Anterolateral Thigh Twin Free Flaps from a Single Donor Site—a Modification Based on the Oblique Branch of the Lateral Circumflex Femoral Artery

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Abstract The pedicle of the anterolateral thigh flap is formed by the descending branch of the lateral circumflex femoral artery. Recently, an oblique branch of lateral circumflex femoral artery was described by Wei et al., which can also be used as an alternative to the descending branch. We describe a case in which both the pedicles were used to create two free flaps (twin flaps) from the same thigh for post tumour reconstruction of breast.

Keywords Anterolateral thigh flap · Twin free flaps · Oblique branch of LCFA · Alternate vascular pedicle

Introduction

The anterolateral thigh flap (ALT) flap has become the most commonly used free flap for soft tissue reconstruction. While the skin paddle of the flap derives its blood supply from musculocutaneous perforators or septocutaneous perforators or from both, the whole flap derives its blood supply from the descending branch of the lateral circumflex femoral artery (LCFA) [1]. Wong et al. [2] studied extensively about the vascular pattern of the ALT flap pedicle and described an oblique branch of the LCFA. This oblique branch may arise from the descending branch, transverse branch, profunda femoris artery or from the femoral artery

itself. Irrespective of its origin, the oblique branch can be used as main pedicle, and therefore, it was also named as alternative vascular pedicle of the ALT flap [2].

Case Report

A 22-year-old female presented with recurrent phylloides tumour of the left breast and was planned for simple mastectomy with axillary node clearance followed by reconstruction with anterolateral thigh free flap. As the defect was circular and the intention was to close the flap donor site primarily, an ALT flap measuring 29×8 cm was designed with the intention of modifying it chimerically, so as to reconstruct a circular defect with a circular flap (Figs. 1 and 2) and avoiding split skin graft at the donor site. Preoperative assessment of the skin perforators of the left thigh with hand Doppler revealed good signal at the mid-point of the line joining the anterior superior iliac spine and superior lateral patella.

During the flap harvest, the medial exploratory incision was made and the vascular anatomy was assessed. A large blood vessel was noticed supplying the proximal part of the skin paddle in addition to the descending and transverse branches (Fig. 3) and was found arising from a common pedicle along with the transverse branch. Considering this to be the oblique pedicle, this vessel was included in the flap with a part of its common pedicle with the transverse branch and the harvest was completed. The flap donor site was closed primarily as intended and the single flap was split in to twin free flaps, each based on its own vascular pedicle, one being the descending branch and the other being the oblique branch so as to give a good contour to the reconstructed breast and to avoid compromising the vascularity of the skin paddle by using a single pedicle anastomosis or

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Fig. 1 Post excision defect

Fig. 2 Marking for left ALT flap with the intention of closing the donor site primarily

Fig. 3 The branching of the lateral circumflex artery (*single arrow*) with the oblique and transverse branch sharing a common pedicle (*double arrow*)

chimeric modification (Figs. 4 and 5). The descending branch (12 cm) which was longer than the oblique branch (8 cm) with its component flap was anastomosed with the left internal mammary vessels, and the oblique branch with its component flap was anastomosed with the left latissimus dorsi pedicle vessels (Fig. 6a, b) as they were nearer to the lateral aspect of the defect. Both the flaps survived well, enabling a good reconstruction (Fig. 7).

Discussion

Ever since described, the anterolateral thigh flap has emerged as an ideal free flap for soft tissue reconstruction [3]. With increased clinical application, the flap has undergone several modifications in terms of size, components, vascularity and design according to the need [4]. Hemi thigh flap [5], giant thigh flap [6], extended ALT flap [7] and combined anterolateral and anteromedial thigh flaps [8] are notable modifications which were used to reconstruct large defects. Chimeric modification of the ALT flap was used to reconstruct more complex defects with more freedom and ease [9, 10]. A simple chimeric flap has separate soft tissue components, but has a common vascular source. A chain circle chimeric flap has one of the component flaps anastomosed back with the axial vessel [9]. In this case, one end of the component flap vessel is anastomosed with the axial vessel and the other end to a branch of the axial vessel ensuring maximum safety to the component flap. The foundation for the different types of modifications was enabled

Fig. 4 **a** Proximal end of the flap (*single arrow*) with the oblique branch of the LCFA held in micro-clamp. **b** Closer view of the oblique (*single arrow*) and descending branch (*double arrow*) of the LCFA. A part of the branch of nerve to vastus lateralis is seen between the two pedicles

Fig. 5 Deeper surface of the flap during division with the oblique branch (*single arrow*) and descending branch (*double arrow*)

due to a plethora of variations in its vascular supply [11, 12]. Twin free flaps are those flaps which are split into two after harvest depending on the pattern of blood supply and requirement at the recipient site [13–15]. Chou et al. and Huang et al. [14, 15] described two free flaps from a single ALT flap based on two perforators from the descending branch of LCFA to reconstruct two separate small defects in the oral cavity. This was possible because of the smaller size of the defects in the oral cavity and availability of good recipient vessels in the adjoining area.

The latest among the information regarding the ALT flap is the oblique vascular pedicle [2]. As this pedicle was found to supply a large area of skin, this is also considered to be an alternative to the descending branch of the LCFA [2]. This branch was noticed during 35 % of ALT flap harvest and can arise from the descending branch, transverse branch, as a separate branch from the LCFA, from the profunda femoral artery or from the femoral artery. The oblique branch has a length of 8–10 cm and most commonly (51 %) arises from the transverse branch of the LCFA and runs between the transverse and the descending branch to supply the lateral thigh skin and the direction being more proximal and lateral to the descending branch. The perforators from the oblique branch supplying the skin paddle can be septocutaneous or musculocutaneous and Doppler signal for these perforators are heard further proximal to the perforator signals of the descending branch [2]. The finding of an oblique branch preoperatively with hand Doppler signal, regular angiogram

Fig. 6 **a** After anastomosis of the descending branch with its component flap with the left internal mammary vessels. **b** The twin free flaps after the anastomosis of the oblique branch with the left latissimus dorsipedicle

Fig. 7 Late postoperative view of the twin free flaps

or magnetic resonance angiogram offers an excellent flexibility in designing and modifying the anterolateral thigh skin components such as a twin free flap (present case) or as an alternative to the descending branch [2].

In our case, the oblique branch was a fortuitous intraoperative finding which enabled us to change the design from a chimeric flap planned preoperatively to a twin free flap intraoperatively. In this case, the branch originated from the transverse branch (Fig. 3) and supplied the skin paddle through musculocutaneous perforators. The descending branch of the LCFA also supplied the skin paddle through musculocutaneous perforators, thus enabling us to design twin free flaps from a single thigh based on two separate branches of the LCFA. By deriving two separate and large flaps based on two different branches of the LCFA and anastomosing with two different vessels to reconstruct a single large defect, we differ from the previously described twin and chimeric modifications of the ALT flap. The drawbacks in this modification were an additional suture scar in the middle of the reconstructed breast and asymmetry of the breast mound which are being planned for correction at a later stage. While the asymmetry is being planned to be corrected with an implant, the additional scar might still not be pleasing aesthetically. While application of the chimeric concept or a bi-paddled flap could have caused compression of pedicle in this case, as a circular defect was being reconstructed with an elliptical flap, we used the additional branch to good effect with a second free flap. From this experience, we conclude that the oblique branch not only offers an alternative pedicle but also a twin free flap from the same donor site, and detecting it preoperatively adds more flexibility for designing and modifying the ALT flap from conventional methods in reconstructing complex defects.

Conflict of Interest Nil

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