ANTEROLATERAL THIGH FLAP: VERSATILITY AND ANATOMIC VARIATIONS

Tariq Iqbal, Asif Shah, Samira Ajmal, Firdous Khan

Department of Plastic Surgery,
Hayatabad Medical Complex, Peshawar-Pakistan

ABSTRACT

Objective: *To determine the pattern of the cutaneous perforator of the lateral circumflex femoral artery in anterolateral thigh perforator flap.*

Introduction: *Antero lateral thigh flap has become one of the most commonly used flap for the reconstruction of various soft tissue defects. The anterolateral thigh flap is known for variations of its vascular pedicle. Its major limitation has been uncertainty in predicting perforator anatomy, with the occasional absence of suitable perforators and high variability in their size and course.*

Material and Methods: *Reconstruction of 13 composite defects in 13 consecutive patients by free microvascular anterolateral thigh flap at the Department of Plastic and reconstructive surgery, Hayatabad Medical complex, Peshawar.*

Results: *Thirteen patients were operated and free microvascular anterolateral thigh flap was used. In 12 patients the main vascular supply was through the descending branch of the lateral circumflex artery (LCFA). One patient has a vascular supply through the transverse branch of the lateral circumflex femoral artery.*

Conclusion: *Transmuscular perforators (mostly 3) were found in all the patients, commonly arising from descending branch of lateral circumflex femoral artery.*

Key words: *Anterolateral thigh flap (ALTF), Lateral circumflex femoral artery (LCFA), Microsurgery.*

INTRODUCTION

The lateral thigh flap was first described by Baek in 1983 as a fascial or fasciocutaneous flap based on the smaller vessels that extend from the profunda femoris system to the skin [1]. Then the Song et al in 1984 described anterolateral thigh flap (ALTF) [2]. Since the first report of the anterolateral thigh flap in 1984, this has become one of the most commonly used flaps for the reconstruction of various soft tissue defects[3]. The anterolateral thigh flap is an extremely versatile extremity flap since its moderately thick skin and large potential muscle bulk can be independently tailored to provide ideal tissue matches for heterogeneous group of defects [4]. The skin paddle can be taken in size ranging from 20 to 32 cm in length and 10 to 22 cm in width [5]. The free ALTF has become the workhorse for covering defects in most clinical situations in our center .The anterolateral thigh flap is known for variations of its vascular pedicle[6]. This is a prospective intraoperative analysis of the vascular anatomy of the anterolateral thigh flap that focuses on clinically important variations that impact flap harvest. The anterolateral thigh flap (ALTF) has become increasingly popular due to its versatility and minimal donor site morbidity. Its major limitation has been uncertainty in predicting perforator anatomy, with the occasional absence of suitable perforators and high variability in their size and course[7]. In this study we determined the pattern of the cutaneous perforators of the lateral circumflex femoral artery (LCFA) in anterolateral thigh perforator flap (ALTF).

MATERIAL AND METHODS

Thirteen dissections of the LCFA were carried out in thirteen patients. The number, type,

origin, and location of the perforators of the LCFA were studied.

Lateral circumflex femoral artery system is composed of three branches. Ascending branch, which passes through the intermuscular septum between the sartorius and the vastus lateralis; the transverse branch, which terminates in the tensor fascia latae muscle; and finally the descending branch which run through the intermuscular space between rectus femoris and vastus lateralis muscles[8]. Usually, the vascular supply to the anterolateral thigh skin (overlying the rectus femoris and vastus lateralis) is by way of the largest and longest descending branch of the lateral circumflex femoral artery[8-9]. It runs obliquely under the rectus femoris before entering the medial edge of vastus lateralis in the midthigh[8-9]. However, in about 10% of cases the vascular supply is by way of a large anomalous pedicle from its transverse branch [8-10](transverse pedicle anomaly), which enters the muscle more superiorly. In these cases, a descending branch is usually still present, although it is smaller (1.5 mm) and enters the vastus lateralis more inferiorly.

Patients were anesthetized in supine position. A line was drawn from the anterior superior iliac spine and superolateral border of the patella [11]. The main skin perforators are identified preoperatively and marked (found usually in the mid thigh) (Figure 1). The skin paddle is then designed around the identified perforators. Skin incision is made on the medial side and deepened down to the fascia.

Fasciocutaneous flap (subfascial) involves incision through deep fascia with lateral dissection until perforators identified. All the perforators were identified to be musculocutaneous. Retrograde dissection of pedicle to descending branch is done. Once the entire course and suitability of the pedicle are confirmed, the lateral aspect of the skin paddle is incised [12]. Vessels are skeletonized to the skin paddle. The donor area up to 10cm can be closed primarily or can be grafted if defect is more than that.

RESULTS

Thirteen patients underwent free microvascular anterolateral thigh flap at Department of Plastic Surgery, Hayatabad Medical Complex, Peshawar, during a period of 27 months. In nine patients the pathology was a malignancy while rest of the four patients was operated for

Figure 1: Marking of ALTF

Figure 2 A: Defect created after removal of tumor

Figure 2 B: Defect was reconstructed with ALTF

Table 1: Pattern of vascular supply of ALTF and outcome.

Pathology	Vascular Supply	Number of Perforators	Complications
Tumor	Descending branch of LCFA	Three perforators Transmuscular	Patient died (MI)
Tumor	Descending branch of LCFA	Three perforators Transmuscular	None
Tumor	Descending branch of LCFA	Three perforators Transmuscular	Partial necrosis
Tumor	Descending branch of LCFA	Two perforators Transmuscular	None
Tumor	Descending branch of LCFA	Three perforators Transmuscular	None
Tumor	Descending branch of LCFA	Three perforators Transmuscular	None
Tumor	Descending branch of LCFA	Three perforators Transmuscular	None
Tumor	Descending branch of LCFA	Three perforators Transmuscular	None
Tumor	Transverse branch Of LCFA	Single perforator Transmuscular	Congestion
Trauma	Descending branch of LCFA	Three perforators Transmuscular	None
Trauma	Descending branch of LCFA	Two perforators Transmuscular	None
Trauma	Descending branch of LCFA	Three perforators Transmuscular	None
Trauma	Descending branch of LCFA	Three perforators Transmuscular	None

Figure 3 A: Intra operative single perforator from transverse branch of LCFA

Figure 3 B: Single perforator from transverse branch of LCFA

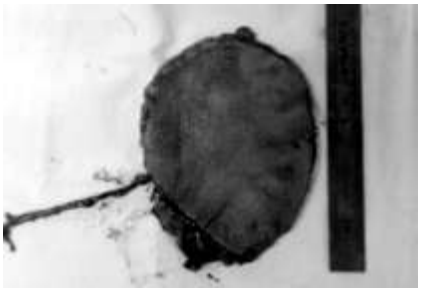

Figure 4 A: Three perforators of the descending branch of LCFA

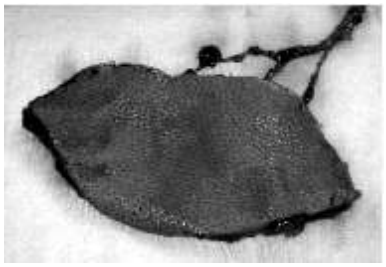

Figure 4 B: Intra operative showing three perforators

trauma. In 12 patients the main vascular supply was through the descending branch of the lateral circumflex artery (LCFA) (Figure 2). One patient had a vascular supply through the transverse branch of the lateral circumflex femoral artery (Figure3). We encountered transmuscular perforators in all of our patients. With those 12 patients with descending branch only two flaps were elevated on two perforators the rest of 10 flaps were found to have three perforators (Figure 4). One flap with supply from transverse branch had single perforator. One of the patients died 1 week after surgery in ICU and the cause was found to be myocardial infarction. Only one flap had partial necrosis. Flap congestion was encountered in one patient that was managed at bed side by taking out a few stitches and relieving tension on the flap. In ten of our cases donor area was closed primarily whereas in other three patients donor area was skin grafted.

DISCUSSION

During our experience with free flaps we kept on searching for an ideal one which will provide us with bulk, adequacy and ease of dissection. With diversity in design and composition, the anterolateral thigh musculocutaneous flap can cover most of the pathologies that need free tissue transfer. In the current study we present our experience with 13 patients in which 9 flaps were done for tumor and 4 for trauma.

Anterolateral thigh flap is a versatile soft-tissue flap in which thickness and volume can be adjusted for the extent of the defect, and it can replace most soft-tissue free flaps in most clinical situations. For extensive defects, this flap has been found to be significantly less morbid than any other soft tissue donor site (including pectoralis major, radial forearm, rectus abdominis, and latissimus dorsi)[8,12,13]. One of our patients with bomb blast injury was having a large defect on the face and anterolateral thigh flap was the only suitable flap of providing that amount of tissue with less donor site morbidity. Radial forearm free flap can not be used for extensive defects and carries a disadvantage of visible donor site scar. Rectus abdominis can cover large defects but has inherent problem of bulkiness[14]. It also causes donor site complications as abdominal wall weakening and large abdominal scar. Activities of the patients are limited due to abdominal wall weakening in contrast to ALTF. ALTF addresses most of these issues, donor site scar is hidden therefore more acceptable, skin territory is large and wide, pedicle diameter is large approximately 2 mm, harvesting is easy because of multiple perforators deriving from the descending branch of lateral circumflex artery and early mobilization. In harvesting ALTF vascular anomalies may occur but the dissection can be accomplished safely once the cutaneous perforator is identified[15].

In this study anatomic variation of the flap was studied in order to help the surgeons in raising the free flap. Initially ALTF was considered to be a septocutaneous flap based on the descending branch of lateral circumflex artery[2]. But in various studies a septocutaneous perforator from that source was identified in only 10-40%[8,12,15,16]. Skin flap is supplied by musculocutaneous perforators in 88% of the cases and is termed as musculocutaneous flap[17]. In another large series of 672 flaps used in total, a majority (439) 87.1 percent were musculocutaneous perforator flaps and 12.9 percent (65) were septocutaneous vessel flaps[9]. In all of our patients the perforators were musculocutaneous and none were found to be septocutaneous. The difficulty with the use of this flap is the anatomical variations that may render this flap unreliable[18]. Usually, the vascular supply to the anterolateral thigh skin (overlying the rectus femoris and vastus lateralis) is by way of the largest and longest descending branch of the lateral circumflex femoral artery.[11-13] It runs obliquely under the rectus femoris before entering the medial edge of vastus lateralis in the midthigh.[11-13] However, in about 10% of cases the vascular supply is by way of a large anomalous pedicle from its transverse branch[9, 11] (transverse pedicle anomaly), which enters the muscle more superiorly. The dissections we performed, In 92 %(12) of our patients the perforators raised from descending branch of LCFA and in 8 %(1) patients it had an origin from transverse branch of LCFA. In these cases, a descending branch is usually still present, although it is smaller (<1.5 mm) and enters the vastus lateralis more inferiorly.

CONCLUSION

Anterolateral thigh flap can be used for most of the defects that need free tissue transfer. Transmuscular perforators (mostly 3) were found in all the patients, commonly arising from descending branch of lateral circumflex femoral artery.

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Address for Correspondence:
Dr. Tariq Iqbal
House # 145, Street 3, Sector C2,
Phase 5, Hayatabad,
Peshawar – Pakistan
Email: drkhantariq@yahoo.com