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Outcomes of anterolateral thigh free flap thinning using liposuction following lower limb trauma

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Summary *Background:* Whilst soft tissue closure is the priority to prevent infection in open fractures of the lower limb, some patients find that bulky flaps interfere with function and dislike the appearance. We report the outcomes of delayed free anterolateral thigh flap thinning with liposuction.
Material and methods: 38 patients treated between 2006 and 2009 were offered flap contouring. 23 chose flap thinning and 15 did not. We measured outcomes using the SF-36v2 questionnaire and cosmetic outcome scores pre and postoperatively at a mean follow up of 12 weeks (range 10—16 weeks).
Results: SF-36v2 physical health (PH) scores improved from a mean of 67 preoperatively to 80 postoperatively ($p = 0.01$) in the thinned group, while mental health (MH) scores remained unchanged (74—72). The mean SF-36v2 scores for the non-thinned group were 77 (PH) and 86 (MH). Following liposuction the median cosmetic outcome scores out of 5 improved from 1 (not at all satisfied) to 4 (very satisfied) postoperatively ($p = 0.0005$), which was also higher than the non-thinned group (3) [moderately satisfied], $p = 0.004$). There was no difference in sex, age, BMI and region on the leg of free flap reconstruction between the non-thinned and thinned groups.
Conclusions: Delayed contouring of free ALT flaps used for lower limb reconstruction results in improvements in physical health measures and cosmetic outcomes. Patients not requesting thinning are generally satisfied with their reconstruction.

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Introduction

Open fractures of the tibia require early soft tissue coverage. Free flaps are often necessary for distal third fractures, large defects and when the perforators have been damaged through trauma. The anterolateral thigh (ALT) flap is being increasingly used for a variety of soft tissue defects[1] including reconstruction of the lower extremity.[2] This flap has proven popular as it provides a long pedicle enabling anastomoses outside the zone of injury, large calibre donor vessels, a large fasciocutaneous paddle and it can be raised as a composite flap incorporating a segment of muscle. The latter is particularly useful for covering diaphyseal fractures.[3,4] It also avoids the problem with unstable skin grafts over insensate free muscle flaps around the ankle and is easier to elevate for secondary bone grafting of tibial shaft fractures. Even for large flaps, the donor site is relatively inconspicuous as it is usually covered by clothing. It can, however, be bulky in certain individuals, influencing both the final functional and cosmetic outcome. Despite this we find it extremely versatile, and if excessive bulk is a problem, we offer patients liposuction and revision of the flap once the fracture has united and the swelling settled.

ALT flap thinning has been well described in the literature.[5–15] Cadaveric studies looking at the effect of ALT flap thinning on skin blood supply suggested that immediate thinning may not be advisable in Western populations.[5] Indeed, a recent systemic review has suggested that it is inadvisable to primarily thin ALT flaps in Western patients, especially when large flaps are required as is often the case following lower limb trauma. These authors postulated that this difference was due to increased amounts of subcutaneous fat in Western patients compared to those from the Far East.[6]

Ohjimi et al[16] compared a group of non-thinned free flaps to a group of predominantly rectus abdominis free flaps, which were thinned at primary surgery to cover lower extremity defects. They reported one flap failure in the non-thinned group and two flaps with partial necrosis in the thinned group. Other techniques include full thickness skin grafting as a second stage debulking procedure after limb reconstruction.[11,17] This involves the harvest of the full thickness skin from the flap, which is then grafted back onto the in-situ thinned flap.

ALT flap thinning with the combination of liposuction and w-plasty as a delayed single stage procedure has been described after oral cancer reconstruction.[8] Recently, power assisted suction lipectomy has been recommended as a delayed one stage procedure following reconstruction with fasciocutaneous flaps following upper limb surgery (11 patients) with good results. These authors also described good results in four patients that had ALT flaps for lower limb trauma.[18]

We report our results in a group of 23 patients of delayed ALT flap thinning using liposuction following lower limb reconstruction. We measured outcomes using the short form-36 version 2 (SF-36v2) health survey questionnaire and a modified cosmetic outcome score[19] and compared this group to patients who chose not to have a flap thinning procedure (15 patients).

Patients and methods

Thirty eight patients underwent free ALT flap reconstruction of soft tissue defects to cover lower limb fractures between 2006 and 2009 (Table 1). All patients were offered flap thinning once the fracture had united and the swelling settled. Patients were divided into 2 groups; those that chose to undergo flap thinning and those that did not. The non-thinning group consisted of 15 patients (male to female ratio 2:1) and the thinning group consisted of 23 patients (male to female ratio 2:1). The mean age of patients in the flap thinning group was 44 years (range 22–80 years) and in the non-thinning group was 40 years (range 21–69 years).

Data were collected on patients that had flap thinning procedures between April 2007 and May 2010. There were 26 procedures performed, 20 patients had one procedure and 3 patients underwent two staged procedures. Flap thinning took place at a mean of 14.5 months (range 7–29 months) after the initial microsurgical reconstruction. For those patients that had two flap thinning procedures the length of time was calculated from ALT to first (mean 14.5 months, range 8–21 months), and from first to second procedure (mean 16 months, range 9–21 months).

Our unit is a tertiary referral centre for lower limb trauma and many of our patients were referred from outside our region. Despite repeated attempts to contact patients some were lost to follow up. Other patients did not fill in all the questionnaires. This made it difficult to collect complete data for all outcome measures. Nevertheless, in the liposuction group, cosmetic outcomes were collected in 15 patients preoperatively and postoperatively. Cosmetic scores were collected in 8 of the non-thinned group. SF-36v2 scores were collected in 10 out of 15 non-thinned flap patients and in 12 patients preoperatively in the thinned group. The number of patients who completed the SF-36v2 questionnaire postoperatively in the thinned group rose to 19 patients. Complete matched pre and postoperative SF-36v2 data was available for 9 patients in the thinned group, which allowed for subgroup statistical analysis. Data on body mass index (BMI) was available for 13 patients in the thinned group and 7 patients in the non-thinned group. Data collected on the site of the soft tissue defect, volume of liposuction fluid/fat and recorded complications (e.g. infection, haematoma and flap problems) were available for all patients.

Table 1 Number of free flaps performed to the various regions of the lower limb in those undergoing flap thinning and those that did not.

Region on Lower Leg	Non-thinned group ($n = 15$)	Thinned group ($n = 23$)
Foot	2	2
Malleolar	4	7
Distal third tibia	4	5
Middle third tibia	5	8
Proximal third tibia	0	1