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Rectus femoris branch: An alternative blood supply for a distally based anterolateral thigh flap



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KEYWORDS

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Summary Successful raising of a distally based anterolateral thigh (dALT) flap mainly depends on a well-developed lateral circumflex femoral artery (LCFA) descending branch and an intact vascular connection between the descending branch and the vascular network of the knee. However, in some clinical scenarios, the descending branch is hypoplastic or the vascular connection of the knee is compromised. We present six cases of using dALT flaps in soft tissue defect reconstruction of the knee with either of the above-mentioned conditions. In these cases, the flaps relied on the reverse blood flow through the rectus femoris branch and showed complete survival postoperatively. We believe that the reverse flow from the rectus femoris branch could be an alternative blood supply for the dALT flap in the presence of hypoplasia of the LCFA descending branch or compromise of the vascular connection between the descending branch and the articular geniculate network.

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Introduction

The distally based anterolateral thigh (dALT) flap has been commonly used for defect reconstruction around the knee since Zhang¹ first described it in 1990. It is supplied by the reverse blood flow from the distal portion of the lateral circumflex femoral artery (LCFA) descending branch when

the proximal portion of the descending branch is ligated. In cadaveric dissection, a vascular anastomosis between the LCFA descending branch and the articular geniculate network, particularly the superior lateral genicular artery, was demonstrated.² Therefore, the successful raising of a dALT flap mainly depends on a well-developed LCFA descending branch and an intact vascular connection between the LCFA

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descending branch and the articular geniculate network.¹⁻³ However, when a hypoplastic LCFA descending branch is encountered or when the vascular anastomosis between the LCFA descending branch and articular geniculate network is seriously injured by traumatic or iatrogenic causes, raising a dALT flap is challenging. Although a free flap may be a more desirable option under these circumstances, the deep location of the available recipient vessels at this level makes vascular anastomosis difficult.⁴

The rectus femoris branch of the LCFA, which was considered the dominant vascular supply of the rectus femoris muscle, was always present.^{5,6} We present six cases of knee defects caused by tumor extirpation that were reconstructed using dALT flaps based on reverse flow from the rectus femoris branch.

Patients and methods

All the procedures were approved by the institutional review board of the Cancer Hospital, Chinese Academy of Medical Sciences, and Peking University People's Hospital prior to the execution of the study. Patients and/or direct family members provided written consent to the procedure. The present study strictly abided by the Declaration of Helsinki and adhered to the STROBE guidelines.

Six dALT flaps were used to reconstruct defects around the knee and proximal leg after tumor ablation in six patients between September 2015 and March 2017 (Table 1). Five patients were female, and one was male. The patients' mean age was 47 years (range, 16-73 years). The mean follow-up period was 5 months (range, 1-7 months).

Operative technique

The dALT flap was designed following a well-described conventional pattern.^{7,8} The perforating vessels of the flap were mapped by using a handheld ultrasound Doppler probe and in conjunction with computed tomographic (CT) angiography in four patients. Intraoperatively, after tumor excision and confirmation of the safety margins by the oncologist, the initial design of the dALT flap could be modified in accordance with the defect and mapped perforators (Figure 1).

All the flap operations were performed by the senior plastic surgeon. A medial incision was made down to the deep fascia. Subfascial dissection then proceeded, and the lateral intermuscular septum was reached. We opened the septum in a distal-to-proximal direction. Care should be taken not to compromise the potential septocutaneous perforators that traverse the septum. The overall configuration of the LCFA and its vascular branches was observed (Figure 2). The retrograde dissection of the perforators was performed, and the most appropriate perforator for the dALT flap was identified. The dominant perforator could originate from the descending branch, oblique branch, or transverse branch. When a hypoplastic descending branch of the LCFA was encountered, or the articular geniculate network was iatrogenically injured, we ligated the main trunk of the descending branch proximal to the point at which the rectus femoris branch left the descending branch. The rectus femoris muscle was then transected at the same level and flipped distally.

Table 1 Detailed characteristics of the patients in this series.^a

No	Sex/Age(Y)	Cause of defect	Reason of using RFB	Side	Defect location	defect size (cm ²)	Duration of surgery	Donor site closure	Outcome	Complication
1	F/54	Malignant fibrous histiocytoma	Hypoplastic descending branch	Left	Medial knee	12 × 6.5	1 h 16 min	Direct closure	Survival	None
2	F/46	Malignant peripheral nerve sheath tumor	Injury of articular geniculate network	Right	Lateral knee	25 × 8	2 h 57 min	Direct closure	Survival	None
3	F/62	Malignant peripheral nerve sheath tumor	Injury of articular geniculate network	Left	Posterior knee and proximal leg	20 × 10	5 h 17 min	Pedicle DIEAP 25 × 7 cm ²	Survival	None
4	F/73	Soft tissue sarcoma	Hypoplastic descending branch	Right	Lateral knee	19 × 8	4 h 2 min	Free skin grafting	Survival	None
5	F/16	Tibial osteosarcoma	Injury of articular geniculate network	Right	Anterior portion of proximal leg	15 × 10	3 h 25 min	Direct closure	Survival	None
6	M/33	Tibial osteosarcoma	Injury of articular geniculate network	Right	Anterior knee and proximal leg	22 × 6	2 h 51 min	Direct closure	Survival	None

^a The patients in this table are arranged according to the sequence of the operative time.

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