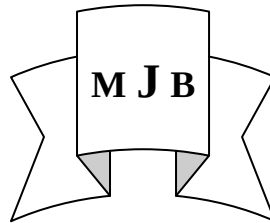


Evaluation of Applicability of Free Anterolateral Thigh Flap in Limbs Injuries

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Abstract

Free anterolateral thigh flap is considered as the work horse for reconstruction of different body areas, this study is designed for evaluation of its applicability for reconstruction of limb injuries. Free ALT flap is a sort of perforator flap, 1st described by Song et al in 1984 & since that time it has been evolved as a versatile flap that is able to harbor multiple combination of tissues [1]. Fifteen free anterolateral thigh flaps were used to cover soft tissue defects of upper or lower limb injuries during the period from April 2010 to April 2013. The patients' data are summarized in table no. (1). Of the fifteen flaps, one flap (6%) suffered total necrosis in a patient with spina bifida with senseless deformed feet; another flap (6%) underwent partial necrosis. Free ALT flap is safe, applicable & somewhat easy flap when anatomical consideration is respected. anterolateral thigh flap, free ALT flap.

Abbreviations:

ALT flap: anterolateral thigh flap

LCFA: lateral femoral circumflex artery

FA: femoral artery

SFA: superficial femoral artery

ASIS: anterior superior iliac spine

S.T: soft tissue

تقييم مدى عملية استخدام سدة الفخذ الأمامية الجانبية الحرة في إصابات الأطراف

الخلاصة

تعتبر سدة الفخذ الأمامية الجانبية الحرة السدة التي يعتمد عليها في العمليات التقييمية لمختلف مناطق الجسم، أجريت هذه الدراسة لتقييم مدى إمكانية استعمال هذه السدة في تقويم إصابات الأطراف. إن سدة الفخذ الأمامية الجانبية الحرة هي إحدى أنواع سدلات الأوعية الثاقبة التي استتبطت من قبل الجراح سونغ في العام ١٩٨٤ ومنذ ذلك التاريخ تطور استعمالها كسدة متعددة الفوائد قادرة على حمل مختلف أنواع الأنسجة. في هذه الدراسة تم إجراء خمسة عشر سدة فخذية أمامية جانبية حرة لتعويض الأنسجة الرخوة والجلد المفقود لمختلف الأسباب في الأطراف العليا والسفلى للفترة من نيسان ٢٠١٠ حتى نيسان ٢٠١٣. وقد لخصت معلومات المرضى في الجدول رقم ١.

من بين السدلات الخمسة عشر حدثت موات كاملة في إحدى السدلات (٦%) في مريضه كانت تعاني من قرح في القدم نتيجة انشقاق في الفقرات الظهرية الولادي أدى إلى انعدام الأحساس في القدمين مع تشوهما. كما حدثت موات جزئية في سدة أخرى (٦%). إن سدة الفخذ الأمامية الحرة هي سدة آمنة وعملية وسهلة نوعاً ما حينما تؤخذ الجوانب التشريحية بعين الاعتبار.

Introduction

Free ALT flap is a sort of perforator flap that was 1st described by Song et al in 1984

as a septocutaneous flap, but in fact, only 12-18% of ALT flaps are septocutaneous the remaining are Myocutaneous perforators mainly

through vastus lateralis [1]. It is supplied by the descending branch of LCFA which is originated from the profunda FA in 75% and from SFA in 25% [1]. It is a practical flap with very little donor site morbidity [2]. It can be used in different modalities, as a pedicled proximally or distally based or as a free flap with different combination of tissues [3]. It has been used successfully for reconstruction of anterior abdominal wall [4], for reconstruction of vulvar defects [5], penile reconstruction [6], flexion contractures of the knee joint [7]. It was used to combat chronic osteomyelitis in lower limb injuries [8]. It also can be used as multiple skin islands on a single pedicle [9]. Thinning or super thinning of the flap can be used with the possibility of direct closure of donor site if the flap width is less than 8 cm [10].

Patients and Methods

Fifteen patients with the need for soft tissue replacement for different causes in upper and lower limbs were included in this study in Alwasity hospital for reconstructive surgery during the period from April 2010 till April 2013 (the epidemiological data are included in table no.1). All patients had been referred from orthopedic department or from other units of plastic surgery department and were evaluated and prepared for reconstruction with free ALT flap.

Technique of flap elevation: ALT flap is designed on a long axis from ASIS to the superolateral margin of patella this line approximates the intermuscular septum between rectus femoris and vastus lateralis muscle and the surface marking of lateral femoral cutaneous nerve of the thigh, major perforators are located within a circle of 3 cm radius bisecting the midpoint of long axis and can be located with hand held Doppler. (different anatomic

variations of perforators and flaps dimensions are summarized in table no.2). the flap was usually planned where the perforator lies at the junction of its upper third and the lower two thirds. When there is no dopplerable perforator at that circle a proximal or distal perforator may be found 8.5 cm away from the center point. Sub fascial elevation begins distally and medially until we reach the already marked perforator where fine dissection of the perforator begins proximally until we reach the beginning of the descending branch distal to the main pedicle of rectus femoris muscle. All the donor sites except one were directly closed while a small skin graft was applied for one patient.

Details of clinical cases: (are summarized in table no.3).

Results

One of fifteen flaps was totally lost (6%), the case was a spina bifida with deformed ankles and insensate feet with multiple ulcers bilaterally, a free ALT flap was applied to cover a dorsal left foot defect after excision of a chronic neurotrophic ulcer as the patient was used to walk on the dorsum of the equinus foot. Another one had got partial necrosis where the perforator was a proximal one (6%). There were no significant complications in the donor site or limb (details of complications are summarized in table no.4).

Discussion

Since its advent by Song, the free ALT flap has occupied its place as a versatile, practical and easily elevated flap with fairly constant anatomy and the possibility of plan B in case of absence of a suitable perforator where one can switch to a TFL flap or an ad hoc perforator flap in such cases. It is reputable of having many advantages; long pedicle (up to 12 cm), large skin

territory (up to 20×40cm)[11], flow through flap, chimeric concept design, two team approach, no need for changing the position of the patient. The average time of the operation in our study was about 6hours with a range of 5 to 8 hours is in accord with other studies [12]. Sometimes there may be a need for sacrificing a small nerve to vastus lateralis muscle where a multiple branches do exist without any sequel & this coincides with many studies [13].For primary closure of the donor site we used the pinch test where ever it suffices for the reconstruction and when not, we were obliged to use a small skin graft as happened in one case in this study. It is evaluated that for direct closure, the flap width should not exceeds 8 _10 cm or the maximal width of the flap should not exceed 16% of thigh circumference at midpoint between ASIS and superolateral corner of patella [14].Total necrosis of one flap occurred in a case of spina bifida with senseless feet, deformed ankles with

bad motor function, the arteries and veins were having an abnormally thick wall as if there was some fatty degeneration, ,the flap developed intense hyperemia on the third day which had progressed into congestion and necrosis in the issuing days, it needs further investigation. For the case with partial necrosis of the distal part, the perforator was a proximal one and it was expected.

Conclusion

ALT flap is safe, practical & versatile flap in reconstruction of lower limb injuries for the following characteristics; it does not require patient repositioning &allows for two team approach, its donor site can be concealed easily, its donor site can be closed primarily, it does not require the sacrifice of a motor unit and it has very little donor site morbidity. The main disadvantage is the disfigurement when it requires skin graft for the donor site.

Table 1 patients' epidemiological data

Age	No.
1-10 y	3
11-20 y	4
21-30 y	6
31-40 y	1
41-50 y	1
Sex	
male	13
female	2
Limb	
upper	2
lower	13
Indication	
Traumatic S.T cover	11
iatrogenic	1
neurotrophic	1
S.T replacement	2

Table 2 characteristics of flaps perforators

Site of perforator	No.
Central	13
Proximal	2
distal	0
No. of perforators	
One	11
Two	4
More than two	0
Type of perforator	
Septocutaneous	3
musculocutaneous	12

Table 3 characteristics of flaps and viability

<i>Flow through flap</i>			
yes	1/15 (6%)		
no	14/15 (94%)		
<i>Need for vein graft</i>			
yes	2/15 (12%)		
no	13/15 (88%)		
<i>Flap dimensions</i>		Average width	Average length
		9 cm	22 cm
<i>Flap viability</i>		No.	
Total necrosis	1/15 (6%)		
Partial necrosis	1/15 (6%)		

Table 4 complication of donor site

weakness	0
Loss of sensation	No complaint
pain	0
Wound dehiscence	0
Wound infection	0
Need for skin graft	1/15(6%)

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Figure 1, a case of blast injury with soft tissue loss of left elbow and forearm with complete cut of the brachial artery and median nerve.(a)after debridement,(b)planning of the flap,(c) elevation of the flap,(d) primary closure of the donor site,(e) inseting of the flap,(f) final result after delayed primary closure of the remaining raw area.

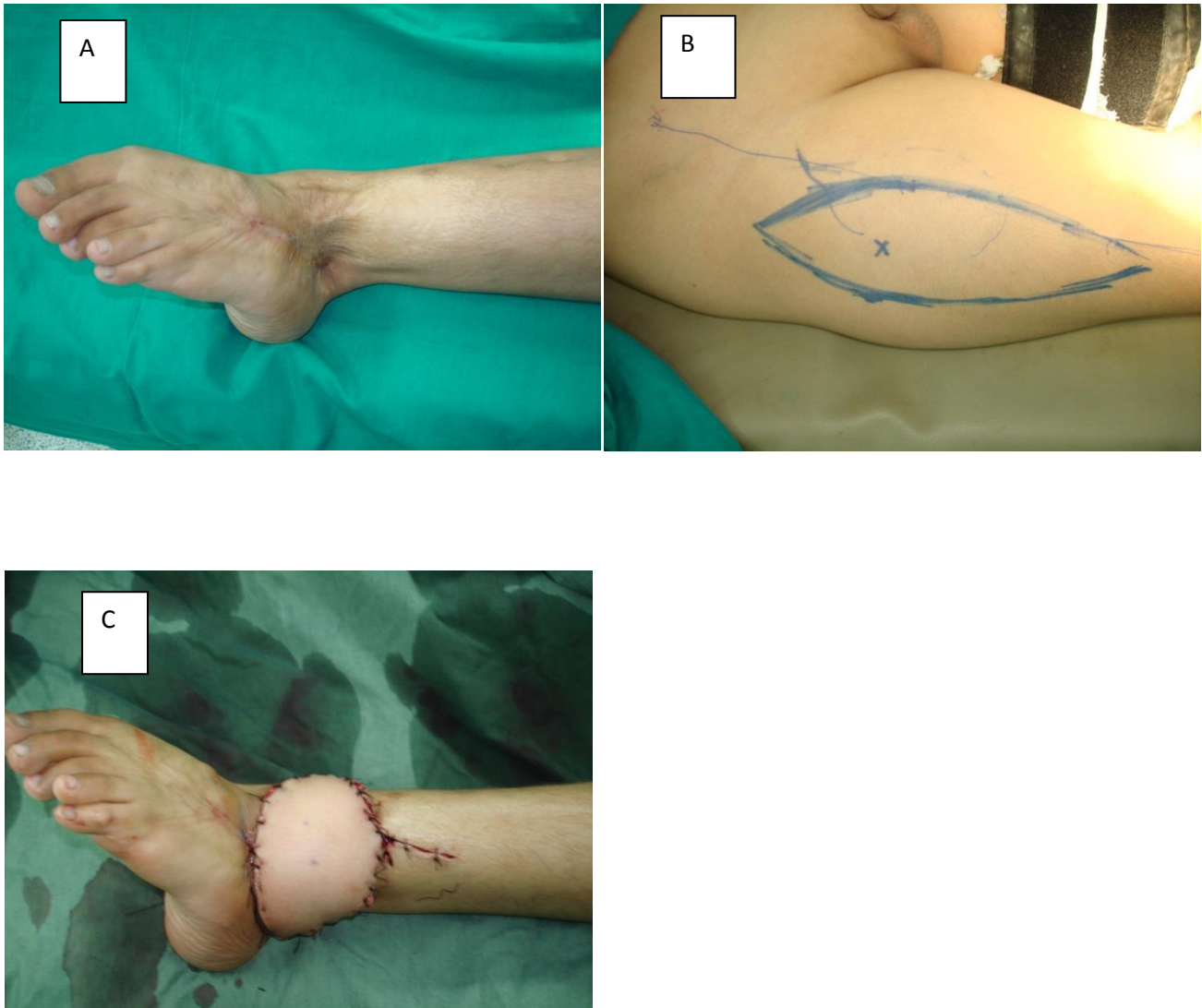


Figure 2 A case of post traumatic calcaneovalgus deformity of the right ankle, the orthopedic surgeon requested replacement of the scar with pliable soft tissue for later correction of the deformity.(a) the deformity,(b) planning of the free ALT flap, the perforator was a proximal one, (c) after inset of the flap.



Figure 3 Post traumatic soft tissue loss over the dorsum of the left foot with exposure of mid tarsal joint.(a) the defect prior to the final wound excision,(b) planning of the flap,(c) primary closure of the donor site, (d) inset of the flap.



Figure 4 post traumatic chronic unstable scar of the right ankle,(a) the scar before excision, (b) planning of the flap with a proximal Septocutaneous perforator,(c) the flap two weeks later,(d) the donor area.

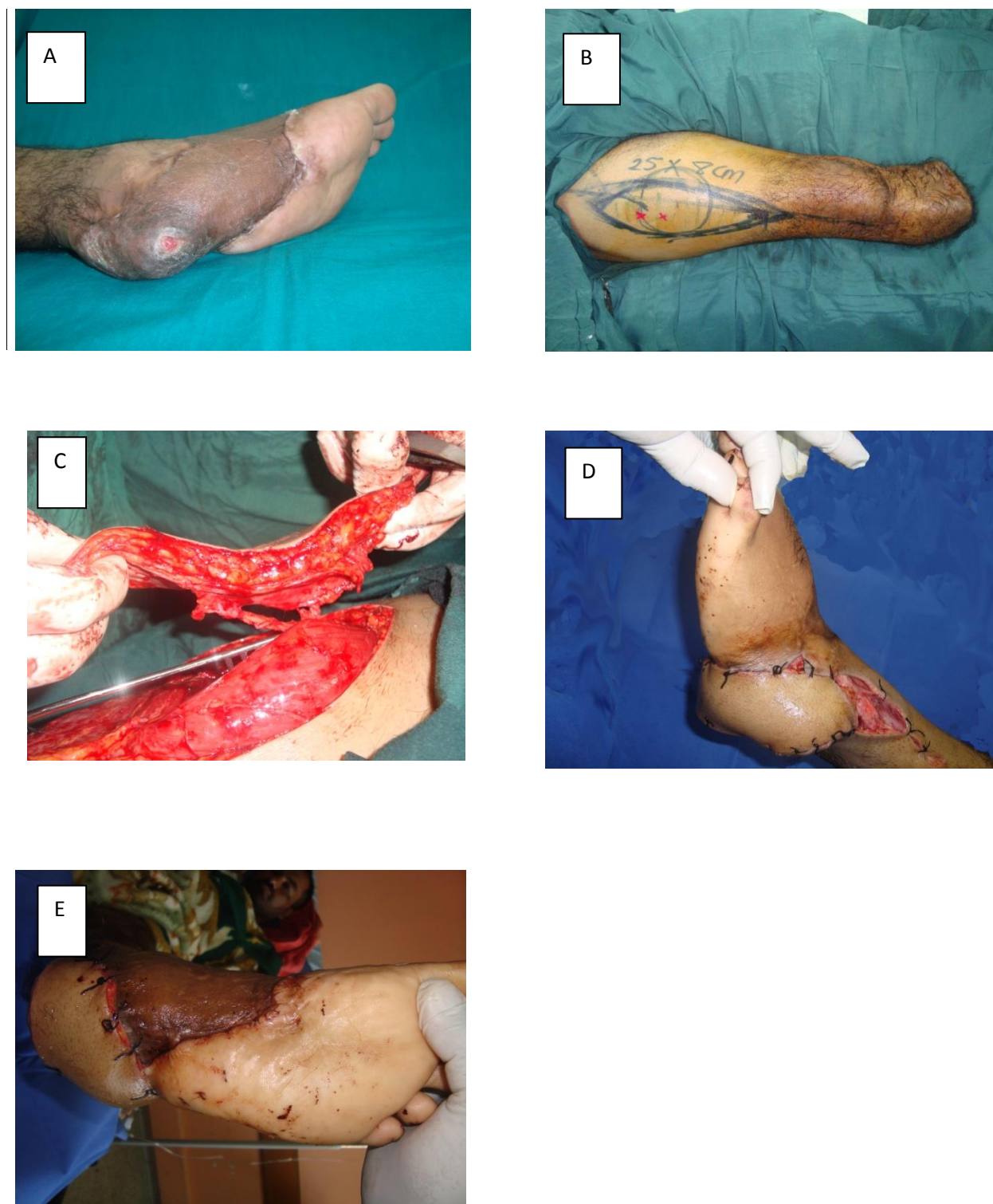


Figure 5 a case of chronic unstable ulcer on a previously skin grafted heel managed with a free ALT flap to cover the ulcer.



Figure 6 a case of blast injury with severe injury to the left ankle that resulted in devascularised left foot, a flow through free ALT flap used to cover and revascularise the foot through anastomosis to both ends of the posterior tibial artery, the remaining raw areas were skin grafted.(a) at the time of injury,(b,c) after application of free flow through ALT, (d) donor site, (e,f,g) end result few months later.