

Original Article

De-epithelialised fasciocutaneous turnover flap: An alternative for defects in lower thigh and knee joint

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ABSTRACT

We describe the use of proximally based de-epithelialised fasciocutaneous flap for coverage of defects in the lower thigh and knee joint. These flaps are based on a number of perforators around the knee joint and can be based either posteriorly, posteromedially or posterolaterally depending upon the location of the defect. The whole of the flap including the bridge segment is de-epithelialised and turned over by 180 degrees and a split thickness graft is placed over the flap and the donor site. The flaps can be raised quickly, have minimum morbidity and are reliable even in the presence of extensive injuries. These flaps have remained stable and trouble free during a follow up period of 2-4 years.

KEY WORDS

Fasciocutaneous, de-epithelialised, turnover flap, lower thigh, knee joint

INTRODUCTION

Soft-tissue defects in the distal thigh and knee joint region constitute a difficult reconstructive problem especially in high velocity injuries. Various reconstructive options include loco-regional flaps (like fasciocutaneous flap, muscle flap, venous flaps, perforator flaps etc.), cross-leg flap and free tissue transfer. All of these have their individual merits and demerits. We present an alternative simple and quick technique for covering these defects with minimum morbidity. The technique entails single stage elevation of a proximally based fascio-cutaneous flap in upper part of leg and turning it over after de-epithelialization so as to cover lower thigh and knee joint defects.

SURGICAL TECHNIQUE

The flap can be planned in posterior, posterolateral or posteromedial aspect of the leg as necessitated by the location of the defect. The dimensions of the defect are noted and a proximally based fasciocutaneous flap in the upper leg in the vicinity of the defect is planned in reverse in such a way that after "turning over" the flap would comfortably sit on the defect. The flap is dissected in the subfascial plane proximally up to ~ 5cm below the knee joint line. The whole length of the flap and the base up to the margin of wound defect is deepithelialised. (Figure 1a). The flap is turned over so that it covers the defect. The under surface of the flap as well as donor site of the flap is split skin grafted

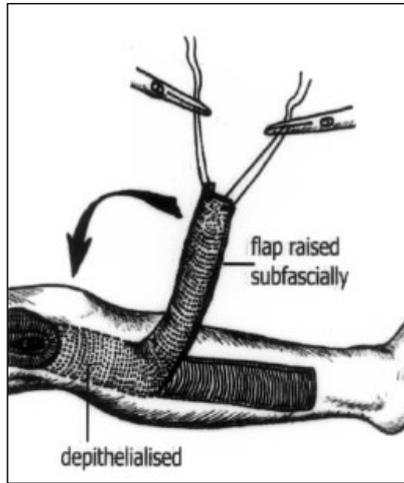


Figure 1a: Flap design, de-epithelialisation and raising in the subfascial plane

Table 1

S No.	Age/Sex	Status of Gastrocnemius	Popliteal art	Defect size	Fate of flap
1	24/male	okay	Not palpated and not seen in angiography	10x8cm	Survived
2	60/male	okay	Intact but pedicles of gastrocnemius not seen	7x6cm	Survived
3	45/male	okay	Intact	10x8cm	Survived

(Figure 1b). The technique has been used in 3 patients. The details are shown in Table 1.

PATIENT REPORTS

Patient 1

A 24-year male, met with a road traffic accident and sustained closed supra-condylar fracture of femur for which open reduction and internal fixation was done. Around six weeks later, the patient developed an abscess at the operation site. Wound debridement

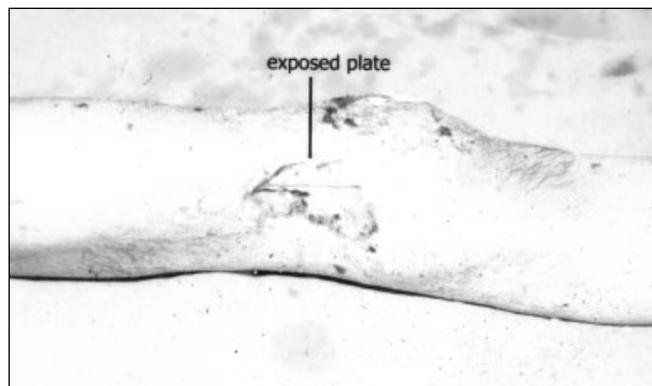


Figure 2a: Exposed plate and bone in lower third thigh

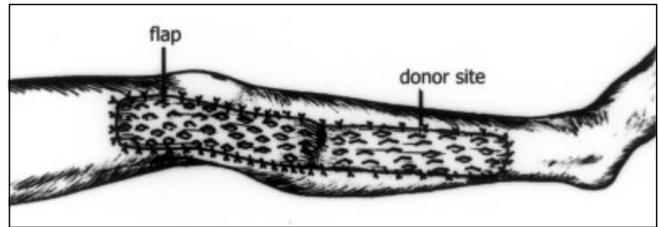


Figure 1b: Turned over flap and donor site skin grafted

was done resulting in a 10 x 8 cm defect in posterolateral aspect of thigh just above the knee (Figure 2a). The fixation plate was exposed and the underlying bone was osteomyelitic. The popliteal vessels could not be palpated, angiography showed non-visualization of a segment of popliteal artery. In view of the angiographic findings, the gastrocnemius flap was considered unuseable. A proximally based fascio-cutaneous flap measuring 20 x 8 cm was elevated on posterolateral aspect of the leg keeping a base of 5 cm from the knee (Figure 2b). The flap and the intervening normal skin were de-epithelialised and turned over 180 degrees to cover the defect completely. The fascial surface and the donor area were split-skin grafted. The flap healed well (Figure 2c).

Patient 2

A 60 year male sustained crush injuries in a road traffic accident across the knee joint. He had near total amputation at the level of knee joint albeit with an intact neurovascular bundle and skin posteriorly across popliteal fossa. Primary closure was done after debridement, but the patient developed wound dehiscence over anterolateral aspect of knee joint with concomitant exposure of the same (Figure 3a).

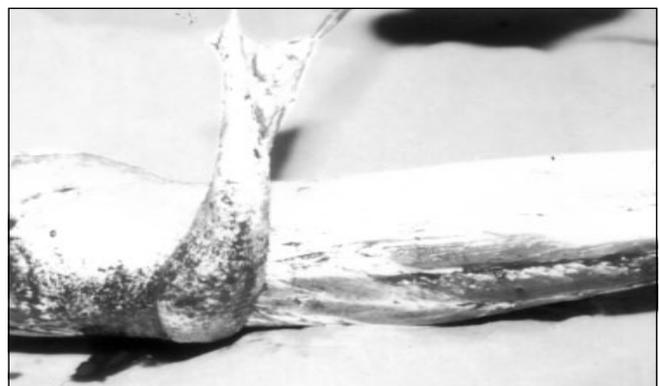


Figure 2b: Flap raised and de-epithelialised



Figure 2c: Healed flap

Angiography was done but pedicles to gastrocnemius muscle heads were not detected. A proximally based fasciocutaneous flap measuring 7 x 21 cm was raised and de-epithelialised. This was turned over to cover the exposed knee joint and the fascial surface of the flap and donor area was split skin grafted (Figure 3b).

Patient 3

A 45 year male sustained compound fracture involving distal third of femur in a road traffic accident. External fixation was done to stabilize the fracture leaving 10 x 8 cm soft tissue defect on anterior aspect of lower thigh with exposed bone (Figure 4). The defect after debridement was large for gastrocnemius muscle head. A proximally based de-epithelialised turnover flap measuring 8 x 24 cm was similarly used to provide full-thickness cover



Figure 3a: Exposed knee joint



Figure 3b: Well healed flap

for the exposed lower end of femur.

DISCUSSION

Defects in the lower thigh are rare as the femur is well padded by the soft tissues. However, whenever such a defect is created, it poses a challenge for the reconstructive surgeon as very few options are available locally. The muscles in the thigh have major pedicles which are present proximally and therefore unsuitable for using them distally. Although gastrocnemius can also reach the lower-thigh after extensive mobilization, the dissection is difficult and muscle becomes small and tendinous distally. Shaw et al¹ reported failures with gastrocnemius muscle flap for suprapatellar defects and preferred the technically demanding islanded posterior calf fasciocutaneous

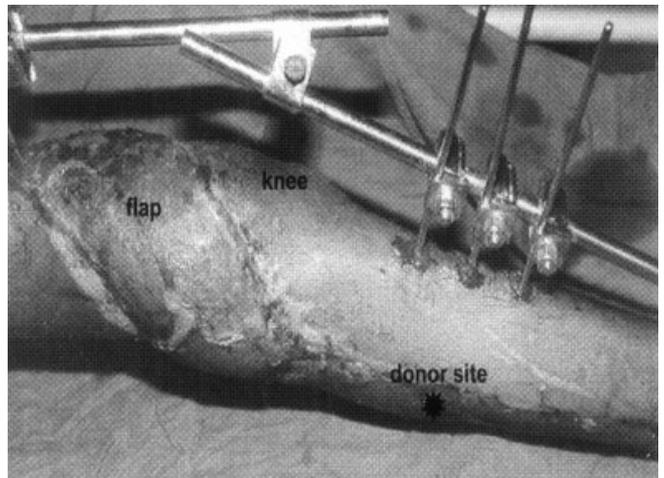


Figure 4: Completely healed flap and donor site

flap based on superficial sural arteries for defects of knee joint and suprapatellar area. Loco-regional skin flaps from the thigh can be used to cover the defect but these require a two-stage procedure so as to include initial delay. Muscle flaps, though providing a highly vascular tissue for the defect, may, again, not be available and moreover, may compromise the muscle function. A cross-leg flap requires multiple stages and often involves immobilization in a cumbersome position. In patients with extensive defects or in whom the vascular supply precludes use of local flaps, distant tissue transfer is an alternative. Although free-tissue transfer avoids the above limitations, it requires prolonged operative time, is technically demanding in this area and may not be suitable in all the patients. Flaps islanded on isolated single perforators around the knee^{2,3,4,5} are also an option depending upon the available skin around the defect, but it requires localization with the help of Doppler and is technically more difficult.

In dealing with the defects of the limbs, the concept of “turning over” of tissues as adipo-fascial or as a cutaneous (skin) flap is well established.^{6,7,8,9,10,11} However, these are random pattern flaps and authors have given specific values of flap design to ensure flap survival. In our case, since the turn-over flap is a proximally based fasciocutaneous flap having definite fasciocutaneous perforators in its base, such strict adherence to flap geometry is not essential. This makes the flap design more “pliable”. In addition, the safety and reliability of leg fasciocutaneous flaps is well established. In contrast to a turnover adipo- fascial flap or the traditional skin flap, the de-epithelialised turnover

fasciocutaneous flap is very vascular on the surface facing the devitalized area because of exposed rich intradermal anastomosis. This advantage has been highlighted by Pakiam.¹²

In conclusion, the de-epithelialised fasciocutaneous turnover flap is a simple, easy to execute (can be done in an emergency setup) and is a reliable alternative in management of defects of lower thigh and knee joint.

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