silicon increase the local pH and osmotic pressure, guaranteeing antibacterial properties.[14, 15] There are various bioactive glass compositions on the market. In this case, Glass Bone (BG) 45S5 was used. It is a biomaterial with properties that meets the aforementioned characteristics.[18,19,21,22]

II. Clinical Case

42-year-old male patient, peasant occupation. He went to the traumatology and orthopedics outpatient service for presenting fetid secretion and ulcer at the pretibial level of the left leg. Anamnesis: current illness begins at the age of 22 years in an acute and insidious way with increased volume and pain in the metaphyseal region of the left tibia, he was subjected to surgical toilets on three occasions and the application of multiple antibiotics for prolonged periods without improvement. Physical examination: presence of fistulas in the proximal metaphyseal region 1 cm in diameter, both with communication to the spinal canal and with active, purulent and fetid exudate. Paraclinical Hb 13mg/dl, HTC 30%, Cr 2.3mg/dl, Urea 40mg/dl, culture of E. coli wound exudate sensitive to moxifloxacin and amikacin, anteroposterior and lateral X-ray of the left leg showing anterior cortical condensation from proximal metaphyseal region to the distal third of the tibial diaphysis with the presence of a lytic zone of approximately 3 cm in the proximal metaphyseal region. After these findings, it was classified as chronic tibial osteomyelitis type IV B according to the host with added systemic disease chronic renal failure (CRF). Definitive surgical treatment in 2 stages was chosen.(fig. 1)

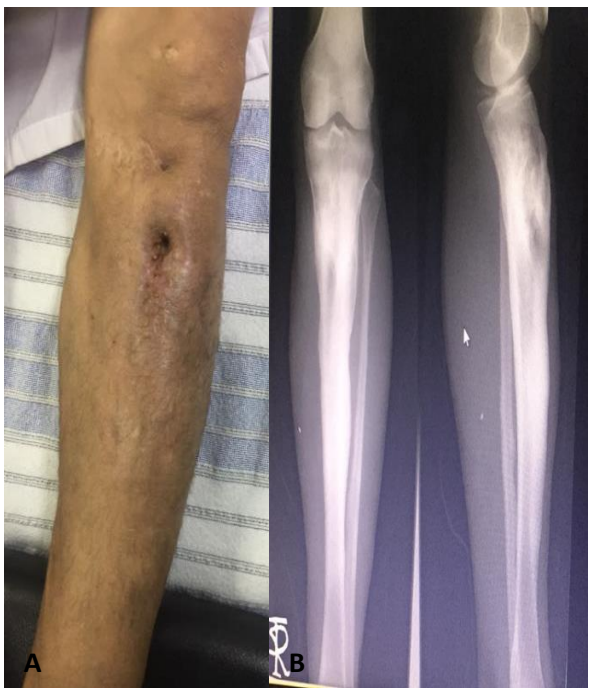

Fig 1.A:Fistulas in the proximal metaphyseal region. B: AP and lateral radiography of the left tibia, lytic area in the tibial metaphyseal region and anterior bone condensation up to the distal diphyseal region.

In the first stage, an anterior linear hemidiaphysectomy is performed up to the proximal region at the metaphyseal level with resection of sequestered bone tissue up to the region of the anterior tibial tuberosis, medullary evacuation of said anatomical region, obtaining abundant fetid yellowish secretion, scarification of the medullary canal until tissue is obtained. bleeding bone, amikacin-medicated cement beads were placed in the medullary cavity and intramedullary osteoclysis system for irrigation with 100ml physiological solution plus 1g of vancomycin every 24 hours for 10 days.[23](fig.2)

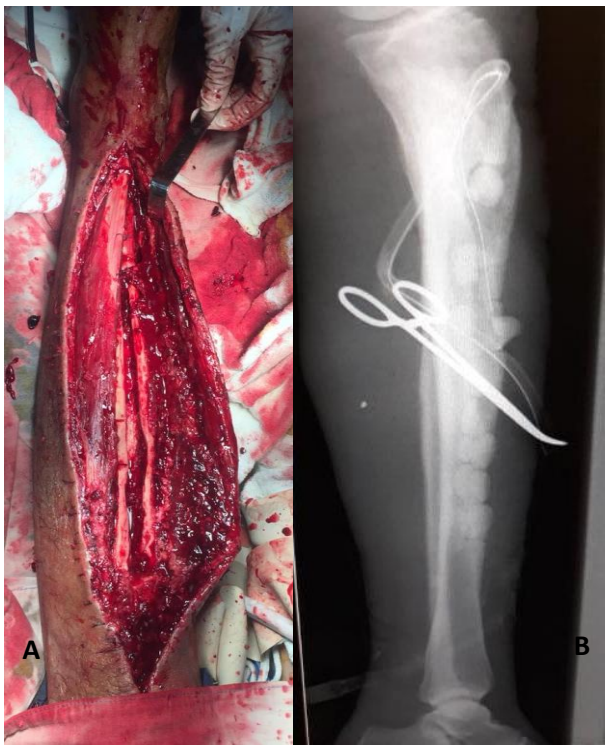

Fig 2. A: Anterior cortical resection. B: Osteoclysis system and PMMA medicated with amikacin.

In the second surgical stage, the non-vascularized free fibula is taken, the fibula is obtained with the desired length and it is presented in the exposed medullary canal, fixation and stabilization is carried out with 4.5 titanium screws with the placement of 4 of a standard 30mm measurement. Subsequently, the bioactive glass is placed in interface areas between the stabilized fibula and the posterior cortical bone of the tibia along its entire length, as well as the total filling of the medullary cavity in the metaphyseal region (16 grams of 1mm bioactive glass were used), the surgical wound is closed, and remains hospitalized, amikacin 250mg every 12 hours and Moxifloxacin 400mg every 24 hours are applied. He was discharged from the hospital 5 days after the second surgical intervention with a wound in the healing phase, fistulas closed without expense, antibiotic moxifloxacin 400mg po every 24 hours, for 6 months, and monthly liver function test controls. One month later, the patient presented clean healed surgical wounds, closed fistulas, no signs of infection, full range of motion, muscle hypotrophy, radiographic control with graft in the integration phase, no signs of instability of the osteosynthesis material, PFH in normal parameters, continued with moxifloxacin 400mg every 24 hours and rehabilitation exercises. Last assessment 3 months later, the patient was already walking without support and laboratory tests within normal parameters. (fig3)

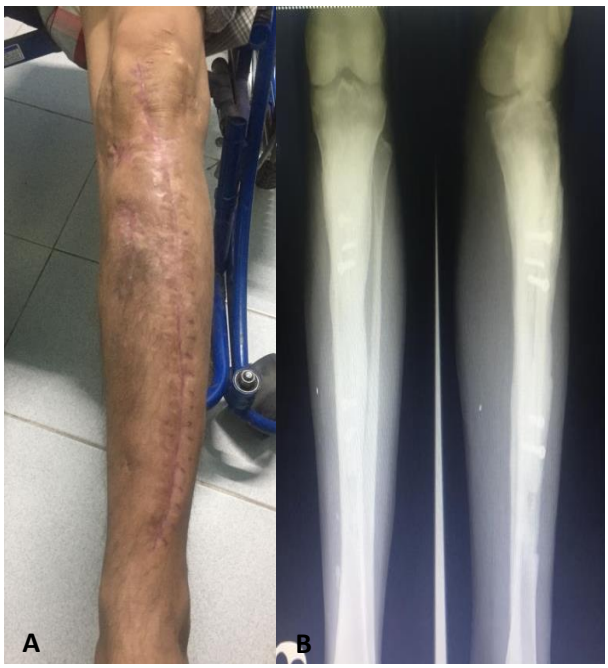

Fig 3. A: Closure of fistulas and surgical wound without evidence of exudates. B: Bone osseointegration of the fibula in the tibia.

III. Conclusion

Chronic osteomyelitis is a complicated infection to treat, most cases management involves a multidisciplinary approach, the primary care provider plays a key role in the initial diagnosis and coordination with other specialists. Surgical treatment is the essential part of treatment, complementation with adequate antibiotic treatment significantly improves the success rate. The treatment must be individualized and assess the available management alternatives, assessing the cost benefit. Treatment strategies depend on several factors: characteristics of the host, the segment involved, the size of the lesion, the location of the lesion, and the substitute or support material to be used. Several studies have shown that management with bone graft material alone is associated with different cure rates ranging between 60 and 90%, however, there are problems with the use of bone autografts such as insufficient amount of graft, post-surgical morbidity in donor area, infections and hemorrhage mainly. The concept of polytherapy gains strength in the orthopedic field and consists of simultaneously implanting two or three fundamental components for healing. Combination therapy is a logical option, especially in elderly individuals with associated comorbidities and a limited capacity for tissue regeneration. For these reasons mentioned before a chronic osteomyelitis of the tibia that did not evolve correctly after previous surgical treatments and before a patient with added systemic disease, a two-stage surgical treatment was decided. The polytherapy concept is also taken into account. An extensive surgical debridement was performed, PMMA impregnated with amikacin was applied, an osteoclysis system with vancomycin irrigation in the second stage, an autologous fibular graft was performed and bioactive glass was applied, with which a complete eradication of infection and recovery of limb function. In the 12-month follow-up, the patient shows no signs of infection with recovery of 90% of the function of the affected limb.

IV. Conflict of interests.

The authors of this article have no conflicts of interest.

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