



Masquelet technique for the treatment of a severe acute tibial bone loss



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ARTICLE INFO

Keywords:

Open fracture
Bone defect
Masquelet technique
Induced membrane
Bone reconstruction

ABSTRACT

The “induced membrane” technique described by Masquelet has been used successfully for many years for posttraumatic bone defect reconstruction, non-unions and osteomyelitis. The main advantages are the two-step surgical procedure that in case of primary infection allows repeated debridement if necessary, in case of internal fixation early weight bearing with decreased malalignment risk and it has a short learning curve. A theoretical application of this procedure is the management of acute severe traumatic bone loss of the limbs despite the lack of this experience in literature. We report on a Gustilo IIIB meta-epiphyseal fracture (AO 43-C3) of the leg with a 6 cm in length bone loss that was treated with the Masquelet technique.

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Introduction

Reconstruction of severe traumatic bone loss is a major problem in orthopaedic practice because of the risk of infection, long healing times and poor long-term clinical results [1–3]. Several techniques have been proposed, such as bone transport distraction osteogenesis and free vascularised bone transfers. These techniques are associated with long healing times and a considerable rate of complications [4,5]. Masquelet et al. [6] proposed an original technique for the treatment of large diaphyseal bone defects due to non-unions or chronic osteomyelitis. They developed the concept of the “induced membrane”, where a membrane induced by a foreign body acts as a biological chamber that prevents graft resorption by providing vascularisation and growth factors [3,6]. Karger et al. [7] recently reported the experience of the French Society of Orthopaedic Surgery and Traumatology (SoFCOT) with the Masquelet technique in the treatment of chronic posttraumatic diaphyseal long bone defect with a 90% success rate. However, there are no reports in literature about the management of acute Gustilo IIIB critical size tibial bone

defects. The aim of this paper is to present a case of Gustilo IIIB critical tibial bone loss that was treated successfully with the Masquelet technique.

Case report

A 53-year-old male was admitted to our department after a motorcycle accident. The patient was run over and presented with an open-book pelvis fracture, a Gustilo IIIA left femur diaphyseal fracture (AO 32-A3) and a Gustilo IIIB left meta-epiphyseal fracture (AO 43-C3) (Fig. 1). The following procedures were conducted in emergency: the open-book pelvis fracture was closed with external fixation; the femur fracture was stabilised with a nail; the leg fracture was treated with pinning, and an external fixator bridging the ankle joint (Hoffman II external fixation system, Stryker, USA). The exposure was partially closed and covered with non-adherent gauzes. Intravenous antibiotic therapy with vancomycin 500 mg × 4/die and meropenem 1 g × 3/die was started immediately.

When the general conditions improved at 5 days, the fracture was revised, necrotic tissue was debrided, including the entire distal tibia, and the external fixator was modified. The length of bone loss was 6 cm (Fig. 2A). Tissue samples were taken for microbiological culture. The bone defect was filled with antibiotic cement containing gentamicin (Cemex Gent; Tecres spa, Italy)

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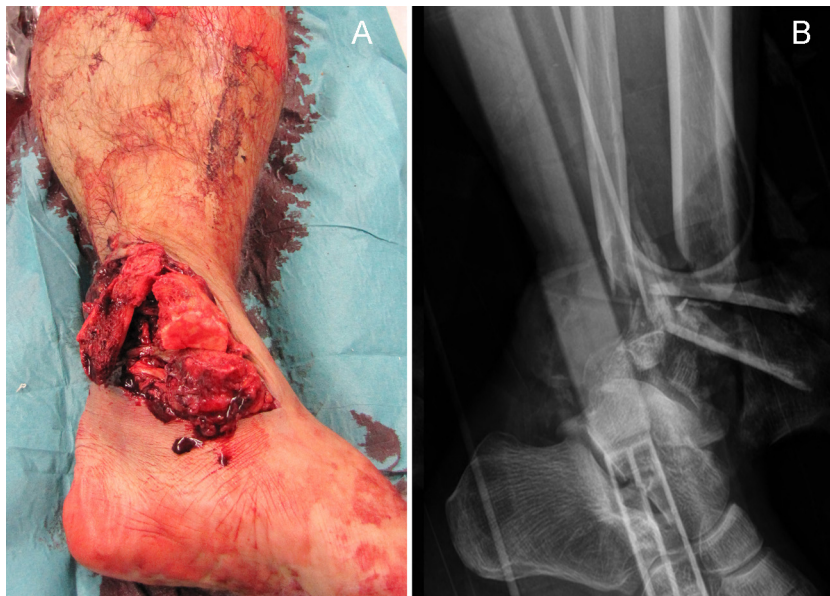


Fig. 1. (A) Extensive anteromedial soft tissue damage with comminuted meta-epiphyseal Gustilo IIIB fracture of the left distal tibia. (B) AO 43-C3 fracture involving tibia and fibula.

customised according to the Masquelet technique (Fig. 2B). The soft tissue defect was reconstructed with an extended free gracilis flap harvested from the contralateral thigh (Fig. 2C). The anastomosis was performed in termino-lateral fashion with the posterior tibial artery and satellite veins to preserve the blood flow to the foot (Fig. 2D and E). After 9 days, once the free flap was

stabilised, the gracilis muscle flap was covered with final split thickness skin graft harvested from the contralateral thigh.

Partial weight-bearing with crutches was allowed immediately. The microbiological cultures were positive for *Staphylococcus aureus*, therefore the antibiotic therapy was changed to ciprofloxacin 500 mg \times 2/die *per os* according to antibiogram. Blood exams

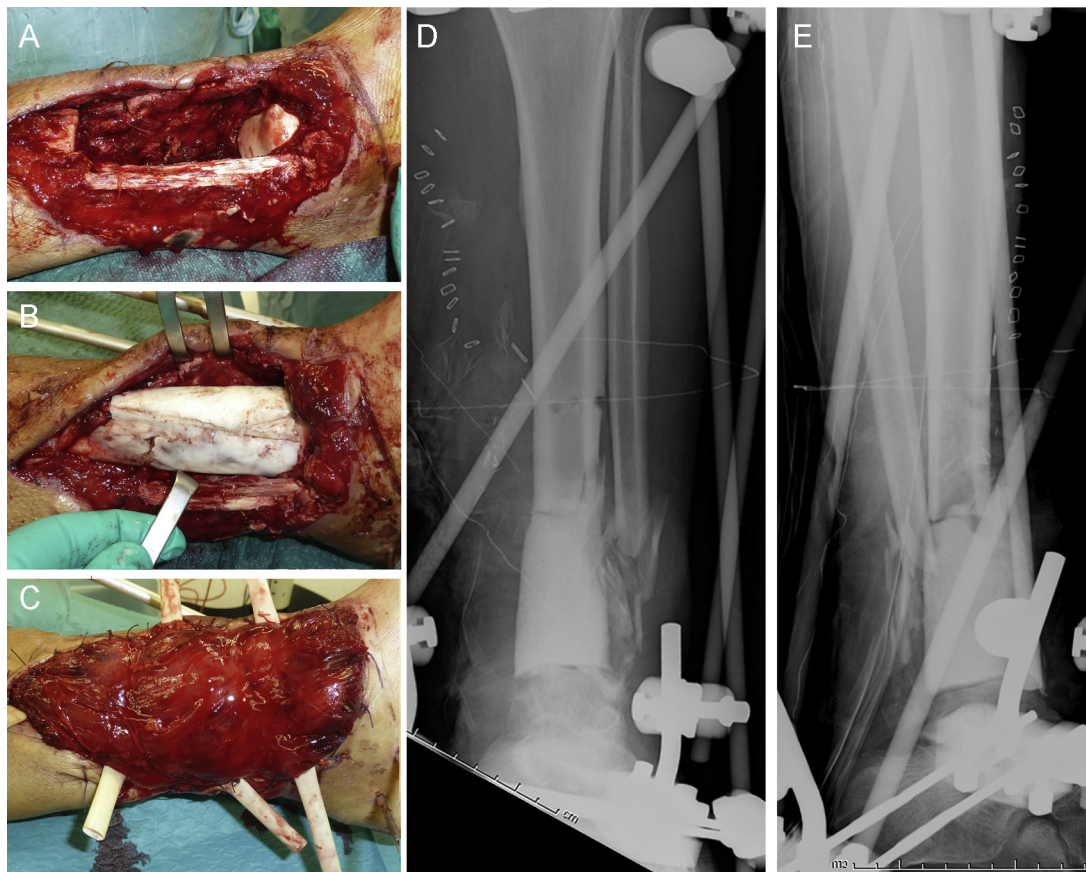


Fig. 2. First step of the Masquelet technique. (A) Tibial bone defect sized about 6 cm after debridement. On the right side, the talar dome is visualised. (B) Customised cement spacer bridging tibia and talus. (C) Soft tissue coverage with gracilis free flap. (D and E) X-ray aspect of the cement spacer in antero-posterior (D) and lateral (E) view. Proper alignment and length of the limb obtained with external fixation.

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