

Free Fibula Flap for Bone Lost Complicated with Recalcitrant Osteomyelitis

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A new clinical case is added to previous ones to document the importance of Vascularized Bone Flaps in reconstructing large bone defects, particularly those complicated with Osteomyelitis.

In vascularized bone flaps, the transferred bone segment can be large in size, adhering to the principle of demand. Furthermore, it has its own blood supply independent of the host bone's circulation. Its survival depends on the patency of the arterial anastomosis between the flap's artery and the host artery, not on the nutritional state of the host bone or its environment. These flaps are exceptionally resistant to infection. Moreover, they allow for larger quantities of antibiotics to reach the focus of the bone infection. I will elaborate on this last point.

*The venous return from the transplanted bone flap drains mostly into the medullary cavity (bone marrow) of the host bone. This is, incidentally, a significant blood flow. The arterial inflow to the bone flap is substantial due to the importance of its nutrient artery, which has a diameter of 1.5-2 mm, on one hand, and the importance of the perfusion pressure in the host anterior tibial artery (in our case) on the other. The venous blood from the graft flap, saturated with antibiotics, washes the medullary cavity of the host bone as well as its surrounding environment. The significant role this plays in combating infection is evident to all; **see Figures (1), (2), (3), (4).***

Clinical Case

A 36-year-old male was injured by a gunshot projectile, which caused a fracture and significant bone loss in the bones of the leg: the fibula and the tibia. The loss was significant in the proximal third of the tibia. The fracture was complicated by osteomyelitis, which thwarted all attempts at bone reconstruction using traditional bone grafts.

In such a case, the only remaining management option is the Vascularized Bone Flap. It is known to work even under conditions of severe infection. This case provides the evidence and testimony to the validity of its renowned characteristics.



Figure (1): Pre-Operative X-Ray, Left Leg

The patient is a 36-year-old male who sustained a gunshot wound to the left leg. The projectile caused a fracture in both bones of the leg (the tibia and fibula) in their proximal thirds. The tibia fracture was complicated by osteomyelitis. Multiple attempts at cleaning and debridement were performed. A tibia-to-tibia external fixator was placed to ensure stability.

During the most recent surgical exploration, the tibia was found to be void of bone material at its proximal epiphysis and metaphysis, with only a narrow bony bridge connecting the two fracture segments. The decision was made to use a vascularized fibula flap from the right leg to reconstruct the left tibia.

The procedure had two primary goals: first, to address the significant bone loss, and second, to improve the conditions for combating the bone infection.



**Figure (2): The Vascularized Fibula Flap after Complete Harvesting-
Intraoperative Views**

The surgeon's forceps are holding the nutrient artery supplying the bone flap. The harvested bone segment is 13 cm in length. Meticulous care was taken to preserve a muscle cuff, 1-2 mm thick, along the entire length of the bone segment to protect the periosteal branches. To further enhance the flap's viability, the medullary branch (nutrient artery) originating from the peroneal artery was preserved. This medullary branch enters the fibula bone approximately at its midpoint, with a safe margin of 3 cm preserved in both directions along the bone.

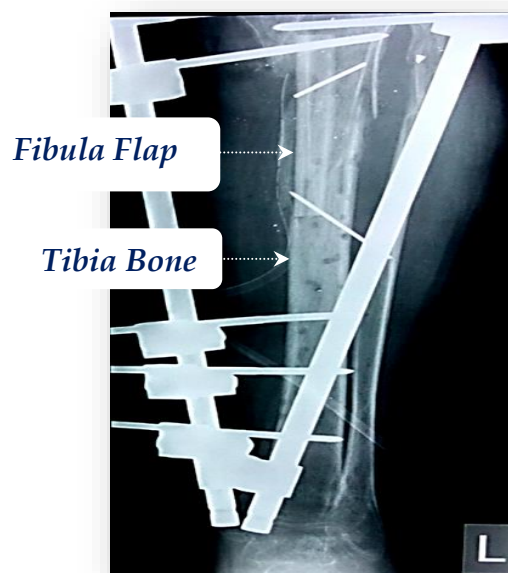


Figure (3): Post-Operative X-Ray, Left Leg

The vascularized fibula flap is shown in its final position. It is anchored by the host tibia at its proximal end and makes contact with the tibial bone substance at its distal end. The blood supply to the flap was successfully established via a microsurgical end-to-end anastomosis between the graft's fibular artery (peroneal artery) and the host's anterior tibial artery. To provide greater stability, two Kirschner wires were inserted, transfixing both the host tibia and the grafted fibula.

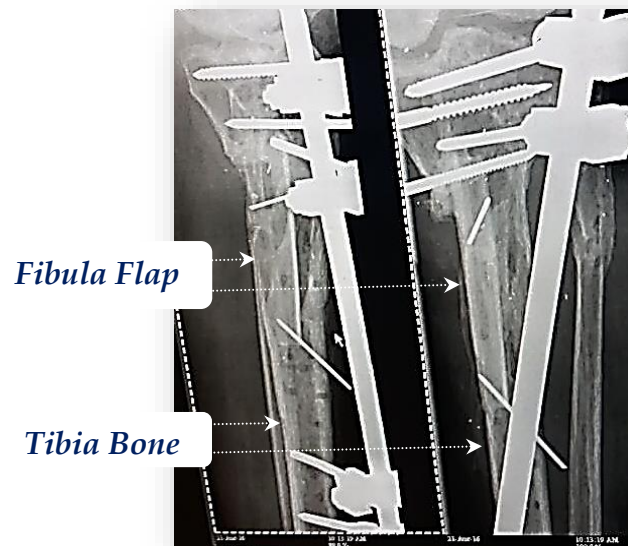


Figure (4): Post-Operative X-Ray, Left Leg

Summary of Findings:

This X-ray demonstrates a successful long-term outcome.

Key positive indicators include: **Bony Union:** Solid integration of the graft with the host bone. **Periosteal Reaction:** Active new bone formation, a sign of excellent graft viability. **Graft Hypertrophy:** The fibula has thickened in response to mechanical load, a process that will continue until it resembles the native tibia in size and strength.

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