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

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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 altenative 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) extansor digitorum brevis, (14) reversed tibialis anterior (3, 15, 16) or peroneal fascial flaps

(17,18). 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 I). Trauma was the most common factor (90 %) necessitating some form of vascularized coverage (Table I).

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

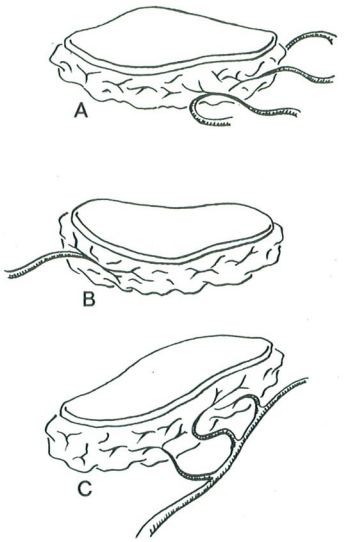

Fig - 1 : Types of fasciocutaneous flaps : Type A-multiple source of inflow; Type B-single, discrete perforator; Type C-multiple segmental perforators from an underlying deep artery.

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

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 - 3: Case no : 8 A . Preoperative view of an open proximal tibial wound

Fig - 3: Case no : 8 B . Rotation of the distally based fasciocutaneous flap.

Fig - 3: Case no : 8 C . Three months postoperatively with excellent healing.

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

Fig - 4: Case no : 10 A . Preoperative oblique view of a large unstable heel scar.

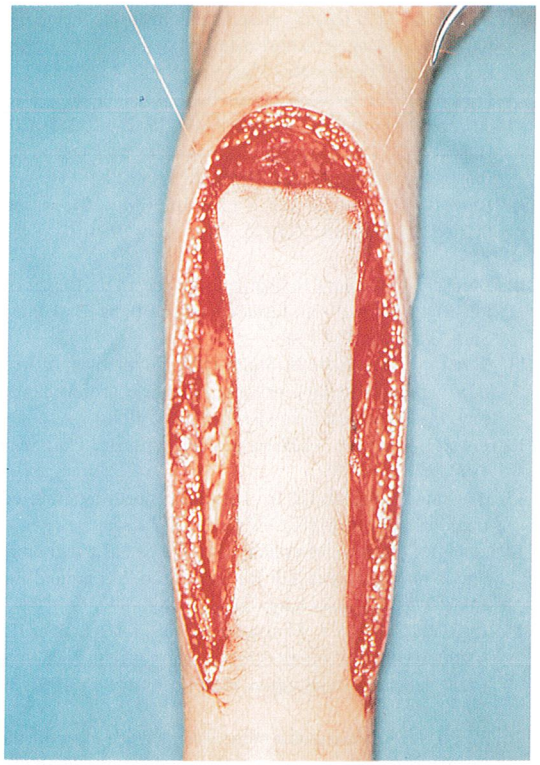

Fig - 4: Case no : 10 B . Distally based fasciocutaneous flap was elevated.

Fig - 4: Case no : 10 C . Transposed to the heel.

after local debridment, underlying fascia survived to support a skin graft.

Fig - 4: Case no : 10 D . After three weeks the tube pedicle was divided and carrier segment were returned to its original anatomic position.

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 necrosis in the distally based 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 morbitiy, 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.

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REFERENCES

1. Louton RB, Harley RA, Hagerty RC : A Fasciocutaneous transposition flap for coverage of defects of the lower extremity. J Bone Joint Surg 1989; 71-A : 988-994.
2. Amarante J, Costa H, Reis J, Soares : A New distally based fasciocutaneous flap of the leg. Br J Plast Surg 1986; 39: 338-340.
3. Hallock GG : Distally based flaps for skin coverage of foot and ankle. Foot Ankle Int 1996; 17 : 343-348.
4. Hallock GG : Local fasciocutaneous flap skin coverage for the dorsal foot and ankle. Foot Ankle 1991; 11 : 274-281.
5. Lagvankar SP : Distally-based random fasciocutaneous flaps for multi-staged reconstruction of defects in the lower third of the leg, ankle and heel. Br J Plast Surg 1990; 43: 541-545.
6. Lagvankar SP : Distally-based random fasciocutaneous flaps for one-staged reconstruction of defects in the upper two- thirds of the leg. Br J Plast Surg 1990; 43 : 468-472.
7. Pontén B : The fasciocutaneous flap: its use in soft tissue defects of the lower leg. Br J Plast Surg 1981; 34 : 215-220.
8. Hallock GG : Distal lower leg local random fasciocutaneous flaps. Plast Reconstr Surg 1990; 86 : 304-311.
9. Barclay TL, Sharpe DT, Chisholm EM : Cross leg fasciocutaneous flaps. Plast Reconstr Surg 1983; 72 : 843-846.
10. Barclay TL, Cardoso E, Sharpe DT, Crocet DJ : Repair of lower leg injuries with fasciocutaneous flaps. Br J Plast Surg 1982; 35 : 127-132.
11. Serafin D, Georgiade N, Smith DH : Comparison of free flaps with pedicled flaps for coverage of defects of the leg or foot. Plast Reconstr Surg 1977; 59 : 492-499.
12. Bowen J, Meares A : Delayed local leg flaps. Br J Plast Surg 1974; 27 : 167-170.
13. Mc Craw JB, Furlow LT Jr : The dorsalis pedis arterialized flap. Plast Reconstr Surg 1975; 55 : 177-185.
14. Landi A, Soragni O, Monteleone M : The extansor digitorum brevis muscle island flap for soft tissue loss around the ankle. Plast Reconstr Surg 1985; 75 : 892-897.
15. Rocha JFR, Gilbert A, Masquelet A, Yousif NJ, Sanger JR, Matloub HS : The anterior tibialis anterior flap: Anatomic study and clinical application. Plast Reconstr Surg 1987; 79 : 396-406.
16. Wee JTK : Reconstruction of the lower leg and foot with the reverse-pedicled anterior tibial flap: preliminary report of a new fasciocutaneous flap. Br J Plast Surg 1986; 39 : 327-337.
17. Yoshimura M, Imura S, Shimamura K, Yamauchi S, Nomura S : Peroneal flap for recontruction in the extremity: Preliminary report. Plast Reconstr Surg 1984; 74 : 402-409.
18. Gu YD, Wu MM, Li HR : Lateral lower leg skin flap. Ann Plast Surg 1985; 15: 319-324.
19. Grabb WC, Argenta L : The lateral calceneal artery skin flap (the lateral artery, lesser saphenous vein sural nerve skin flap): Plast Reconstr Surg 1981; 68 : 723-730.
20. Cormack GC, Lamberty BGH : A Classification of Fascio-Cutaneous flaps according to their patterns of vascularization. Br J Plast Surg 1984; 37 : 80-87.
21. Godina M : Early microsurgical reconstruction of complex trauma of the extremities. Plast Reconstr Surg 1986; 78 : 285-292.
22. Masquelet AC, Beveridge J, Romana C, Gerber C : The lateral suprsamalleolar flap. Plast Reconstr Surg 1988; 81 : 74-81.
23. Wu WC, Chang YP, So YC, Yip SF, Lam YL : The anatomic basis and clinical applications of flap based on the posterior tibial vessels. Br J Plast Surg 1993; 46 : 470-479.
24. Lees V, Townsend PLG : Use of a pedicle fascial flap based oon septocutaneous perforators of the posterior tibial artery for repair of distal lower limb defects. Br J Plast Surg 1992; 45 : 141-145.
25. Hyakusoku H, Tonegawa H, Fumiiri M : Case report. Heel coverage with a T-shaped distally based sural island fasciocutaneous flap. Plast Reconstr Surg 1994; 93 : 872-876.
26. Hasegawa M, Torii S, Katoh H : The ristally based superficial sural artery flap. Plast Reconstr Surg 1994; 93 : 1012-1020.