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Case report

# Acute shortening and lengthening following vascular repair with a vein graft for Gustilo–Anderson type IIIC open fracture: A report of two cases

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ABSTRACT

We present two cases of lower extremity open fractures with vascular injury, where acute shortening and early lengthening were performed, following vascular repair with a vein graft. The two patients sustained Gustilo–Anderson type IIIC open fractures (one patient in the tibia and the other patient in the femur) with disruption of the popliteal artery. Initially, they were treated with debridement and stabilization using an external fixator. The disruptions of the popliteal artery were repaired by interposition of a saphenous vein graft. As soon as possible after the injury, the bone segment was resected and shortening was initiated with careful monitoring of blood circulation. After the bone gap and soft-tissue defects were closed at the end of the shortening, distraction osteogenesis was carried out in the proximal part of the tibia and the femur, respectively.

There is not study reporting acute shortening and early lengthening performed on patients who underwent vascular repair with a vein graft. The procedures did not affect blood circulation, and resulted in a good clinical outcome. We consider this method a safe and effective way to treat lower extremity open fractures with vascular injury and massive soft tissue defects.



## 1. Introduction

In lower extremity open fractures with vascular injury and massive soft-tissue defects, acute shortening and lengthening should be considered when free vascularized soft-tissue transfer is unsuccessful or is complicated by bone defects. There are many reports on the effect of lengthening for open fractures associated with and without vascular injury [1,2,7–9]. But there is no article analysing the effect of acute shortening and early lengthening on patients who underwent vascular repair with a vein graft. Therefore there is uncertainty as to whether blood circulation is affected in vascular repair with a vein graft. Here we present two cases where acute shortening and early lengthening were performed following vascular repair with a vein graft in lower extremity open fractures with vascular injury and massive soft-tissue defects.

## 2. Case report

### 2.1. Case 1

A 23-year-old man was admitted to the emergency department after a motor vehicle accident. He sustained a left Gustilo–Anderson type IIIC open tibial fracture and popliteal artery disruption (Fig. 1A), as determined by computed tomography angiography (Fig. 1B). Initially, the fracture was stabilized with an external fixator and the disruption of the popliteal artery was repaired by interposition of a saphenous vein graft from the popliteal artery to the posterior tibial artery. The patient subsequently developed massive skin necrosis and a soft-tissue defect in his lower leg. The soft-tissue defect was reconstructed with free vascularized soft-tissue transfer by plastic surgery. However, the free vascularized soft-tissue also underwent necrosis, and a major part of the tibia became exposed (Fig. 1C). Three weeks after the injury, 10 cm of the tibial bone segment was resected and the tibia was shortened to 5 cm. Thereafter, shortening was initiated at 10 mm/day with careful monitoring of blood circulation. Six weeks after the injury, the bone gap and soft-tissue defects were closed at the end of shortening. An Ilizarov

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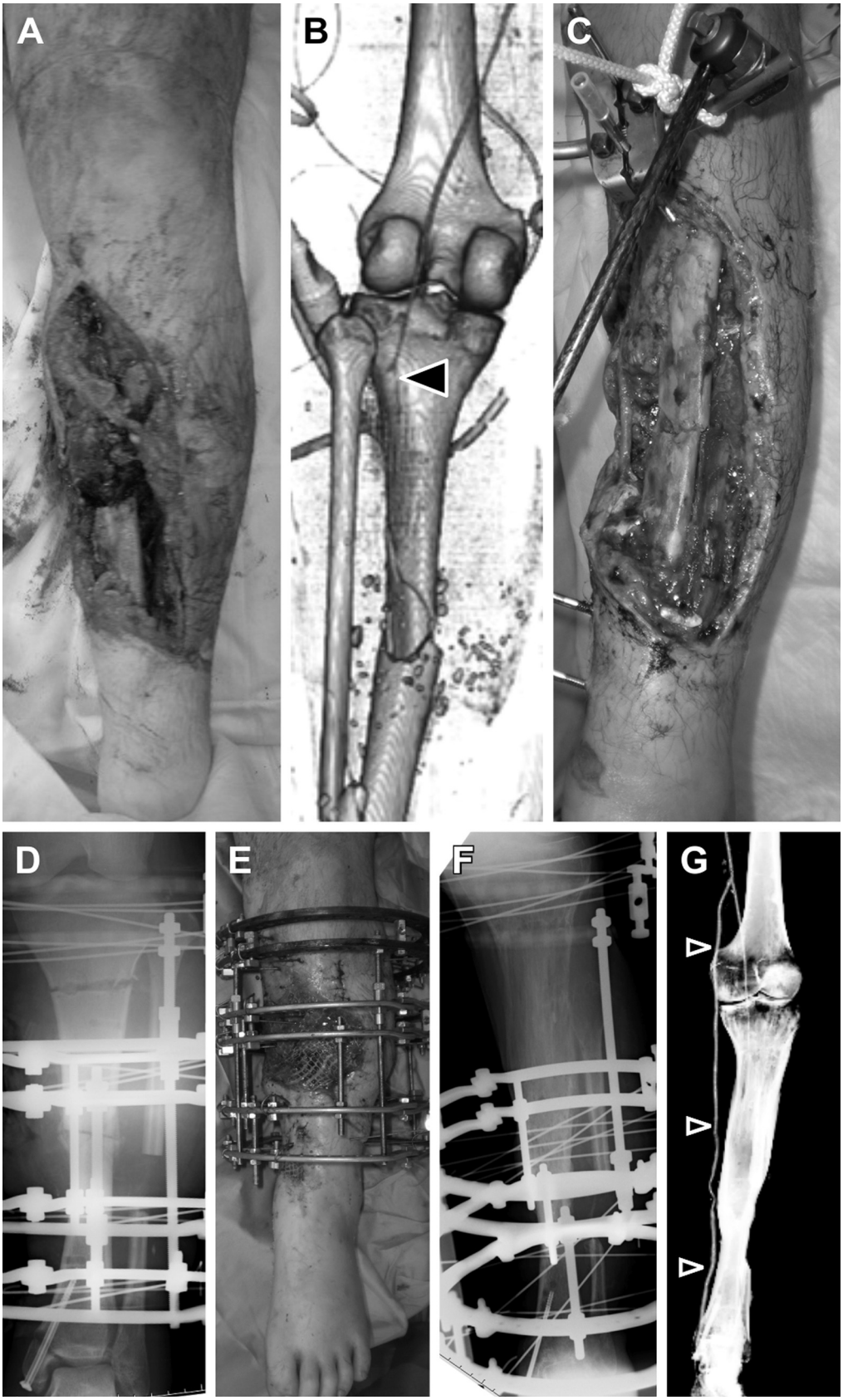


**Fig. 1.** (A) Case1: Left Gustilo–Anderson type IIIC opentibial fracture. (B) Case 1: Computed tomography angiography on the day of admission demonstrated a disruption of the popliteal artery (black arrow). The artery was repaired by a saphenous vein graft. (C) Case 1: A major part of the tibia was exposed because the free vascularized soft-tissue underwent necrosis. (D, E) Case 1: The bone gap and soft-tissue defects were closed at the end of shortening. An Ilizarov frame was applied and osteotomy of the proximal tibia was performed for subsequent lengthening. (F) Case 1: The tibia was lengthened by 10 cm. (G) Case 1: The vein graft at the site of the shortening and lengthening was contrasted without any problem in computed tomography angiography (white arrows).