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Optimal Treatment of the Septic Pseudarthrosis of the Tibial Pestle: About A Case

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Abstract: The deleterious association of non-bone consolidation and septic complication is a therapeutic challenge for orthopedic surgeons. Tibial fractures are a source of high rates of nonunion and septic and cutaneous complications. Here we present the case of a 56-year-old patient with a history of vascular, cardiac and obstructive post-smoking bronchopneumopathy who presented septic pseudarthrosis of the left tibial pilon with cutaneous complications and whose treatment consisted of , initially in an induced membrane technique, associated with a cutaneous cover by a lateral fasciocutaneous flap of the thigh and an osteosynthesis by a Hexapodal external fixator type True Lock. During the second stage, the bone graft was removed by endomedullary boring of the contralateral femur using the device named Reamer-Irrigator-Aspirator, and the stems of the external fixator were replaced by other rods allowing adjustment multiplicane and thus a gradual three-dimensional reduction as the consolidation progresses.

Keywords: Pseudarthrosis, Induced Membrane, Fasciocutaneous Flap, Reamer-Irrigator-Aspirator

INTRODUCTION

Septic pseudarthrosis is a major complication in trauma. The deleterious association of non-bone consolidation and septic complication is a therapeutic challenge for orthopedic surgeons. Tibial tibial fractures have a high percentage of pseudarthrosis and septic and cutaneous complications.

Observation

This is a 56-year-old patient with a history of high blood pressure, dyslipidemia, hypertensive and ischemic heart disease with a 15-year old myocardial infarction, obstructive post-smoking bronchopneumopathy, and obstructive lower extremity arteriopathy.

He suffered a simple fall from his height, resulting in a fracture of the left tibial poniard with a practically frontal oblique line, associated with an over ligamentous fracture of the fibula (Figure-1), without opening or signs of cutaneous pain. The patient was admitted to the operating room within 12 hours for 8-hole screw fixation of the external malleolus via an external approach, with fixation of the tibial puncture by 2 direct screws, reinforced. by a locked plate held by 3 screws in proximal and 3 screws in distal (figure-2). The operative sequences were simple initially. The leg was immobilized by a plaster splint for 6 weeks, and support was allowed after 3 months.

Fig-1: X-ray of the leg showing fracture of the left tibial pylon associated with a fracture of the external malleolus

Fig-2: Internal osteosynthesis by screwed plates + Direct screwing

At 3 months, the patient had sepsis with 2 oozing fistulas at the anterior margin of the internal scar. The tibial plate was visible through the loss of substance. In addition, the external scar was dry and non-inflammatory.

The radiological presence of a consolidation of the fibula and external callus of the tibia (Figure-3), justified the admission of the patient to the operating room for removal of the plate and 2 direct screws of the tibia, and bone curettage. End-of-procedure testing revealed discreet mobility of the fracture line in flexion of the ankle extension. The skin around the scar left a cutaneous substance loss of 5 cm high and 1.5 cm wide with exposure of the internal cortical tibia 2 cm high and 1 cm wide (Figure-4). Bacteriological bone samples taken during intraoperative operation were justified under antibiotic therapy with Ofloxacin for 1 month. Directed scarring resulted in progressive coverage, over 3 months, of poor quality skin tissue with a dark, cardboard appearance.

Fig-3: Control X-ray at 3 months

Fig-4: Control X-ray after ablation of the tibial plate is 2 direct screws (4 months after fracture)

The resumption of support was painful, and the control radiographs objectified a progressive angulation of the tibia with fracture of the fibula plate (Figure-5).

Fig-5: Control X-ray at 8 months post fracture showing progressive angulation of the tibia with fracture of the fibula plaque, indicating non-union of the tibial pylon.

Completion of a CT supplement 9 months after the fracture; confirmed the diagnosis of tibial pilon pseudarthrosis with partial consolidation of the fibula.

The decision to reopen was decided based on induced membrane technique associated with an internal fascio-cutaneous flap.

A first surgical procedure consisted, after ablation of the fibula plate, in a diamond-shaped cutaneous resection carrying all the infected and hardened cutaneous region, followed by the insertion of the plugs and pins of the external hexapodal type True Lock fixator, before performing a bone resection carrying the focus of tibial pseudarthrosis about 5 centimeters. An antibiotic cement wedge was interposed in bone loss and molded around the proximal and distal ends of the tibia (Figure-6). The loss of cutaneous substance was filled by a fasciocutaneous flap of the ipsilateral thigh (Figure-7). The follow-up was simple, and the bacteriological samples allowed to put the patient under a dual-antibiotic therapy for 3 months (Figure-8).

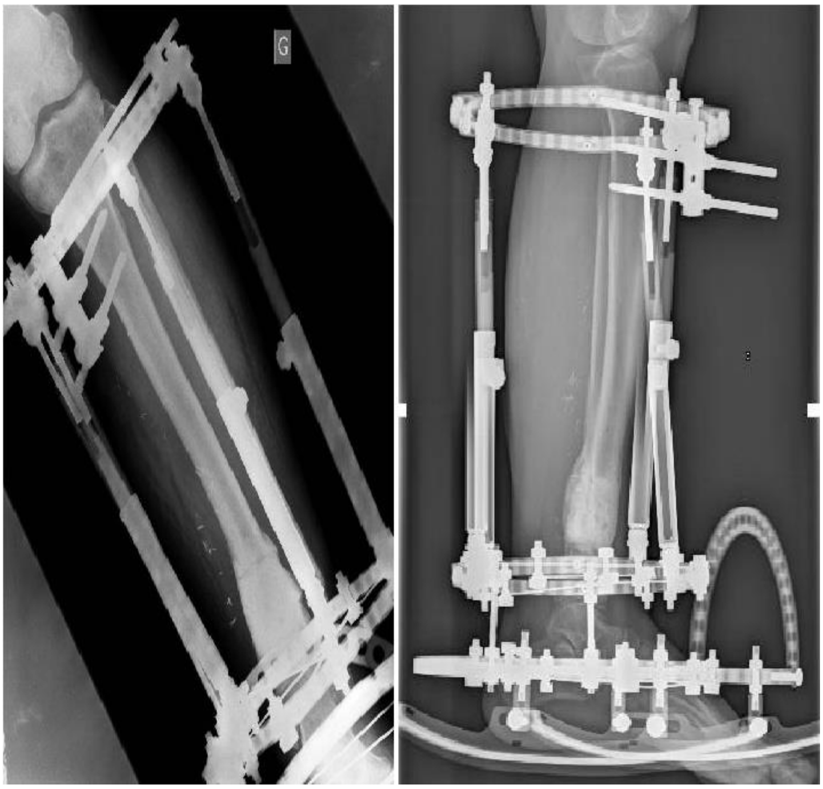

Fig-6: Immediate postoperative control after the first induced membrane time + fascio-cutaneous flap

Fig-7: Clinical aspect of the lateral fasciocutaneous flap of the thigh at day 1 postoperative

Fig-8: Clinical aspect of lateral fasciocutaneous flap of the thigh at 8 weeks

The second induced membrane time was achieved after a delay of 8 weeks. The bone graft was obtained by endo-medullary boring of the contralateral femur using the Reamer Irrigator Aspirator (RIA) device. This graft was mixed with the patient's blood and a freeze-dried bone in granules. The tibial focus was discussed after careful flap detachment, induced membrane incision, and proximal and distal osteo-periosteal decortication. After ablation of the cement, a reperminalization of the medullary canal was performed proximally and distally, before interposing the bone graft already removed (Figure-9). The closure was made in 2 planes; membrane and flap. The outer fixator stems were replaced with TL-HEX rods allowing for multiplanar adjustment and thus a gradual three-dimensional reduction as consolidation progresses (Figure-10).

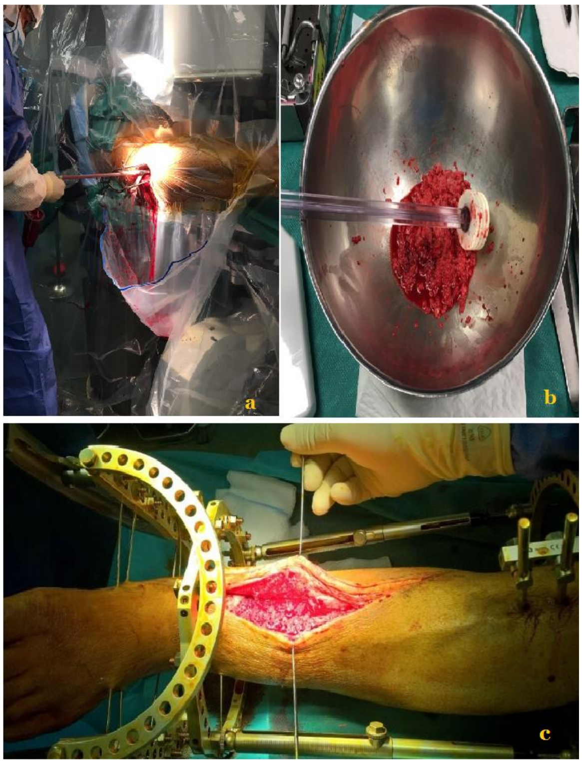

Fig-9: Intraoperative images during the second induced membrane time. (a) Graft samples by endo-medullary boring of the contralateral femur using the RIA device. (b) The graft mixed with the patient's blood and a freeze-dried bone in granules. (c) Interposition of the graft at the tibial focus after ablation decortication and removal of the cemented spacer.

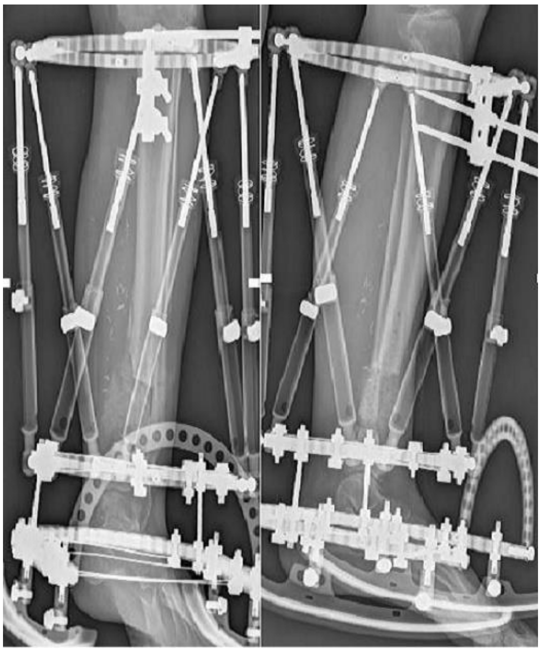

Fig-10: Control X-ray after second induced membrane time.

The donor site of the lateral fascio-cutaneous flap of the left thigh was covered, at the same time, by a semi-thick skin graft taken from the inner side of the contralateral thigh.

The postoperative course was simple

After a follow-up of 9 months, the patient resumed a normal and painless walk, the control radiographs made it possible to objectify a consolidation of the tibia with fusion and corticalization of the graft, without residual axial deviation.

DISCUSSION

The reconstruction requires 2 distinct operative steps: the first intervention consists of a radical debridement followed by a repair of soft tissues by flap if necessary, with systematic installation of a cement spacer in the loss of bone substance. Initially, the role assigned to the cement spacer was to avoid filling bone tissue with fibrous tissue and thus preserve the space needed for reconstruction.

In reality, the main role of cement is biological by its action of induction of a foreign body membrane. It secretes growth factors; a high concentration of VEGF and TGF beta 1 was observed in the second week after cement placement, while BMP2 was at its highest level in the fourth week [1-4].

The second procedure is performed 6 to 8 weeks later once the soft tissue healing has been achieved. The spacer is removed, but the cement-induced membrane is left in place. The cavity is then filled with cancellous bone fragments taken in most cases from the iliac crests, however, when the amount of graft is not sufficient, a bone substitute bone is added to the graft according to a ratio that does not exceed 1 in 3 [1, 5].

Danckwardt-Lillieström [11], a Scandinavian surgeon, imagined the principle of boring combined with irrigation and aspiration, and it was in 1986 that Stürmer and Tammen developed the technique [12]. But it is only much more recently that the osteoinductive potential of the boring product [13, 14], and its use as a bone autograft in orthopedic and traumatological surgery, but also in maxillofacial surgery has been studied.

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CONCLUSION

Although there are many techniques to deal with the loss of bone substances, they all follow the same pattern of three times, separate or combined: the "flattening" of the focus, the repair of the soft parts, and the bone reconstruction proper. Whatever technique is used, its purpose is to obtain consolidation.

Conflicts of interest

The authors do not declare any conflict of interest.

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