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VERSATILITY OF ANTEROLATERAL THIGH FLAP IN RECONSTRUCTION OF CHALLENGING REGIONAL SOFT TISSUE DEFECTS

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INTRODUCTION

Reconstruction of extensive soft tissue defect is a surgical challenge. Anterolateral thigh flap can be considered as one of the workhorse perforated flap. Since its introduction in 1984 by Song et al, the anterolateral thigh flap has gained widespread popularity. Anterolateral thigh flap with its large and long neurovascular pedicle can be used either as a free flap or a pedicled flap. The flap has ease of dissection, and large irregular shaped flap can be raised. The donor site is also hidden and acceptable to the patient. The Anterolateral thigh flap has gained appreciation in other reconstructive areas such as breast, genital, upper and lower extremity reconstruction. The flap can be safely extended to include adjacent vascular territories perfused by single perforator from lateral circumflex femoral artery. Here we present our experience of resurfacing various anatomical territories with the Anterolateral thigh flap.

MATERIALS AND METHODS

A total of 29 ALT flaps were performed from January 2021 to January 2023 for soft tissue reconstruction of various anatomical regions such as face, neck, breast, perineum, forearm, tendo achilles region and dorsum of foot. The causes for the raw areas were trauma and malignancy excision. Flaps of size ranging from 9 x 8 cm to 15 x 10 cm were raised. Most of the flaps were raised suprafascially with 2-3 cm cuff of soft tissue around the perforator, in order to provide a supple flap. When a thinner flap was needed for areas like neck and face, flap based on the distal group of perforators was harvested, which also permits a longer length of vascular pedicle. While resurfacing larger areas, flap with multiple perforators was harvested. Primary thinning was not done. While resurfacing lower extremity defects with unicortical bone loss/ dead space, vastus lateralis muscle was harvested along with the ALT flap.

SURGICAL TECHNIQUE:

The patient is placed in supine position. The central axis of the flap is marked by a line drawn from ASIS to the superolateral border of the patella. At the midpoint of the line, a circle with a 3cm radius is drawn and the major perforators is located using Doppler probe, especially in lower outer quadrant. Flap of appropriate size is marked with its base overlying the perforators. The flap dissection usually begins on the anterior margin over the rectus femoris muscle with an incision through the skin, subcutaneous tissue and deep fascia. Flap elevation then proceeds in the subfascial plane from anterior to posterior direction. A posterior caudal flap incision facilitates flap elevation and exposure of cutaneous branches arising in the intermuscular septum between the rectus femoris and vastus lateralis muscle. These branches are traced to descending branch of lateral femoral cutaneous artery, venae comitantes, which are exposed by retracting the rectus femoris muscle medially. The pedicle is elevated along with its septocutaneous perforators and segment of intermuscular septum. The deep fascia is then incised as is the posterior flap margin and the flap is now attached only by its vascular

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pedicle and is observed for continuous perfusion. Once viability is ascertained, flap is transferred either as free tissue transfer or as pedicled transfer.

RESULT

The mean size of defects ranged from 150 sq. cm to 72 sq. cm . The mean hospital stay ranged from 10 to 15 days. Out of 29 ALT flaps done, 25 survived completely, 2 flaps necrosed completely due to venous congestion. In 1 flap, re-exploration was done for arterial thrombosis, 2 hours after surgery, following which flap settled uneventfully. 1 patient developed wound infection leading to flap loss, after 7 days.

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DISCUSSION

ANATOMICAL CONSIDERATION

The anterolateral thigh flap is a fasciocutaneous flap (Type B/C) based on the cutaneous perforators that arise from the descending branch of the lateral circumflex femoral artery. The lateral circumflex femoral artery arises from the lateral side of profunda femoris artery and passes lateralward deep to the femoral nerve branches, Sartorius and rectus femoris muscles. It then divides into ascending, transverse and descending branches. The descending branch courses caudally in the septum between rectus femoris and vastus lateralis muscles where it gives several cutaneous perforators to the lateral aspect of thigh. These perforators are usually concentrated in the lower outer quadrant of a circle with 3 cm radius centered on the line joining anterior superior iliac spine and superolateral border of patella. The average pedicle length is 8 to 12 cm with an external diameter of 2.1 mm. These cutaneous perforators can be classified into two types: septocutaneous perforators – first reported by Song et al, in the intermuscular septum between vastus lateralis and rectus femoris; and musculocutaneous perforators that penetrate the vastus lateralis muscle. These perforating arteries exhibit a wide range of anatomic variations. While septocutaneous perforators may be found only in 30% of the cases and majority of the times the perforators are musculocutaneous. It is not uncommon to find an absence of cutaneous perforators issuing from the lateral circumflex femoral artery.

Koshima et al. reported 8 anatomic types of cutaneous perforators from the lateral circumflex femoral artery. Types 1,2 and 3 septocutaneous perforators arise from the descending branch of the lateral circumflex femoral artery. In types 4,5 and 6, perforators arise directly from the trunk of lateral circumflex femoral artery. Type 7 perforators arise independently from the profunda femoris artery while Type 8 perforators, although rare, arise from femoral artery.

Paired venae comitantes always accompany the descending branch. They may be of different sizes and care must be taken to select an appropriately draining vein of suitable size. The average external diameter of the vein is 2.3mm.

The lateral cutaneous femoral nerve emerges from the deep fascia below the inguinal ligament. It gives anterior and posterior branches that supply the anterolateral thigh skin between the greater trochanter and the knee.

Yoshihiro Kimata et al reported the importance of selection of the perforator in relation to length of the pedicle needed while harvesting the flap. The more proximal the perforator lies from the midpoint of axis, the shorter will be pedicle. The more distal the perforator, the pedicle can be harvested as long as 20 cm. Moreover, he also reported that to obtain a thinner flap, distal perforator should be selected.

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Yoshihiro Kimata et al reported about harvesting of vastus lateralis muscle flap along with anterolateral thigh flap to obliterate dead space and he also reported that splitting the muscle longitudinally without harvesting it in toto leads to necrosis because its fibres are arranged obliquely. Thorough knowledge of the anatomic variations and the necessary careful dissection of the musculocutaneous perforators make anterolateral thigh, flap harvest safe and reliable. **(1,2)**

Lee et al and Demirtas et al reported the advantages of flap as having 8 to 20 cm of pedicle length, large pedicle diameter, flexibility of flap design as whole flap can survive upon single perforator alone, harvesting about 800 sq.cm of free tissue, performing surgery in supine position, concealed donor area, primary closure of donor area up to width of 7 cm, harvesting as chimeric flap, donor site away from recipient site facilitating two team approach, with the only drawback being the variability of vascular pedicle. **(3,4)**

Lifeng Liu et al published a study on extended ALT flap for reconstruction of foot and ankle and they stated that while harvesting thin Anterolateral thigh flap care must be taken to preserve a cuff of small deep fascia around large cutaneous perforator to protect them and their connection to the sub dermal plexus, more over while harvesting large flap with single perforator larger cuff of deep fascia is to be retained to secure blood supply of flap, whereas in larger flap with 2 or 3 perforators this is not needed. **(5)**

Tarek Abdalla El Gammal et al published about resurfacing the dorsum of foot in children with free ALT flap and emphasis on need for higher magnification of 16x to 20x for flap dissection and vessel anastomosis, as against adult flap dissection where this is possible by loupe magnification of only 3.5x to 4.5x **(6)**

Zhye Lee et al published an article on optimal timing of traumatic lower extremity reconstruction and stated that free flap coverage could be performed from within 72 hrs to not later than 10 days from initial injury. He noted that Godina's analysis did not account for the learning curve acquired over time which is a confounding factor in his study. In our study, we transferred anterolateral thigh flap taking into account, this time interval **(7)**

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PEDICLED ISLANDED ALT FLAP FOR PERINEUM

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