CASE REPORT

Anteromedial thigh perforator flap to cover the inguinal region in a crossover femorofemoral bypass

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Abstract
We report the case of a 48-year-old male with an exposition of a femorofemoral crossover bypass in the inguinal region and superficial femoral occlusion. This was successfully treated using an anteromedial thigh (AMT) pedicled flap based on the perforator vessel of the descending branch of the lateral circumflex femoral artery. Our report focuses on: i) considering the AMT flap as a safe and easy option to cover the inguinal region in cases of bypass exposure; ii) describing the attachment of this flap to the deep femoral artery in a patient with superficial femoral occlusion, in spite of some literature controversy.

Keywords:
Anteromedial thigh flap, bypass, inguinal defect, superficial femoral occlusion

Introduction
The anterolateral thigh (ALT) flap is one of the most widely used reconstructive options in modern surgery, chosen because its vascularization is well known and extensively studied; it is very versatile, easily dissected, and is associated with a low rate of donor site morbidity. The anteromedial thigh (AMT) flap, meanwhile, is equally versatile, with similar low donor site morbidity, can be pedicled [1-3] or used as a microvascular free-tissue transfer [1,4-7], but comparatively little is known of its vascularization.

We report a case of soft tissue loss in the inguinal region with exposure of a femorofemoral crossover bypass and occlusion of the superficial femoral artery in a 48-years-old patient treated successfully with an AMT pedicled flap to cover the inguinal region. This report shows that the AMT flap is a valid option for covering the inguinal region in cases involving lower extremity revascularization, despite the superficial femoral artery being unavailable. We believe that this is a good example of association of the AMT flap with the branches from the deep femoral artery.

Case report
A 48-years-old man had underlying chronic lower extremity ischemia, Fontaine grade IIB, with occlusion of the superficial femoral artery (Figure 1) and extensive collateral circulation through the deep femoral artery. Coronary revascularization was performed, inserting an intra-aortic balloon pump via the common femoral artery. Acute ischemia and compartment syndrome of the lower left extremity followed as a complication of the procedure. Thrombectomy and iliofemoral endarterectomy were performed, followed by a second procedure to perform a femorofemoral crossover bypass with prosthesis. The patient presented infection at the bypass site associated with torpid evolution of the inguinal wound. A third procedure was performed involving a new deep femorofemoral crossover bypass using the right internal saphenous vein. One week after the third procedure, the patient presented a 10 × 7 cm inguinal defect with exposure of the bypass. It was decided to cover the defect by transposition of sartorial fascia and an AMT pedicled flap.

During surgery, a preliminary incision measuring 5 cm was made in the proximal third of the line connecting the anterior superior iliac spine and the superolateral corner of the patella. Musculocutaneous perforators were then located (Figure 2); these could only come from the rectus femoris branch of the descending branch of the lateral circumflex femoral artery, as the superficial femoral artery was occluded (Figure 1). The presence of this perforator facilitated the procedure, and a skin paddle was designed to coincide with the perforator, which was transposed to cover the inguinal defect (Figure 2). Donor site was primarily closed after the insetting of AMT perforator flap into the
groin defect (Figure 3). Final result was good coverage of the bypass and closure of the wound after 2 months (Figure 4).

**Discussion**

The AMT flap can be a good alternative to the ALT flap option: the scar is more discreet, fewer pilous hair follicles are present, and the fascia is more elastic [8]. Nevertheless, because vascularization of this area is more variable, the AMT flap has to a large extent been considered a second-line option. ALT flap perforators are present in $>$95% of cases [9], unlike AMT flaps, where perforators are present in between 100% [8] and 50% [10] of cases, considering only rectus femoris branch perforators as the true pedicle of this particular flap.

The AMT flap was first described by Baek [11] in 1983, and a year later, in 1984, by Song et al. [12]. Since then, the literature on its vascularization can only be described as confusing. Baek describes the flap as being vascularized “by an unnamed artery from the superficial femoral artery”. Song et al. called the vascular pedicle “an innominate branch of the lateral circumflex femoral artery which arises near its base and descends medially on the medial aspect of the rectus femoris muscle and between the sartorius and vastus medialis muscle”. Following Song et al.’s lead, Serafin and Buncke [13] describes the vascularization of the AMT flap based on the innominate branch of the lateral femoral circumflex artery. Several subsequent cadaver and in vivo studies [8,14] have attempted to describe and clarify the problem.

Yu and Selber’s article [10] is probably the most successful at unifying criteria in regard to the question “what is the pedicle of the true anteromedial thigh flap?” In their prospective in vivo study of 100 thigh muscles, Yu and Selber found that 21% had no perforators, 28% had superficial femoral perforators, and 51% had rectus femoris branch perforators of the descending branch of the lateral circumflex femoral artery, these latter being what could be considered the true AMT flap.

**Figure 1.** Arteriogram showing the lower right extremity (healthy extremity) and the lower left extremity (revascularized extremity). The arrow indicates the superficial right femoral artery (left picture) and the left deep femoral artery (right picture).

**Figure 2.** Illustration of AMT perforator flap based on the musculocutaneous rectus femoris branch perforator (x) of the descending branch of the lateral circumflex femoral artery, which is surrounded by a vessel loop. Abbreviation: AMT = Anteromedial thigh.

**Figure 3.** Illustration of AMT perforator flap after its insetting into the groin defect. Donor site is closed primarily. Abbreviation: AMT = Anteromedial thigh.

**Figure 4.** Illustration of the final result 2 months after surgery: coverage of the bypass with the AMT perforator flap and closure of the wound. Abbreviation: AMT = Anteromedial thigh.
Coverage of an exposed bypass in a compromised patient is a reconstructive challenge. We present the first case, to our knowledge, in which a pedicled AMT flap is used to cover the inguinal region in a femorofemoral crossover bypass following deep femoral artery revascularization. In addition, the superficial femoral artery was occluded, so vascularization was only possible via rectus femoris branch perforators. Moreover, we hypothesize that in this situation where only the deep femoral system is permeable, larger collateral and AMT perforators can be found (Figure 2).

Donor site was closed primarily without any tension. Still a small wound (2 × 1 cm) with granulation tissue can be observed on the proximal part of the flap in the 2-month follow-up picture (Figure 4). These complex patients have a slow healing process due to their comorbidities. In the patient here presented, 3 more weeks were necessary for the complete epithelialization. No follow-up picture could be taken due to patient diverse geographic location.

We still think that ALT flap would be the standard and first approach for a broad spectrum of defects. However with this case we tried to illustrate that, when superficial femoral artery occlusion is found, AMT flap could still be a potential first option in some situations (i.e., no ALT perforators). Some degree of confusion has been found in literature about the AMT perforators (superficial vs deep femoral artery). We think this patient is a good illustration of AMT perforator anatomy and potential clinical use.

In summary, our report shows: i) the AMT flap is a viable option to cover the inguinal region in cases of lower extremity revascularization or as an alternative to the ALT flap; ii) the association of the AMT flap with the vascular system of the deep femoral artery, instead of the superficial femoral artery as some papers had described.

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**Declaration of interest**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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