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Research Study

Experience with the Distally Based Sural Neurocutaneous Flap for Ankle and Heel Wounds

遠端蒂腓腸神經營養血管皮瓣應用在足踝部和腳後跟的傷口的經驗

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ABSTRACT

Background/Purpose: Soft tissue loss over the ankle and heel is a challenging issue for reconstructive surgeons. The aim of this study is to present the technique of using sural neurocutaneous flap and analyse the results.
Methods: From 2002 to 2014, 15 cases of sural flap were performed in the Department of Orthopaedics and Traumatology of United Christian Hospital, Hong Kong. All cases were handled by two hand surgeons. The outcomes and complications were reviewed retrospectively.
Results: The aetiology included trauma (6 cases), neoplasm (4 cases), Achilles tendon repair wound complication (3 cases) and ulcer (2 cases). The age of patients ranged from 21 years to 82 years (average, 61.9 years). The size ranged from 12 cm^2 to 99 cm^2. The mean follow-up period was 20 months. Eleven flaps healed successfully without significant complications.
Conclusion: Sural neurocutaneous flap is a reliable flap design with constant vascular anatomy. There is minimal donor site morbidity, and no major vessels are sacrificed. It provides a durable, pain-free, functionally and aesthetically satisfying coverage for ankle and heel wounds.

中 文 摘 要

背景: 重建在足踝部和腳後跟的軟組織損失,對外科醫生來說,是一個十分富挑戰性的難題。本研究的目的是研究遠端蒂腓腸神經營養血管皮瓣的應用和分析術後結果。
方法: 從2002年到2014年,在香港基督教聯合醫院進行了15例遠端蒂腓腸神經營養血管皮瓣手術。所有手術由兩位手外科醫生主理。我們回顧了手術結果和併發症。
結果: 15例的病因包括外傷(6),腫瘤(4),跟腱修復手術傷口併發症(3)和潰瘍(2)。病人年齡介乎21至82歲,平均61.9歲。傷口大小介乎12至 99平方厘米。平均隨訪期為20個月。當中十一例皮瓣癒合成功,沒有顯著的併發症。
結論: 蒂腓腸神經營養血管皮瓣是一種設計可靠而帶有固定血管解剖位置的皮瓣。它的供皮位創傷小,也不需要有大血管被犧牲。它為足踝部和腳後跟傷口提供了一個耐用,無痛苦,功能上和美學上都令人滿意的覆蓋方案。

Introduction

Soft tissue loss at the level of ankle and heel often presents a challenging problem to orthopaedic surgeons because of the lack of local soft tissue for coverage. It is also usually associated with poor or marginal circulation. Tendons and bones are commonly exposed because of the relatively thin subcutaneous tissue. The functional demands over this area such as weight bearing and shoe wear warrant a surgical procedure of coverage.

To cover skin defects over lower limbs, various choices can be used from delayed healing to free flaps. Delayed healing and skin graft are not suitable to cover exposed tendon and bone. Skin graft is also difficult to perform with the lack of a well-nourished soft tissue base. The use of local transposition flaps is restricted by their limited size and arc of rotation. Free flap can provide good coverage especially for large defects, but it requires

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microvascular expertise, sophisticated equipment, and lengthy procedure.

Fasciocutaneous flaps with distal pedicles have become another useful option in the repair of soft tissue defects of the lower leg. A detailed description of the sural flap anatomy and surgical procedure was given by Masquelet et al[1] in 1992. Its vascular axis is the median superficial sural artery, the accompanying artery of the sural nerve and lesser saphenous vein. The sural flap is based on the distal peroneal septocutaneous perforators. The aim of this study was to evaluate the outcomes of the distally based sural neurocutaneous flap for coverage of ankle and heel wounds.

Methods

From 2002 to 2014, we performed 15 cases of sural flap on 14 patients in the Department of Orthopaedics and Traumatology of United Christian Hospital (Hong Kong). This is a retrospective case review. We assessed the outcomes and complications as well as risk factors such as aging, diabetes mellitus, and peripheral vascular disease which should not be the contraindications to sural flap. All cases were handled by two hand surgeons.

Operative technique

The patients were placed in the prone or lateral position. With the guidance of Doppler ultrasound, the lowermost septocutaneous perforator of the peroneal artery was located and marked at ~5 cm proximal to the lateral malleolus. A line was drawn from the midpopliteal fossa between the two heads of gastrocnemius muscles to the midpoint between the Achilles tendon and the lateral malleolus. It represents the course of the sural nerve and the lesser saphenous vein. The flap skin paddle was also along this line as its central axis. The pedicle length and flap location were designed according to the distance between the planned pivot point and the defect (Figure 1). The design and the size of the flap were determined by the soft tissue defect.

Tourniquet was applied without exsanguination. The proximal margin was dissected first. The deep fascia was incised. The lesser saphenous vein, the sural nerve and the median superficial sural artery were identified and included in the flap (Figure 2). Anchoring stitches were placed to avoid separation of skin and fascia. The flap was elevated from proximally to distally with longitudinal strip of fascia containing the nerve, the vein and the accompanying artery. The skin extension was left over the pedicle. The width of the adipofascial pedicle was ~3 cm, and the pedicle dissection stopped at the pivot point that was at least 5 cm above the lateral malleolus

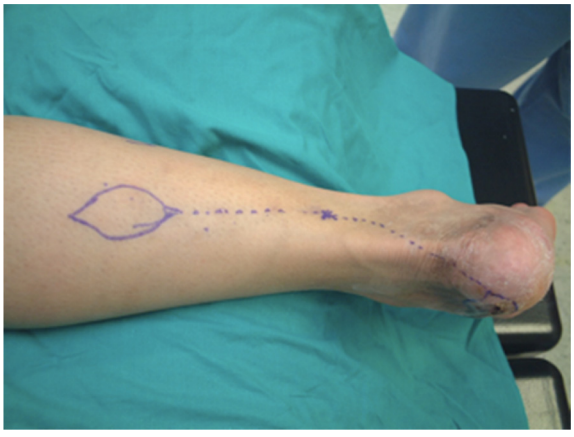

Figure 1. Preoperative planning with pivot point marked.

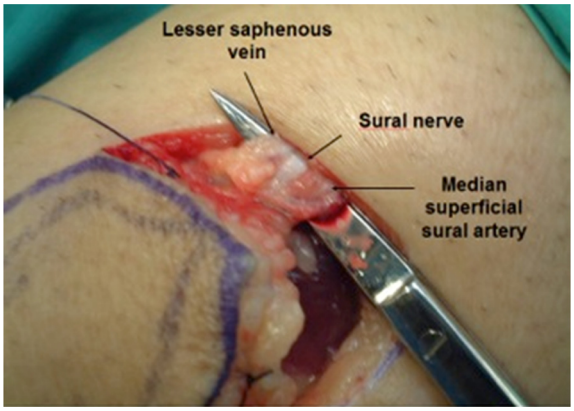

Figure 2. Important structures to be identified during operation.

(Figure 3). We routinely released the tourniquet to check the perfusion of the flap after harvesting it. Bipolar diathermy was used to control all bleedings. We did not reinflate the tourniquet during insetting and the rest of the procedure. The flaps were rotated and passed through a subcutaneous tunnel to cover the defects in the first four cases. In the subsequent 11 cases, the flaps were transposed through an open tunnel with splint thickness skin graft covering the exposed pedicles (Figures 4 and 5).

Postoperatively, a dorsal plaster of Paris slab was applied for 2 weeks to keep the ankle in plantar flexion so as to decrease stretching of the pedicle. The operated leg was elevated without pressure on the vascular pedicle. We also marked “No Pressure” in red on the dressing surface overlying the area of the flap. This helps to remind the nursing staff not to put the foot on the bed or a pillow, which may press onto the pedicle or flap. Dextran 40 infusion (in 500 mL normal saline) over 4 hours daily was given for 3 days. Nonweight bearing was prescribed for 4 weeks in total (Figure 6).

Figure 3. Case of basal cell carcinoma over lateral foot in preoperative planning.

Figure 4. Rotating the sural flap in an open tunnel to cover the excised wound defect.