

# Medial Perforator Flap for Coverage of Defects around the Ankle

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**Background:** Wounds around the ankle with exposed bones, tendons and nerves are very common in our practice and their reconstruction remains a challenge for the plastic surgeons. They often lead to infection and mal-union if early vascularized cover is not provided. **Objective:** To evaluate efficacy of medial perforator flap for reconstruction of this difficult area. **Methods:** A total number of 40 patients with injuries around the ankle were studied between December 2004 to December 2006 and all of them underwent reconstruction with medial perforator flaps. **Conclusion:** The Medial perforator flap is a quick, versatile, reliable reconstructive option and has minimal donor site morbidity.

**Keywords:** Medial perforator flap, around the ankle defects, early cover

Trauma around the ankle with exposed bones, nerves, vessels and tendons is extremely common and reconstruction of this area continues to be challenging for Plastic Surgeons. High-energy injuries lead to complex defects in this area. Early coverage of exposed structures is crucial to promote healing and decrease the risk of infection and non-union<sup>1</sup>. The goal is to provide an early cover i.e. within seven days<sup>2,3</sup>. Many centers began to reconstruct the majority of these defects with microvascular free-tissue transfer<sup>4,5,6</sup>. The Free flaps are technically demanding, need expensive instrumentation and long operating time with significant complication rates and donor site morbidity<sup>6,7,8</sup>. A better understanding of vascular anatomy of the lower leg has resulted in popularity of many reliable and robust local flaps. Medial perforator flap is the torch bearer amongst this new breed of flaps<sup>6,9</sup>. These local flaps are simpler alternative to free tissue transfer<sup>10</sup>. A series of 40 patients is presented.

## Vascular Basis and Technique

**Vascular basis:** Medial perforator flap is a distally based flap perfused by septocutaneous perforators of posterior tibial vessels and it does not sacrifice any major vessel of the extremity.

Medial intermuscular septum divides flexor compartment of the leg into superficial and deep muscles. Posterior tibial artery (PTA) runs between Soleus and deep Flexors in upper two third and between Soleus and Flexor hallucis longus in lower third. Along its course PTA gives off 3-11 septocutaneous perforators at variable levels.<sup>6</sup> In the Zone -I (lower third of leg) it gives off 1-4 perforators, out of these one around 5 cm is most constant and sizeable. A flap based on this perforator is used to cover more distal defects. However flaps on second perforator is useful for lower third tibial defects

**Technique:** PTA perforators marking is done by 10 MHz probe hand held Doppler. First a thorough débridement is done under tourniquet. Then an incision is made along posterior border of the tibia and the perforator location is confirmed. A suitable perforator is selected and flap is designed, raised, islanded on the perforator, transferred to the defect and inset into the defect. Medial perforator flap

can be raised either as fasciocutaneous or adipo-fascial flap. Donor site usually requires a split thickness skin graft except for adipo-fascial variety.

Fig. 1: Zones and PTYA perforators in leg

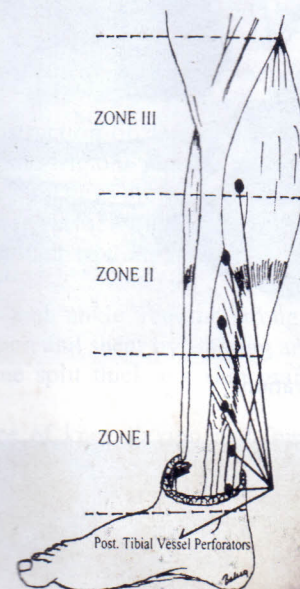


Fig. 2: Pre-op PTA perforator marking with hand held Doppler

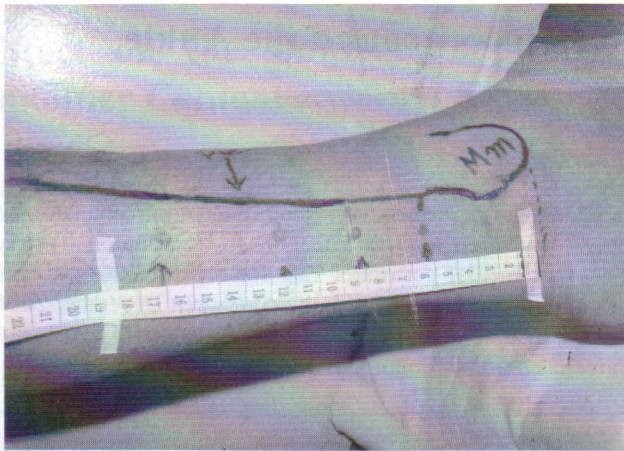


Fig. 3- PTA perforator in zone



Fig. 4: Wound debridement & MPF design

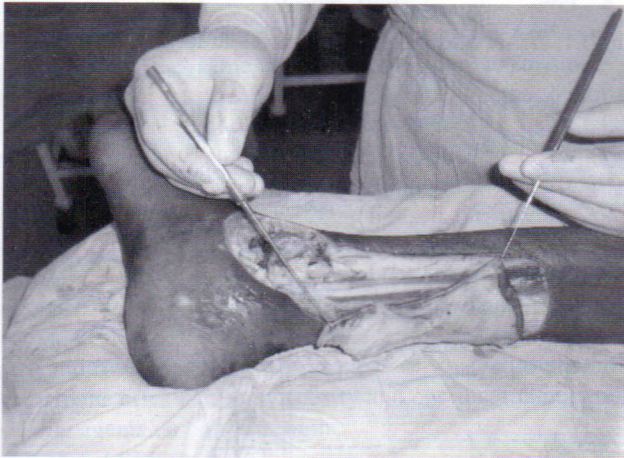


Fig. 5- MPF elevation



Fig. 6: final result



Fig. 7- Exposed Achilles tendon



Fig. 8- Late result Adipofascial MPF

### Patients and methods

Between December 2004 and December 2006 a total of 40 patients with defects around the ankle were managed in the Department of Plastic Surgery, Jinnah Hospital, Lahore. The patient population included 25 male (62.5%) and 15 female (37.5%). The age ranged between 10 and 50 years, with a mean of 28 years. 26 patients (65%) were between 10-30 years of age, representing the major trauma susceptible group (See Fig. 9). 34 patients (85%) presented after Road-Traffic accidents, 4 patients (10 %) after firearm injuries and 2 (5 %) with other causes (see Fig. 10). Average time elapse between the injury and reconstruction was 13 days.

Fig. 9 Age distribution

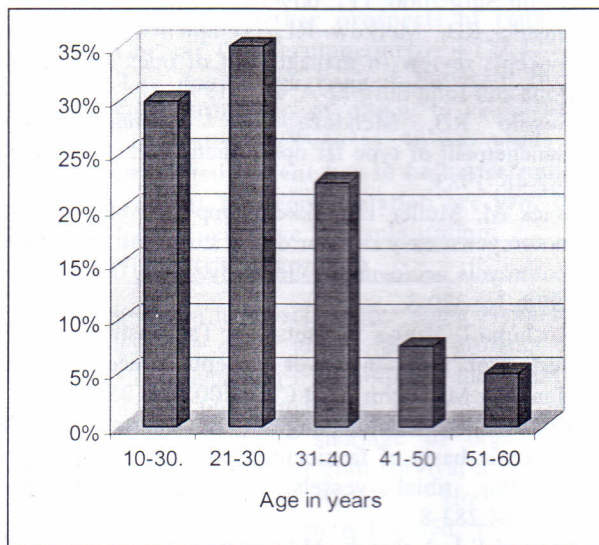
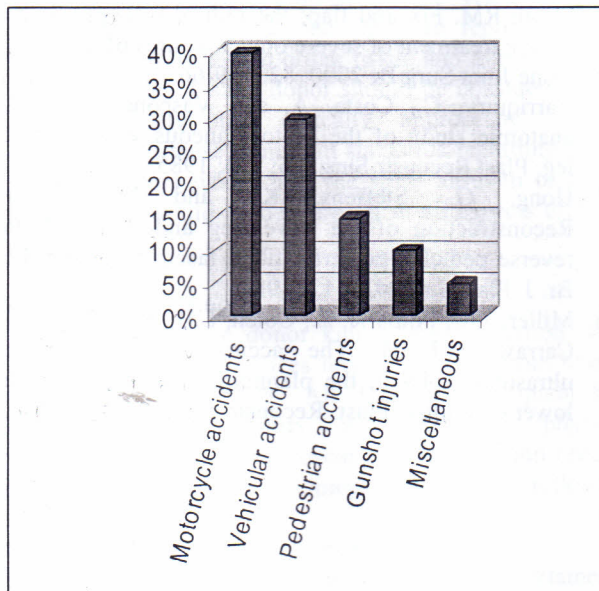


Fig. 10: Aetiology of defects



### Results

Thirty-eight (95%) patients made successful recovery with complete flap survival. One (2.5%) patient had complete flap necrosis because of inadvertent injury to the perforator and was recognized immediately, the flap was returned to its original place where it subsequently necrosed. The primary defect was covered by another local flap. There was partial flap necrosis in another patient (2.5%), which was managed by flap advancement. In 39 (97.5%) patient was used as fasciocutaneous and the donor sites were split-skin grafted. In one (2.5%) patient the flap was used as adipofascial and the donor site was closed primarily. In 5 (12.5%) patients contour irregularity of the donor area was noticed because of thick subcutaneous tissues but rest of the patients (87.5%) had acceptable donor site appearances.

### Discussion

Road Traffic Accidents due to unrestrained and unregulated traffic system in our part of the world leads to crushing, avulsion and high-speed bursting injuries, resulting in complex defects, which often requires combined management by the orthopedic and Plastic surgery teams.

The reconstruction of defects around the ankle with exposed bones and tendons remains a challenge for plastic surgeon. As the structures are subcutaneous and the skin in this area has poor elasticity Fractures of lower 1/3<sub>rd</sub> of leg are notorious in their healing and availability of local soft tissue for cover<sup>11</sup>.

The foot and ankle require strong durable cover because of friction and shear by walking and footwear. For this reason alone split thickness skin graft is not a good option.

The degree of knee flexion and immobilization for the weeks required for cross-leg flap with subsequent joint stiffness and contracture preclude its use in adults and elderly patients. However, this flap can be used in children because the risk of joint stiffness and contracture is less.

Free tissue transfer is indicated in large or circumferential defects exposing fractures, open joints, or Achilles tendon. In some instances loss of soft tissue or placement of incisions preclude the use of lateral or medial fasciocutaneous areas as local flaps. However free tissue transfer requires specialized instrumentation, long operating time and microsurgical training.

There is an ongoing debate between the use of muscle or fasciocutaneous flaps for coverage of these complex defects.

Mathes et al cite better healing and adherence in an infected wound with a muscle flap<sup>12</sup>. Muscle seems to conform better to regular cavities and to adhere or fibrose better than a fasciocutaneous flap. Fasciocutaneous flaps however seem to suite most wounds well and may be transferred as a sensate flap and are much thinner and cosmetically superior. These flaps have the additional

advantage of providing better cover for re-operation for future reconstruction. Medial perforator artery flap is versatile for coverage of defects around the ankle in suitable patients. Thorough debridement and provision of early flap cover is vital in prevention of infection, promotion of healing and restoration of good extremity function<sup>13</sup>.

Examination of the perforators of the posterior tibial artery at the ankle and leg regions and determination of their levels is important for defining different reconstructive alternatives. Hwang et al<sup>10</sup> showed the anatomical and clinical use of the medial leg skin flap. Carriquiry et al<sup>14</sup> searched the anatomy and the septocutaneous vascular anatomy of the leg region. Hong et al<sup>15</sup> have used the reverse flow posterior tibial artery fasciocutaneous flap for reconstruction of lower leg defects. Wu et al<sup>2</sup> showed the perforators of the posterior tibial artery on the leg and ankle region and define the distribution of these perforators according to the zones and also determine the perforators sizes and clinical usability of these perforators. Miller et al<sup>16</sup> showed that duplex ultrasonography is a useful technique for the detection of lower extremity perforator and for preoperative design of the flap.

The medial perforators in lower third of leg are fairly constant, especially the lower most which emerges from the deep fascia 5 to 7 cm proximal to the tip of medial malleolus. These flaps are quick and easy to perform, average operating time being one and half-hour. Their vascular robustness is proven by our study showing success rate of 95%. Its versatility is also evident from the fact that it can reach lower third of tibia proximally, ankle anteriorly, Achilles' tendon posteriorly, sole and dorsum of the foot distally. It can be used as an island, as a propeller or simply as a pedicled flap. According to the need it may be raised as fasciocutaneous or adipofascial flap.

**Conclusion**

Medial perforator flap is versatile, reliable, quick to execute and has minimal donor site morbidity. We strongly recommend its use for coverage of this difficult area around the ankle in suitable cases.

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