

The Versatility of the Free Anterolateral Thigh Flap in Reconstruction of Soft Tissue Defects in the Extremities

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ABSTRACT

Background: Soft tissue defects in the upper and lower extremities pose difficult reconstructive challenges. The free anterolateral thigh (ALT) flap is among the different options that can be used to reconstruct these defects. This flap is characterized by a long pedicle with relative ease of dissection.

Patients and Methods: Fourteen patients suffering from upper and lower extremities defects due to different reasons were reconstructed using the anterolateral thigh (ALT) flap.

Results: Superficial necrosis occurred in one case and hematoma in another. Otherwise, all flaps survived well.

Conclusion: The ALT flap can be considered an excellent and ideal alternative for reconstruction of complex defects in the upper and lower extremities.

INTRODUCTION

Many extremity defects pose challenges to the reconstructive surgeon. The primary goal of extremity reconstruction is to restore and maintain its function. The secondary goal is to provide an aesthetically acceptable final result [1,2]. Traditionally, Latissimus Dorsi and rectus abdominis muscle flap have been used for the reconstruction of large defects. Compared with the thoracic or trunk areas as donor site, a remarkable benefit of the anterolateral thigh (ALT) flap is the minimal loss of function and the cosmetically acceptable donor site.

Since its first description by Song et al., in 1984, the ALT flap has gained popularity in reconstruction of various anatomical regions including the head and neck as well as for extremity reconstruction.

The aim of this study was to assess the feasibility of the ALT flap in reconstruction of challenging upper as well as lower extremities defects due to various reasons.

PATIENTS AND METHODS

This case series study has received the acceptance of the ethical committee in Alexandria Faculty of Medicine under the number 0303272 dated 7.7.2016. Fourteen patients suffering from upper and lower extremities defects were included. The study was conducted in the period starting January 2014 till February 2016.

The mean age of the patients was 28 years (range 5-57 years). Ten patients (75.5%) were males and 4 females. Eight patients (57%) were smokers. Half of the defects were in the upper extremity, and the other seven patients suffered defects in the lower limb. Table (1) shows the demographic data of the patients as well as the etiology of the defects.

Table (1): Patients data.

Case	Age	Gender	Etiology	Defect location	Defect size	Complications
1	5y	F	Post-burn contracture	Axilla	7x12cm	None
2	24y	M	RTA	Distal third leg	10x15cm	Partial (superficial) loss
3	34y	M	High voltage electrical burn	Distal forearm & hand	9x16cm	Hematoma
4	57y	F	RTA	Foot	13x21cm	None
5	36y	M	RTA	Forearm	11x18cm	None
6	22y	M	RTA	Distal third leg	10x8cm	None
7	31y	M	RTA	Distal third leg	8x7cm	None
8	27y	M	Assault by knife	Forearm	13x8cm	None
9	22y	F	RTA	Distal third leg	14x7cm	None
10	33y	M	RTA	Hand	12x8cm	None
11	21y	F	RTA	Middle third leg	15x9cm	None
12	40y	M	RTA	Forearm	13x10cm	None
13	8y	M	RTA	Hand	12x7cm	None
14	21y	M	RTA	Foot	15x9cm	None

RTA: Road traffic accident. M: Male. F: Female.

All the flaps done in this study were of the fasciocutaneous type. In one case only (Case 4), suprafascial dissection was done to obtain a relatively thin flap.

Surgical technique:

All cases were operated upon by two teams simultaneously. One team prepared the recipient site through doing either wound debridement or contracture release and preparing the recipient vessels. At the same time, the other team was harvesting the flap. The flaps were always harvested from the contralateral side of the defect to facilitate the simultaneous work of the two teams.

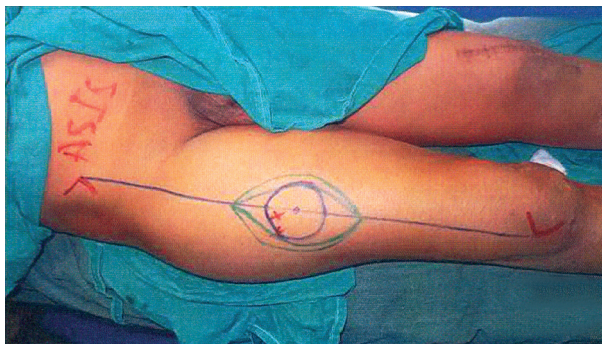
Flap harvest started by Doppler assisted localization of the perforator(s) around the midpoint of a line joining the anterior superior iliac spine (ASIS) to the lateral edge of the patella. Then medial incision was done over the rectus femoris muscle till the muscle. Lateral dissection was then carried out towards the septum between rectus femoris and vastus lateralis muscles (Fig. 1).

The Preoperatively localized perforator was then searched for and dissected towards the main pedicle (descending branch of the lateral circumflex artery). The perforators in this study were either myocutaneous (n=18/20, 90%) or septocutaneous ones (n=2/20, 10%). The distal end of the pedicle was then ligated.

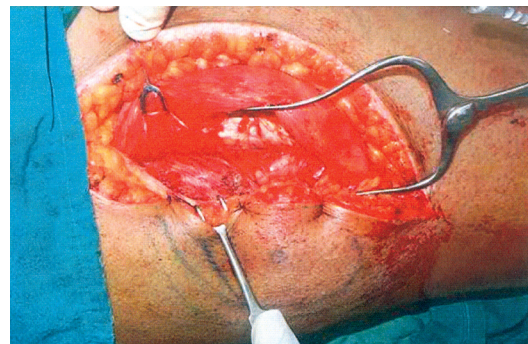
At that time, the second team could determine the exact size of the defect after debridement, contracture release, or scar excision. According to the needed flap size the lateral incision of the flap was done and dissection carried out towards the perforator.

The pedicle was then dissected proximally until adequate length was obtained. The flap was then completely harvested and transferred to the recipient site to be inset.

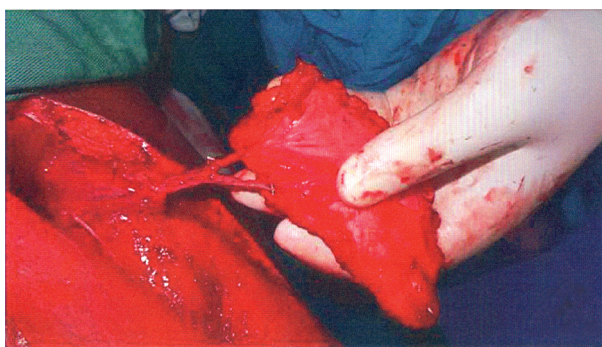
After completion of the microanastomosis, the donor site was closed either directly or using a skin graft.



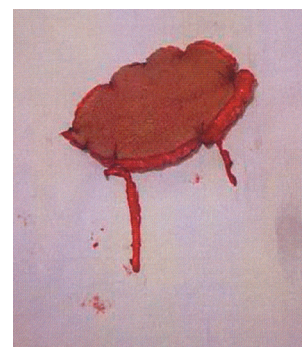
(A)



(B)



(C)



(D)

Fig. (1): Surgical technique of ALT harvest. (A) Preoperative localization of the perforator(s), (B) Medial incision and dissection of the perforator, (C) Lateral incision done and the perforators dissected towards the pedicle, (D) Flap completely separated ready to be transferred.

RESULTS

All cases included in this study were operated upon by two teams. The average operative time was 5.5 hours (range 4.5-7 hours). All donor thighs were chosen to be the contralateral side for the defect in order to facilitate the two teams' simultaneous work.

Out of the 14 flaps in this series, 13 were raised as fasciocutaneous and one only (case #4) was raised on suprafascial level. One perforator only was encountered in 57% (n=8/14) of the patients, with 2 perforators in the remainder. One out of the 20 perforators (5%) in this study arose from the profunda femoris artery.

The mean length of the pedicle was 10cm (range 7-12cm). The size of the defects ranged between 12x7cm - 21x13cm (mean 13.8x8cm). The donor site was grafted in 2 cases, directly closed in 12.

As regard the complications, there were no cases of total flap loss. Partial (superficial necrosis) occurred in a flap used for reconstruction of the leg. Debridement was done and the remaining part of the flap was covered by skin graft. Haematoma occurred in a case of electrical burn which necessitated reoperation and the flap survived well. This means that reoperation was done in 14% (n=2/14) patients during this study.

Case 1:

A five years old girl suffering from postburn contracture of the right axilla (Fig. 2). There were no available donor sites for local flaps. Contracture release yielded a 7x12cm defect. The central part of the defect was reconstructed with an ALT flap harvested from the left thigh, the rest of the defect was reconstructed with split-thickness skin graft.

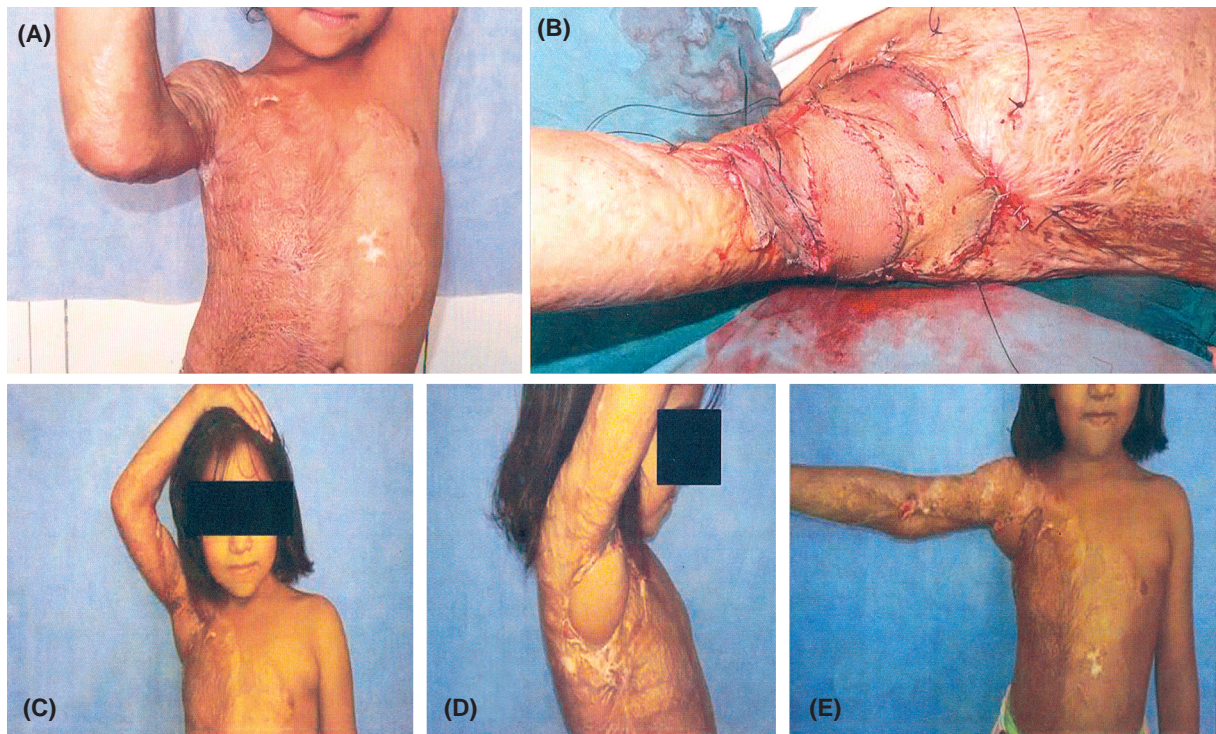


Fig. (2): Case (1) (A) Postburn contracture of the right axilla, (B) Release of the contracture, reconstruction of the central part of the defect by an ALT flap and the rest with skin graft, (C,D,E) One month postoperatively with release of the contracture and functional improvement.

Case 4:

Fifty seven years old female patient suffered road traffic accident two weeks before being referred to our institute. She suffered left heel defect measuring 12x21cm (Fig. 3a). As the patient was obese, suprafascial dissection of right ALT flap

was carried out and the flap used to reconstruct the defect (Fig. 3b). Although thinning of the flap was done intraoperatively, the flap was bulky at inseting (Fig. 3c). The patient was instructed to wear elastic stockings. The flap showed marked decrease in bulkiness at 11 months period (Fig. 3d).

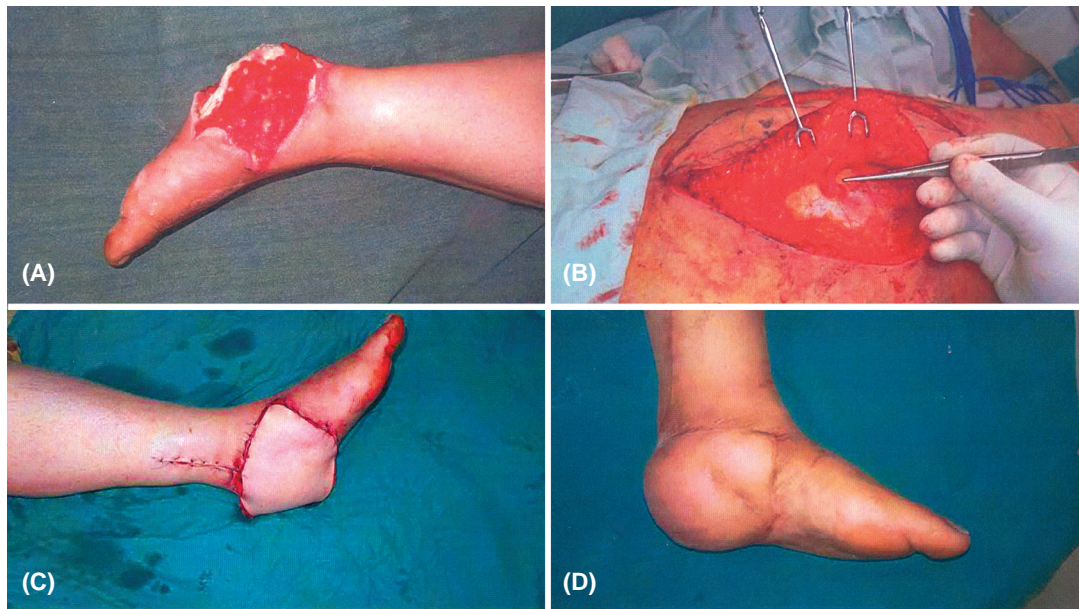


Fig. (3): Case (4) (A) Left heel defect measuring 13x21cm, (B) The perforator encountered after suprafascial dissection, (C) The flap at the end of the procedure, (D) 11 months postoperatively.

Case 8:

A 27 years old male patient suffering from an adherent scar on the ulnar side of the distal right forearm, presented to our department for reconstruction of the ulnar nerve (Fig. 4a). The treatment

plan included two stages, excision of the scar and reconstruction with an ALT flap was done in the first stage (Fig. 4b). Three months later, reconstruction of the ulnar nerve was done using cable nerve graft.

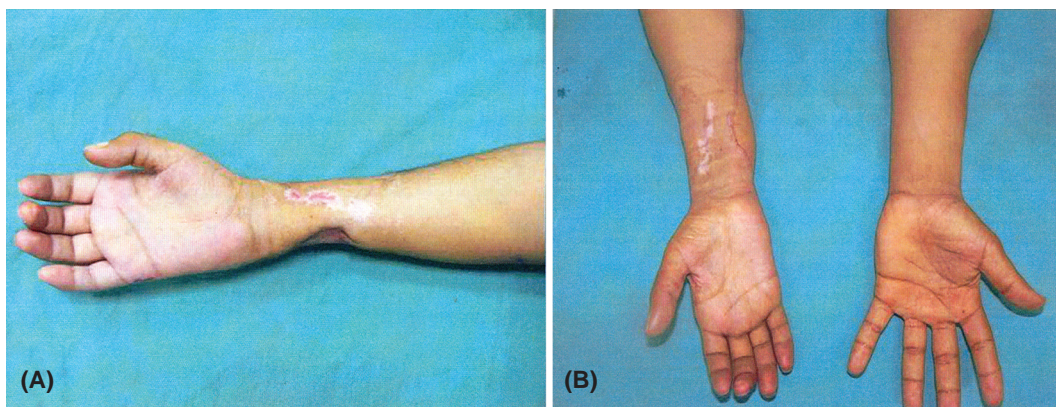


Fig. (4): Case (8) (A) Adherent scar on the distal aspect of the right forearm with injured ulnar nerve, (B) Three months after excision of the scar and reconstruction with free ALT in preparation for ulnar nerve graft.

DISCUSSION

Primary as well as secondary soft tissue reconstruction of the extremities, whether the upper or lower, mostly represent a difficult challenge to solve. The size of the defect, the availability of local tissues, and the need for future operations (to restore lost function for example) mandate free flap coverage for such defects in many instances. The ideal flap should provide enough tissues for reconstruction, with the least possible donor site

morbidity functionally and aesthetically, and possess a pedicle of adequate length and size to do the anastomosis efficiently.

Several free flaps have been traditionally described to reconstruct such defects whether in the upper or lower limbs. Among these flaps are the Latissimus Dorsi, Rectus Abdominis, and even the radial forearm flap among others. Those flaps could solve most of the defects, but on the other hand they lead commonly to major donor site morbidity.

Since its first description by Song et al., in 1984, the ALT has gained popularity in reconstruction of defects in different anatomical regions including the head and neck, the upper, as well as the lower extremities. The flap owes this popularity to its several advantages including relatively low donor site morbidity, no positional changes are needed (unlike the LD flap), the possibility of harvesting several types of the flap to fit with the different reconstructive demands, and the good pedicle length and size that would help face the various challenges met during reconstruction. The flap also has many modifications that facilitate reconstruction of different defects possessing variable needs in their reconstruction.

To date, the flap with its modifications has been described for reconstruction of either lower or upper extremity reconstruction separately. There is only one publication reporting its use in both anatomical regions together.

In this study, the ALT flap was used to reconstruct different defects in the upper as well as the lower extremities. The flap has proved its versatility in the reconstruction of different defects with variable criteria. The disadvantages of the flap include the steep learning curve that requires time for the microsurgeon in order to be acquainted with the different variability in the perforators' position. When a skin paddle wider than 8cm is needed, a skin graft is needed to reconstruct its donor site. In comparison to the radial forearm flap, the grafted donor site of the ALT has a much more acceptable outcome. Among the disadvantages of the flap, is its bulk in obese patients. To overcome this, suprafascial dissection of the perforators is recommended in obese patients. Among the modifications describe to decrease the bulk of the flap, is the fascia only flap for reconstruction of lower extremist defect. Even in the presence of bulky flap, this is not considered as a major drawback as debulking of the flap can be carried out later as a minor procedure.

Conclusion:

As in most other soft tissue defects that have been reported in the literature recently, the ALT flap can be considered an excellent and ideal alternative to the most commonly used conventional methods for most soft tissue defects of the upper as well as the lower extremities.

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