

CASE REPORT **GENERAL RECONSTRUCTION**

Profunda artery perforator flap—a novel approach to soft tissue reconstruction post lower limb amputation: a case report

Shivani Aggarwala BOptom, MBBS, MS (PRS)  0000-0002-3978-1794,^{1,2} Michael Y Cheung BPharm, MD, MS (PRS)  0000-0002-3217-4561,² Frank Hsieh MA (Cantab), MBBChir, FRACS (Plast)  0009-0005-4995-896X^{1,2,a}

¹ Department of Plastic and Reconstructive Surgery, Bankstown-Lidcombe Hospital, New South Wales, AUSTRALIA.

² Department of Plastic and Reconstructive Surgery, Westmead Hospital, New South Wales, AUSTRALIA.

Keywords: free tissue flaps, amputees, knee replacement arthroplasty, surgical amputation

Submitted: February 22, 2023 AEST Accepted: October 24, 2023 AEST

DOI: 10.34239/ajops.89290

Australasian Journal of Plastic Surgery

Vol 7, Issue 1, 2024

Introduction

When lower limb amputation is inevitable, the management goals shift to preserving an adequate stump length and expediting return to mobility. The key to this is having reliable soft tissue coverage of the stump that can provide a stable base for a prosthesis. Free flap reconstruction is a good option when local tissues are insufficient to provide adequate coverage. Traditionally, latissimus dorsi (LD), rectus abdominus muscle (RAM) and anterolateral thigh (ALT) flaps are the workhorse free flaps for soft tissue reconstruction.¹ However, sacrificing an important functional muscle can make rehabilitation more laborious. Similarly, raising an ALT flap is often associated with injury to the vastus lateralis muscle as most perforators are musculocutaneous.²⁻⁴ This is not an ideal outcome when the aim is to preserve the overall function of an amputee.

The profunda artery perforator (PAP) flap was first described by Claudio Angrigiani in 2001 for use in resurfacing burn scar contractures of the neck and soft tissue reconstruction of the lower limb.⁵ This flap utilises the posteromedial aspect of the thigh based on the proximal perforators originating from the profunda femoris artery.⁵ It has become a popular option in breast and head and neck reconstruction.⁵ Here we present a case report of a 54-year-old male who suffered traumatic through-knee amputation (TKA) of his left leg. Two ipsilateral PAP flaps from the same vascular tree were successfully used to resurface his stump post necrosis of his original skin flap.

^a Corresponding author: Frank Hsieh MA (Cantab), MBBChir, FRACS (Plast); drfrankhsieh@gmail.com

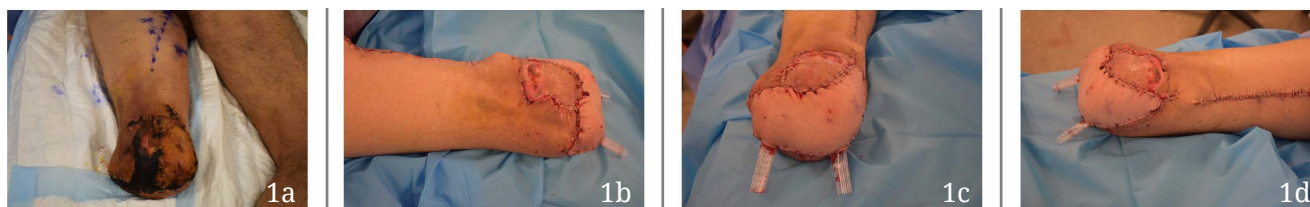


Fig 1. Free profunda artery perforator flap (a) preoperatively and (b, c, d) postoperatively

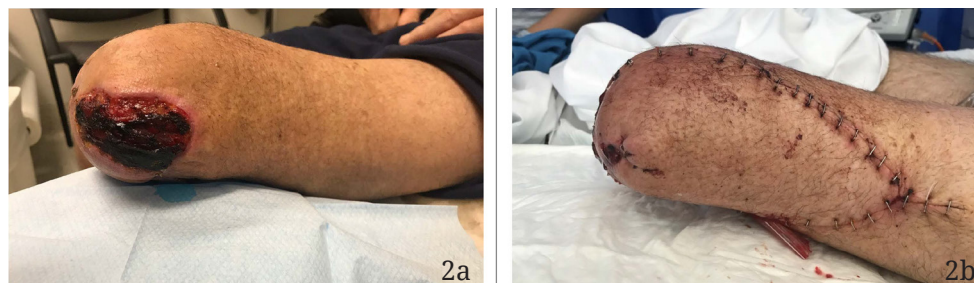


Fig 2. (a) Stump one week post free profunda artery perforator flap with lateral tip necrosis. (b) One week post salvage pedicled profunda artery perforator flap with neurovascular island flap



Fig 3. (a, b, c, d) Healed stump six months post procedure showing robust soft tissue coverage

Case

A 54-year-old male sanitation truck driver was referred to the plastic surgery team for management of a failed skin flap to a TKA stump. The patient had undergone traumatic TKA following a motor vehicle accident with salvage of a soft tissue flap to cover the stump. His past medical history included ischaemic heart disease with two coronary stents placed 12 years prior and dual antiplatelet therapy. He was also a smoker.

On postoperative day 11, the patient was referred to the plastic surgery team for necrosis of the skin flap over his TKA stump (**Figure 1**). The decision was made to proceed with a free flap reconstruction for better support of a prosthesis in the future. Computed tomography (CT) angiography showed patent common femoral and profunda femoris arteries with mild atheroma.

Intraoperatively the overlying skin and muscle covering the stump were found to be necrotic. Post debridement, the entire lateral femoral condyle and part of the medial femoral condyle were exposed. An ipsilateral PAP flap was harvested on a single perforator and micro-anastomosed to the descending genicular artery and its venous commitantes.

Within the first 48 hours postoperatively, the distal aspect of the flap looked venously congested. This area later progressed to a well demarcated 6×5 cm area of necrosis over the lateral femoral condyle (**Figure 2**). Subsequently, a lateral neurovascular island flap incidentally based on a distal profunda artery perforator was raised and advanced to cover the exposed bone. The patient's postoperative phase was uneventful. Three months postoperatively, the stump wound was completely healed and robust enough to support a prosthesis (**Figure 3**).

Discussion

The use of a free flap to resurface a stump means that the stump length is preserved. This is an important consideration as below-knee and through-knee amputees have superior fitting of a prosthesis. They are more likely to walk with a prosthesis and have a better quality of life compared to above-knee amputees due to preservation of muscle bulk and tone.^{6,7}

The PAP flap is based on a perforator from the medial branch of the profunda femoris artery. The perforators have been shown to emerge 2 cm posterior to the gracilis muscle. The point where the

perforator emerges from the fascia may be variable, predominately from the adductor magnus muscle, however less frequently piercing the semitendinosus and semimembranosus muscles or the intervening septum between gracilis and semimembranosus muscles to supply the overlying skin.⁷ Considering the variability of perforator anatomy, preoperative imaging with CT angiography is useful to define the perforator course in the posterior thigh.⁸ Our case highlights this variable anatomical feature, and we took advantage of this by using a proximal free and a salvage distal pedicled PAP flap from the same vascular tree to cover a large size defect. We, however, caution surgeons to avoid including the skin territory beyond the adjacent angiosome when designing the flap as this potentially was the cause for the distal tip necrosis of our proximal free PAP flap.

The PAP flap has been used extensively in autologous breast reconstruction as an alternative to the deep inferior epigastric perforator (DIEP), superior gluteal artery perforator (SGAP), inferior gluteal artery perforator (IGAP) and transverse upper gracilis (TUG) flaps with favourable outcomes.^{6,8,9} The literature reports limited use of the free PAP flap for lower limb reconstruction and no reports of its use for resurfacing an amputated stump.¹⁰ This case report demonstrates a PAP flap can be a valuable option for soft tissue coverage of the amputated lower limb stump.

The choice of the free ipsilateral PAP flap for reconstruction of a lower limb amputee stump conferred certain advantages over conventional choices such as the ALT, LD or RAM free flap. The main benefit is preservation of muscles. The free flap donor site from the same lower limb meant that all wounds and scars were confined to one lower limb without disturbing the good leg or upper trunk muscles. Moreover, when harvesting the PAP flap, most of the flap is raised in a suprafascial plane. The muscle fascia is only entered for the pedicle length.⁹ This contrasts with the ALT flap which often requires extensive muscular dissection to expose perforators that take an intramuscular course.^{3,4}

Conclusion

The PAP flap is an excellent option in the microsurgeon's armamentarium for reconstruction of lower limb soft tissue defects and in particular resurfacing of the lower limb amputee stump. It provides sufficient pedicle length and vessel diameter, preservation of muscle and minimal donor site morbidity with a reasonably well-hidden scar and donor-site contour. Muscle preservation is particularly relevant in cases of lower limb amputation where the end goal is to preserve enough muscle bulk and tone to support a prosthesis.

Patient consent

Patients/guardians have given informed consent to the publication of images and/or data.

Conflict of interest

The authors have no conflicts of interest to disclose.

Funding declaration

The authors received no financial support for the research, authorship, and/or publication of this article.

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