Case report

Severe Open - Gustilo Type III B - Tibial Fracture Treated by External Fixation and the Distally Based Hemisoleus Flap for Reconstruction of a Distal Third Tibial Wound with Exposed Bone

B. R. Adhikari*, S. Giri**

Abstract

Introduction: High-energy trauma of the lower extremity is a treatment challenge for the orthopaedic and plastic surgeons. External fixation and the distal based hemisoleus flap play an important role in severe injury. External fixator allows additional fracture corrections and secondary reconstructive procedures, essential in such severe soft tissue injury.

Key Words
External fixation, open tibial fracture, soft-tissue injury, distal based hemisoleus flap

Introduction
Severe open tibial fractures are the result of high energy injury. High-energy injuries of the lower leg include a traumatic amputation, a Gustilo type III tibial fracture, a disvascular limb after knee dislocation, a closed tibial fracture, or a penetrating wound requiring vascular repair, a major soft-tissue injury of the tibia, and a severe ankle and foot injury. One of the most important goals in the treatment of severe injury of the tibia is to obtain adequate soft-tissue coverage. Soft-tissue coverage procedures are performed to provide a closed wound, to promote revascularization of the injured bone and soft tissue, and to prevent infection and nonunion that may occur secondary to persistent bone ischemia. The treatment of open tibial fractures with severe soft-tissue injuries are managed with radical wound debridement, external or internal fixation and in time soft-tissue coverage. The type of flap used for soft-tissue coverage of a soft-tissue defect is generally chosen on the basis of anatomical considerations, specifically the location of the defect on the leg, the size of the defect, and the availability of local tissues for coverage.

Case Report
A 27-year-old female was sustained bomb blast injury while returning home from work in micro bus. She was hospitalized in the Orthopedics Department Bir Hospital, two hours after the injury. Surgery under general anesthesia was performed within 6 hours. Clinical examination confirmed distal tibia and fibula fracture on left side and auto below knee amputation on right side. Wound swab was taken for culture and sensitivity. After wound irrigation and debridement, external fixation of distal tibia fracture was performed by placing the universal external fixator with 3 pins proximally and 3 pins distally. The patient received tetanus immunization, Injection ceftriaxone 1gm 12 hourly and metronidazol 500mg 8 hourly intravenously, for 7 days. After the surgery, the Wound was kept clean by daily dressing with betadine solution. Six weeks after primary surgery, still there was large wound over the anteromedial aspect of the distal third of the left leg with exposing the tibia 5x10 cm in size (Fig. 1), which indicates need for soft tissue coverage.
for wound healing as well as fracture healing. As there was no plastic surgeon in the hospital, we planned for the medial reversed hemisoleus flap coverage with split skin graft from the ipsilateral thigh (Fig. 7). Distal based hemisoleus flap was taken with intact vascularity, which was checked and the bleeding from the end of the flap was present. There was small central necrosis of the flap after 3rd post operative day, which was healed by cleaning and dressing. After 6 weeks of flap coverage, wound was healed then external fixator was removed and Patellar Tendon Bearing (PTB) cast was applied and she was mobilized in wheelchair.

Results
A case of a 27-year-old female patient with distal tibial open fracture and extensive soft-tissue injury is presented. After thorough wound irrigation and debridement, external fixation, 3 pins in either side were applied and the distal based hemisoleus flap was mobilized to cover the exposed bone and splitted thickness skin grafting was done to cover the muscle flap. After soft-tissue healing, the external fixator was removed and the pins remained for two more weeks. The patient was advised to use wheelchair as she had Below Knee auto amputation at the time of injury in contra lateral leg. 4 months after the injury wound was totally healed and, the external fixator was removed and PTB cast was applied.

Discussion
An open fracture is contaminated and results from a high-energy injury. The question of amputation or salvage for more severe injuries still generates heated debate. While limb salvage is the initial aim, medium and long-term problems with soft-tissue cover, infection and union are too common and result in serious disability. A number of investigators have mentioned the crucial role that soft-tissue reconstruction plays in the healing of a severe injured lower extremity. The operative management is complex. It includes a thorough irrigation and a radical wound debridement, fracture stabilization and soft-tissue coverage. After the surgery on the leg, early mobilization and joint motion were encouraged. Soft-tissue coverage reduces a possibility of serious complications such as osteomyelitis, wound infection, wound necrosis, flap loss, nonunion, and sometimes, unfortunately, amputation. Many authors agree that soft-tissue coverage is an important determinant of wound complications. Another group of authors recommends external fixation in the treatment of severe open fractures. We do not have any experience with the internal fixation of severe open tibial fractures. All open fractures are treated with external fixation method. Our opinion is that the method of unilateral external fixation is workable and relatively easily applied; it also allows additional fracture corrections and additional reconstructive operations, which is often essential.

Conclusion
External fixation and distal based hemisoleus flap allow fracture healing and reduce the possibility of postoperative complications, such as osteomyelitis, nonunion and infection.
Fig. 2: Exposing Soleus Muscles from Medial Incision

Fig. 3: Medial Half of the Soleus detached from Proximally

Fig. 4: Reverse Hemisoleus Flap is Elevated with Distally based Perforators

Fig. 5: Medial Hemisoleus Flap with Good Vascularity

Fig. 6: Exposed Bone is Covered by the Flap
Fig. 7: Wound is Closed and Split Thickness Skin Graft

Fig. 8: The Injured Leg 3 months after the Injury and 3 weeks of Flap Coverage

Fig. 9: Same Patient with Amputated Right Leg

Fig. 10: X-Ray after External Fixation

Fig. 11: Radiographs 4 Months after the Injury.

References
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