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Free flaps in foot and ankle reconstruction: Case series

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Abstract

Introduction: Soft tissue injury around ankle and foot are very difficult to treat. Traditionally in reconstruction of foot and ankle soft tissue defects pedicled flaps have been common mainstay. Evolution in free flap surgery has enabled surgeon to use distant fascial and muscle flap for coverage thereby minimizing morbidity. We present our experience with free flaps for reconstruction of soft tissue defects in the foot and ankle.

Materials and methods: Between April 2016 and March 2017, 11 consecutive patients with average age 33 years (3-60 years old), were referred to our services with soft tissue defect over ankle and foot. This case series consists of patients from either traumatic origin or infective origin. Area of the wound ranges from 80 cm square to 300 cm square (average-130cmsq). All patients were operated under epidural or general anesthesia. All required clinical, laboratory and radiological investigation done before operative procedure to check eligibility of patient for operative procedure.

Results: All the patients tolerated the procedure well. 7 flaps were free antero-lateral thigh flap, 3 flaps were free latissimus dorsi muscle flap and one was free gracilis muscle flap. There was one case of partial necrosis of flap, however the remainder of the flap survived and wound healed completely. Remaining 10 flaps were survived completely. There was one patient who developed donor site graft loss which eventually heals with another skin grafting procedure. Average discharge time of the patient was nine day.

Conclusion: Large defects with exposed bone/ implant with or without infection are best handled with a free flap. Free flaps in our experience are a versatile option for reconstruction for soft tissue defect of ankle and foot.

Keywords: Flaps, foot, ankle reconstruction, tissue defects

Introduction

History

Historically, the principles of surgical management of lower extremity trauma has progressed from that of amputation during World War I and II to one of extremity salvage by improvements in debridement techniques, fracture fixation and soft tissue closure via local, regional and free tissue transfers (1). These advances had seen reductions in mortality, morbidity and length of stay of patients. Initially Pedicle and cross leg flap were mainstay of treatment for soft tissue defect around ankle and foot (2). This modality is cumbersome and with lots of failure. Introduction of free flap and its use in lower limb reconstruction reduced the morbidity significantly.

Materials and Methods

Between April 2016 and December 2017, 11 consecutive patients, were treated. Average age of patients was 34 years (3-58 years old). Patients were referred to our services post trauma to the lower extremity. All wounds were around ankle joint and foot ranging from 80 cm square to 300 cm square. Average defect size was 130 cm.sq. Dorsalis pedis artery and posterior tibial artery checked clinically and with 8 Mhz hand held Doppler device. Pre-operative perforator marking performed in cases of free anterior-lateral thigh flap (3). Consent for operation photography obtained before every procedure.

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Surgical Technique

All patients were operated under epidural anesthesia or general anesthesia. Seven patients were treated with free anterolateral thigh flap, three patients were treated with free latissimus dorsi flap and one in one patient free gracilis flap was used. All flaps were harvested from contra lateral limb or back. In all flaps standard procedure followed which include

1. Debridement of the defect under tourniquet.
2. Measurement of defect with lint piece.
3. Identification of recipient artery and vein. Either anterior tibial or posterior tibial. If suitable artery or vein not found alternate procedure was done thus excluded from the study.
4. Harvesting flap from donor site.
5. Detachment of flap from donor vessels
6. Inset of flap over soft tissue defect except anastomosis site.
7. Anastomosis of donor artery with recipient artery (either end to side or end to end) anastomosis of donor veins

- with recipient veins under microscope
8. Inset near anastomosis area
9. Closure of donor site.
10. Splinting of involved leg to minimize movement.
11. Flap monitoring every 2 hour for first 24 hour.
12. Grafting over flap after 48 hour in case of muscle flap.

Results

Eleven patients with defect over ankle and foot were operated from April 2016 to April 2017 (Table 1). All the patients tolerated the procedure well. There was one flap that was complicated by partial necrosis and in one patient there was a donor site graft loss. One patient had congestion over flap after 8 hour because of venous anastomosis thrombosis which required return to operation theatre and re do of venous anastomosis. All 11 flaps survived (one partial) and no other addition flap were required in these patients. Average hospital stay was 9 days. Donor site complication developed in only one patient.

Table 1

Patient	Age	Sex	Defect Size Cmsq	Etiology	Flap	Hospital Stay	Anesthesia	post op complication	Return To Ot Within 24 Hr
1	21	M	80	trauma	ALT	12	EA	Partial necrosis	
2	58	M	168	Diabetic foot	ALT	15	EA	Donor site graft loss	
3	55	F	144	Diabetic foot	ALT	13	EA	-	
4	42	M	143	trauma	LD	12	GA	-	
5	12	M	96	trauma	ALT	10	GA	-	
6	3	M	98	trauma	ALT	9	GA	-	
7	22	M	100	trauma	GRA	9	EA	-	
8	32	F	130	trauma	ALT	13	EA	-	
9	45	M	300	trauma	LD	14	GA	-	
10	54	M	220	Diabetic foot	LD	15	GA	-	
11	24	M	100	taruma	ALT	12	EA	-	yes



Case 1: Necrotizing fasciitis over dorsum of foot. Debridement and Alt flap coverage.



Case 2: Road traffic accident resulting in ankle soft tissue defect. Coverage of the defect done with free Alt flap. Partial necrosis of flap. Debridement and secondary closure done. flap setteled well



Case 3: Road traffic accident with foot dorsum and toe injury. free alt flap for coverage of soft tissue defect. Flap and donor site healed



Case 4: Crush injury foot due to road traffic accident. Debridement and coverage with free lattissimus dorsi muscle flap. And skin grafting



Case 5: Road Traffic Accident with Dorsum of Foot Injury. Debridement and Free Gracillis Muscle Flap Coverage.



Case 6: 3 year old boy with history of road traffic accident. Patient had extensive soft tissue defect over dorsum of foot. Coverage done with free ALT flap

Discussion

Free flaps continue to be the gold standard for the coverage of lower third leg wounds because of their ability to cover large defects with high success rates and feasibility of using it in acute situations by choosing distant recipient vessels. Free flaps continue to be the first choice for coverage of wounds in the lower third leg with gracilis muscle flap for small and medium defects, latissimus dorsi muscle flap for large defects and anterolateral thigh flap when a skin flap is preferred^[4].

For a reconstructive surgeon to be able to utilize these free flaps in reconstructive surgery, he/she needs to be familiar with microsurgery. The success of free flaps to the lower third of the leg and foot so much depends upon choosing good recipient vessels, it has been said that the surgery of free flaps to the lower third of the leg is the surgery of choosing the recipient vessels^[5].

Preoperative Allen's test is necessary to identify arterial injury. CT angiogram is necessary only when clinical examination is inconclusive

It is always better to perform end to side anastomosis to preserve distal circulation to the foot^[6].

End to anastomosis is done if vessels injured distally and not contributing to distal circulation.

Anastomosis should be performed away from the zone of injury to avoid thrombosis at anastomosis site^[7].

Vena comitantes are the preferred choice of veins for free flaps. Great saphenous vein can be used if vena comitantes are insufficient^[7].

Flap Monitoring should be performed 2 hourly in first 24 hour then 4 hourly in next 48 hour. Monitoring performed with

color, temperature, turgidity, Doppler signal and prick test (if required). Positioning and splinting are very important for prevention vascular thrombosis.

Conclusion

Free flap reconstruction in the foot area is sometimes absolutely indicated. It gives vascularity, tissue volume and coverage. For the infected wounds with dead space and large to medium size, the free flap (ALT, LD and gracilis) is the best choice. Large defects with exposed bone/ implant with or without infection are best handled with a free flap. The final choice of the most suitable treatment always depends on the preference of the surgeon and correct evaluation of each clinical case.

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