FASCIOCUTANEOUS FLAPS IN RECONSTRUCTION OF THE LOWER LEG, ANKLE, AND HEEL

Osman LATIFOĞLU, M.D., Reha YAVUZER, M.D., Sühan AYHAN, M.D., Kenan ATABAY, M.D., Seyhan ÇENETOĞLU, M.D., M. Cemalettin ÇELEBI, M.D.

Gazi University, Faculty of Medicine, Department of Plastic and Reconstructive Surgery, Ankara, Turkey
Gazi Medical Journal 1998; 9: 61-65

SUMMARY:

Purpose: Soft tissue reconstruction of the lower leg, especially the ankle and heel region, is still a challenging problem. With the recent advances of vascular anatomy knowledge, the indication spectrum of fasciocutaneous flap is extended, and it becomes an expedient alternative in lieu of more complicated procedures. In this study, the surgical outcome of fasciocutaneous flaps for lower leg reconstructions is presented. Methods: Over the past seven years, 10 fasciocutaneous flaps were used in 10 patients to cover defects on the lower extremity due to trauma or tumor. Six flaps were superior based and four were distally based, two of which were transposed to the ankle and heel region with tube pedicles requiring a two-stage reconstruction. Results: Although distal superficial necrosis, slight venous congestion, and edema were seen as minor complications, all flaps survived with satisfactory results. Conclusion: Coverage of the lower leg defects with random fasciocutaneous flaps is technically simple, violates only the injured extremity, does not sacrifice a major vessel, brings similar local tissues into the defect, and eliminates the need for more sophisticated equipment and microsurgical expertise. These flaps proved to be safe and simple, and they should be seriously considered among other treatment choices for lower leg reconstruction.

Key Words: Surgical Flaps, Leg Injuries, Heel Injuries, Ankle Injuries, Fascia.

INTRODUCTION

Microvascular techniques have revolutionized the treatment of patients who have soft-tissue defects of the lower extremity. Recent improvements in the understanding of blood supply from musculocutaneous perforators or fasciocutaneous vessels has renewed the interest of fasciocutaneous transposition flap usage in reconstruction of lower extremity (1-10). Recognition of the fasciocutaneous flap as a reliable alternative for obtaining vascularized tissue has developed since its reintroduction by Pontén (7), who applied the knowledge of the suprafascial plexus to design a transposition flap for coverage of injured areas of the lower extremity.

Distant pedicled flaps such as the cross-leg flap or delayed local skin flaps may cause unjustifiable morbidity unless microsurgical capabilities are unavailable or not been successful (11, 12). Neighboring flaps include the dorsalis pedis island, (13) extensor digitorum brevis, (14) reversed tibialis anterior (3, 15, 16) or peroneal fascial flaps.
Other described fasciocutaneous flaps at the ankle level are based on the lateral calcaneal (19) or anterior-posterior perforating branch of the peroneal artery (17, 18), or they are distally based flaps dependent on septocutaneous perforators of the posterior tibial artery (2), Pontén, (7) Barclay et al., (9, 10) and Hallock (4) have demonstrated the successful alternative of free flap coverage using the tibialis anterior perforators. Lagvankar (5) has reported a distally based random fasciocutaneous flap for multistage reconstruction of defects in the lower third of the leg, ankle, and heel. These random flaps do not require the isolation or presence of discrete vessels.

In cases with tissue defects, including bones or tendinous structures of lower leg, ankle and foot, we performed superior or distally based fasciocutaneous flaps or distally based tube fasciocutaneous flaps of the lower leg without sacrificing big vessels.

**PATIENTS AND METHODS**

From 1990 to 1997, 10 local fasciocutaneous flaps were used for lower extremity soft tissue reconstruction and the cases were retrospectively analyzed. The majority of wound problems involved the middle third of the lower extremity (60%). Two cases (20%) involved the proximal third of the lower leg, one involved the heel, and the other one involved the ankle. (Table 1). Trauma was the most common factor (90%) necessitating some form of vascularized coverage (Table 1).

In all cases, type A fasciocutaneous flaps were used (Fig. 1). Each patient had only one flap performed and none of the flaps were delayed. Six flaps were superior based (Pontén) (Fig 2: Case no: 1), and four were distally based, as reported by Amarante (Fig 3: Case no: 8). Two of the distally based flaps were transposed to the ankle and heel region with tube pedicles for two-stages

![Diagram A]

![Diagram B]

![Diagram C]

*Fig. 1:* Types of fasciocutaneous flaps: Type A — multiple source of inflow; Type B — single, discrete perforator; Type C — multiple segmental perforators from an underlying deep artery.

<table>
<thead>
<tr>
<th>Case No</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Etiology of Defect</th>
<th>Defect Site</th>
<th>Flap Base</th>
<th>Flap Size (cm)</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>38</td>
<td>M</td>
<td>Trauma</td>
<td>Middle 1/3 lower leg</td>
<td>Superior</td>
<td>4x9</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>49</td>
<td>M</td>
<td>Trauma</td>
<td>Middle 1/3 lower leg</td>
<td>Superior</td>
<td>8x25</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>F</td>
<td>Tumor</td>
<td>Proximal 1/3 lower leg</td>
<td>Superior</td>
<td>7x20</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>M</td>
<td>Trauma</td>
<td>Proximal 1/3 lower leg</td>
<td>Superior</td>
<td>7x25</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>M</td>
<td>Trauma</td>
<td>Middle 1/3 lower leg</td>
<td>Superior</td>
<td>6x17</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>F</td>
<td>Trauma</td>
<td>Middle 1/3 lower leg</td>
<td>Distal</td>
<td>6x20</td>
<td>Superficial necrosis</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>M</td>
<td>Trauma</td>
<td>Middle 1/3 lower leg</td>
<td>Superior</td>
<td>6x22</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>15</td>
<td>M</td>
<td>Trauma</td>
<td>Middle 1/3 lower leg</td>
<td>Distal</td>
<td>6x19</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>35</td>
<td>M</td>
<td>Trauma</td>
<td>Ankle</td>
<td>Distal - tube</td>
<td>7x21</td>
<td>Edema</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>M</td>
<td>Trauma</td>
<td>Heel</td>
<td>Distal - tube</td>
<td>7x25</td>
<td>Venous congestion</td>
</tr>
</tbody>
</table>

*Table 1:* Patient data, anatomic site of defects, flap base, size and complications.
Fig 2: Case no.: 1 A. Preoperative anterior view of an open tibial wound.

Fig 2: Case no.: 1 C. Three months postoperatively with satisfactory tissue coverage.

Fig 2: Case no.: 1 B. Rotation of the superior based fasciocutaneous flap.

Fig 2: Case no.: 8 A. Preoperative view of an open proximal tibial wound.
reconstruction of defects (Fig 4: Case no: 10). Flap sizes varied over a range from 4x9 cm to 6x25 cm, with an average width to length ratio of 1:3.2. Eight fasciocutaneous flaps were performed as a one-stage reconstruction. For donor site closure, split thickness skin grafting was utilized.

In the postoperative period, patients had to maintain prone or supine position for 5 to 7 days to avoid any pressure on the flap or on the donor site. Simple petrolatum gauze dressings were changed daily. Antibiotics, usually first generation cephalosporins, were administered perioperatively as for prophylaxis. Antibiotics for patients who had osteomyelitis were chosen on the basis of the organism that had grown on culture. For the two cases for whom tube pedicle flaps were used (Case no: 9, 10) a second stage was performed four weeks after the initial transfer, the pedicles were divided, and the carrier segments were returned to their original position.

RESULTS

All the flaps survived with satisfactory outcomes (Table I). Two flaps showed slight venous congestion or edema which disappeared in a few days. However, we did not observe any lasting lymphedema following these operations. Only one distal superficial necrosis was noted in the postoperative period (Case no: 10 - ankle reconstruction with distally based tube flap); and
DISCUSSION

The highest incidence of free flap failure occurs in the difficult region of the lower extremity, and for some of the patients, this might be an unacceptable risk (8, 20, 21). If the wound or defect requires a flap coverage, superior or distally based fasciocutaneous flaps have proven to be a reliable option that can be inset rapidly and simply both in this series and literature.

According to the schema of Cormack and Lamberty, our flaps may be classified as type A fasciocutaneous flaps, as they depend on multiple suprafascial vessels entering their base from predictable sources (8, 20).

Other well-defined lower extremity fasciocutaneous flaps based on a named perforator or branch, such as the lateral calcaneal (19), lateral supramalleolar (22), anterior-posterior perforating branch of the peroneal artery (17, 18) or distally based flaps dependent on septocutaneous perforators of the posterior tibial (23, 24), distally based anterior tibial (3, 15, 16) or distally based sural island (25, 26) flaps do exist. These flaps require a much more meticulous dissection to determine the source of the perforator, which
frequently may be anomalous. The sacrifice of a major limb vessel would not be acceptable in any injured leg.

A significant complication of superficial distal fasciocutaneous flap occurred in a patient who had diabetes mellitus. In the two patients with heel and ankle defects, distally based tube flaps were performed in two stages and the flaps were not delayed. However, Lagvankar (5) reported this technique as a three-staged reconstruction in which a delay procedure was also executed.

The random fasciocutaneous flap has some additional advantages over the more complex composite tissue transfers. These are; having less morbidity, avascular subfascial plane of dissection, little risk of hemorrhage, preservation of the major vascular structures of the lower limb, preserving muscle function, violation of only the injured extremity, bringing similar local tissues into the defect, and avoiding the need for more sophisticated equipment and microsurgical expertise. For acute coverage of distal leg, heel or ankle defects, the simplicity in utilizing these random fasciocutaneous flaps and their reliability should strongly be considered.

Correspondence to: Dr. Osman LATIFOĞLU
Gazi Üniversitesi Tip Fakültesi
Plastik ve Rekonstrüktif Cerrahi
Anabilim Dalı
Beşevler
06500 ANKARA - TÜRKİYE
Phone: 312 - 214 10 00 / 6410

REFERENCES