



Outcomes and Clinical Applications of Free Anterolateral thigh Flap as a Reconstructive option for Leg and Foot Defects

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Abstract

Lower limb reconstruction remains a big concern. Great advancements have been made over the past century for reconstructing traumatic and non-traumatic defects in leg and foot. The reconstructive methods ranged from leaving the wound to heal by secondary intention up to free flap.

Large defects are commonly reconstructed with free fasciocutaneous flaps or free muscle flaps with skin grafts. The result of a reconstructive operation is mainly due to the vascular component's stability, which is crucial in ensuring the flap survival and proper function. The lower extremity has also been recognized for slow wound healing and as an inadequate source of the flap for reconstruction. In this study, we will present our experience in sohag university hospital In free Antero Lateral Thigh flap used in leg and foot reconstruction as regarding flap outcome, complications.

Keywords:Free flap; Antero Lateral Thigh flap; Lower limb; Reconstruction.

Introduction

Lower limb reconstruction mainly depends on the vascular component's stability, which is crucial in ensuring flap survival and proper function [1]. The lower extremity has also been recognized for slow wound healing and as an inadequate source of the flap for reconstruction since the first phase of plastic surgery. Owing to reduced mobility and a lack of overlying skin, even small lower limb soft-tissue defects usually need flap covering[2]. Before microsurgery, few operative choices were available in lower limb reconstruction, such as local flaps (random skin flaps, muscular or musculo-cutaneous flaps) and cross legs flap [3]. A random pattern flap has an indistinct perfusion pattern and is limited in size and mobility[4].

Once all devitalized tissue has been debrided, and when there is a reliable recipient artery available, the free flap is the best to cover the vital structures exposed[5]

The anterolateral thigh perforator free flap has recently become a popular choice for the coverage of lower extremity defects[6]

ALT flap gained popularity because of several advantages the flap can be harvested simultaneously by two-team approach; one team for flap harvesting and the other for bed preparation so the operation time could be shortened. The pedicle length of ALT flap has a long vascular pedicle so the vein graft could be avoided. The large caliber of the vascular pedicle makes the anastomosis easier. The flap could serve as fascioc-

utaneous, adipofascial, or myocutaneous flap as needed. Bulkiness could be added by the incorporation of the de-epithelialized skin or a portion of muscle cuff. The lateral femoral cutaneous nerve can be included to give us a sensate flap. The donor site morbidity is minimal[8].

Patient and Method :

We retrospectively evaluated 16 patients with post-traumatic foot and leg defects in the period between Feb 2019 and January 2020 where free ALT flap was done for all cases.

This study was on cases of variable ages and sex presented to the plastic surgery department at Sohag university hospital from different governorates of Upper Egypt (Sohag, Qena, Luxor, Aswan, and Red sea).

The initial assessment of each case included the following items:

History taking regarding the following data: Age and sex of the patient, Occupation, Residency, mode of trauma, time of trauma to surgical intervention, presence or absence of other medical problems, previous operations.

Clinical examination included: General examination for all the body so as not to miss any lesions.

Local examination of the affected limb as regards: site of the defect, size of the defect, vascularity of the limb, sensation of the leg or foot, motor examination, exposed vital structure, and old scars

Investigations included: radiological investigation as plain X-ray, a handheld Doppler is used preoperatively for detecting the perforators sites, routine preoperative investigations for the cases prepared for surgical intervention as blood picture, prothrombin time and concentration, etc

The flap parameters (length and width) were determined according to the defect site, size, and site of the perforator.

Follow up:

The patients were followed up for a minimum of 6 months and a maximum of 12 months with a median of 9 months. The cases then followed up in our outpatient clinic ten days after discharge for stitches removal and detecting if there is an infection.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) software

program. Qualitative variables were recorded as frequencies and percentages.

Quantitative variables were presented as means \pm standard deviation (SD).

Results

This study included 16 patients with leg and or foot defects of variable etiologies. Motor car accidents were the cause of the defects in 12 patients (75%) and falling from height caused the defect in two patients (12.5%) while two patients had post-traumatic scar and contracture in the foot (12.5%). The frequency of the etiologies is shown in figure 1 and reconstructed by free anterolateral thigh flap.

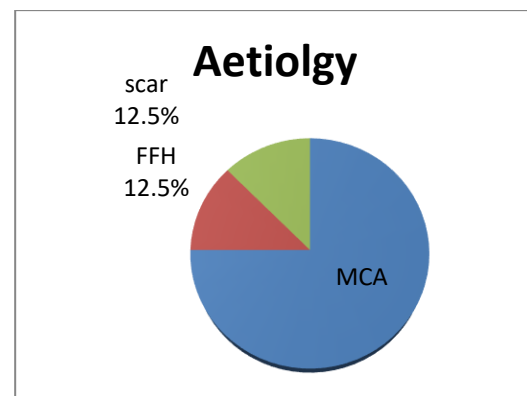


Fig 1: Frequency of leg and foot defect etiologies.

The length of the flaps in our study ranged from 6 to 23 cm and the width ranged from 3 to 7 cm. Defect criteria and time of reconstruction are labeled in Table 1.

| Case number | Defect size | Pathological condition | Time of reconstruction |
|-------------|-------------|------------------------|------------------------|
| Case 1 | 8×4 cm | Infected | 2 weeks |
| Case 2 | 12×4 cm | Clean | 1 month |
| Case 3 | 5×5 cm | Clean | Immediate |
| Case 4 | 10×4 cm | Clean | 2 week |
| Case 5 | 11×7 cm | Clean | Immediate |
| Case 6 | 8×4 cm | Clean | 3 weeks |
| Case 7 | 6×7 cm | Clean | Immediate |
| Case 8 | 9×4 cm | Clean | Immediate |
| Case 9 | 5×3 cm | Clean | 2 weeks |
| Case 10 | 4×2.5 cm | Contracture | 6 months |
| Case 11 | 5×4 cm | Infected | 3 weeks |
| Case 12 | 8×4 cm | Infected | 2 months |
| Case 13 | 3×3 cm | Contracture | 6 month |
| Case 14 | 4.5×4 cm | Clean | 2 weeks |
| Case 15 | 3×4 cm | Clean | 3 weeks |
| Case16 | 4×2.5 cm | Clean | 3 weeks |

Table (1): defect criteria and time of reconstruction.

The maximum size of flap harvested was 27x5cm² and used for covering a defect in the lower third of the left leg and foot following a road traffic accident.

The length of the pedicle that could be dissected ranged from a minimum of 10 cm and a maximum of 15 cm with a mean pedicle length of 12.5 cm. (table2)

| Cases | Flap length/width | Ischemia time | Pedicle length |
|---------|-------------------|---------------|----------------|
| Case1 | 20/7 cm | 5 hr | 12 cm |
| Case 2 | 13/4 cm | 4 hr | 11 cm |
| Case 3 | 16/6 cm | 4 hr | 12.5 cm |
| Case 4 | 27/5 cm | 7 hr | 12.5 cm |
| Case 5 | 20/5 cm | 2 hr | 12 cm |
| Case 6 | 9/4 cm | 4 hr | 11 cm |
| Case 7 | 10/4 cm | 4 hr | 10cm |
| Case 8 | 12/5 cm | 3 hr | 12 cm |
| Case 9 | 22/6 cm | 4 hr | 11 cm |
| Case 10 | 12/5 cm | 3 hr | 15cm |
| Case 11 | 7/4 cm | 2 hr | 12 cm |
| Case 12 | 23/4 cm | 5 hr | 14 cm |
| Case 13 | 6/3 cm | 3hr | 15 cm |
| Case 14 | 10/5 cm | 2 hr | 11 cm |
| Case 15 | 8/4 cm | 2 hr | 13 cm |
| Case 16 | 12/4 cm | 3 hr | 14 cm |

Table (2): Flap length/width, ischemia time, and pedicle length.

Recipient Vessels used in anastomosis:

14 cases were anastomosed on the posterior tibial artery.

2 cases were anastomosed on the anterior tibial artery.

14 cases single vein anastomosis(deep system)

2 cases two veins (one vein from the deep system and great saphenous vein)

Complications

One flap had venous congestion and complete flap necrosis Debridement

and a split-thickness skin graft was done.

Wound infection occurred in 3 cases, which was managed by daily dressings and empirical antibiotics (Amoxicillin clavulanic acid combination + cefotaxime) for one week. Demographic data are presented in (Table 3).

| Type | Frequency | Percentage |
|-----------------------|-----------|------------|
| Total flap loss | 1 case | 6.25% |
| Infection | 3 cases | 18.75% |
| Hypertrophic scar | 1 case | 6.25% |
| Poor function outcome | No cases | 0% |

Table 3: Complications detected during the follow-up period.

Donor site management Split thickness skin graft had been used for donor site closure in 14cases (87.5%). The donor site had been closed completely primary in 2 cases(12.5%) in figure 2.

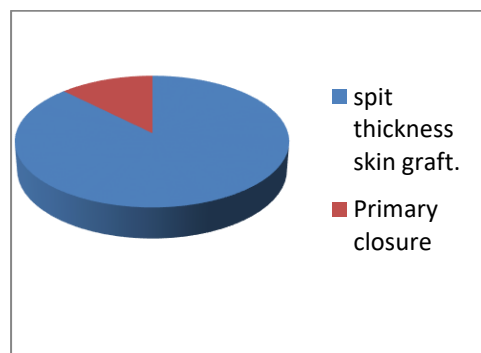


Fig 2: The percentage of each method of donor site closure.

Discussion:

Flap harvesting is done with the assistance of a handheld Doppler to localize a cutaneous perforator and the flap is designed around it, then the vessel is retrogradely dissected until we reach a sufficient pedicle length and caliber[5]. There are two pedicles for the anterolateral thigh flap: the descending branch or the oblique branches. The descending branch is the best because it is usually a longer and larger caliber.[9]

Free ALT flap replaced the radial forearm flap, which was the most preferred flap used.. anterolateral thigh flap gain a good reputation because it can be harvested as a cutaneous, fasciocutaneous, and myocutaneous flaps[5]. When a thin flap is needed, it can be thinned to about 5 mm by excision of subcutaneous tissue[2]. It can be a muscle flap (vastus lateralis muscle flap) based on the descending branch of the lateral circumflex femoral artery[10]. The flap can be sensate by the inclusion of the lateral femoral cutaneous nerve[5]. A vascularized fascia lata can be included with the flap for tendon reconstruction (eg, patellar tendon or tendon Achilles). The only other donor site which may be as good as free ALT flap is the dorsal thoracic territory based on the subscapular system[11]. The subscapular system allows the harvest of skin, muscle, myocutaneous, and bone. The major advantage that the ALT flap has is patient positioning during the harvest. The dorsal thoracic territory based on the subscapular system is usually harvested in the prone or lateral decubitus position. So it requires an intraoperative change in patient position for head and neck cases that will lead to lengthening operation time. The anterolateral thigh, in contrast, allows a 2-team approach. Donor site morbidity tends is greater when the subscapular system is used and shoulder stiffness and high rates of seroma, particularly if the latissimus dorsi muscle is harvested[12]. The only limitation of this flap is that it is unable to reliably provide bone. When a bone flap is needed, we do free fibula transfer. When there is both soft tissue defect and bone defect we can combine free Anterolateral thigh flap with free fibula flap. [1].

Conclusion :

The anterolateral thigh flap is very versatile. It gives us large and pliable skin coverage of defects of the foot. The

flap can reliably and safely be harvested in most patients with minimal donor site morbidity.

Case presentation :

Case (1) Nine years old male patient with a traumatic raw area over the dorsum of left foot defect size was 7x 5 cm reconstructed by a free ALT flap donor site was closed primarily with minimal donor site morbidity. Fig 3

Vessels used in the anastomosis

A1: posterior tibial artery

V: posterior tibial artery vena comitants



fig 3a: A traumatic raw area with exposed bone on the dorsum of the left foot



Fig 3b :Flap raising



Fig 3c: Flap inset to the defect.



Fig 3d: Donor site closed primary.

Case (2): 35 years old male patient with a traumatic raw area over the dorsum of left foot defect size was 6x5 cm reconstructed by a free ALT flap donor site was closed primarily fig 4.

Vessels used in the anastomosis

A: posterior tibial artery

V: posterior tibial artery vena comitants



Fig 4a: A traumatic defect over the left foot.



Fig 4b: Defect coverage by the flap.

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