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# End-to-patch anastomosis for microvascular transfer of free flaps with small pedicle



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## KEYWORDS

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Microsurgery;  
Becker's flap;  
Groin flap;  
Anastomosis

**Summary** *Background:* Although perforator-to-perforator anastomosis in supermicrosurgery may be used in transferring free flaps with small vessels, it is still difficult in certain situations that include potentially infected wounds. Moreover, it is limited to smaller flaps. Anastomosis of large vessels is still safer for transfer of a large flap for most surgeons. The harvesting of a patch of the parent artery together with the perforator supplying the flap allows the surgeon to perform an anastomosis between the vessel ends of larger caliber, and possibly with greater anastomotic success.

*Method:* When the vascular pedicle of a free flap is < 0.8 mm, an option is to take a cuff of the major artery for an end-to-patch anastomosis. From 1983 to 2013, this method was applied to the anteromedial thigh (AMT) flap (seven cases), the groin flap (81 cases), and the free Becker's flap (five cases). When a patch was taken from the femoral artery, direct anastomosis for the major artery was performed using 5/0 Prolene sutures, followed by coverage with local soft tissue. When a patch was taken from the ulnar artery, a patch of vein graft was used for repair of the ulnar artery. In one case, a segment of the femoral artery was harvested with an AMT flap and a segment of a sartorius muscle flap; the compound tissue was transferred to the neck with the femoral artery to replace the left carotid artery. In the donor site, the defect of the femoral artery was reconstructed with an artificial graft.

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**Results:** The flaps had no failure or partial necrosis, but one patient developed bleeding from the femoral artery 2 days postoperatively. It was treated by adding one more suture for the femoral artery and coverage with the sartorius muscle. In the ulnar artery, the patients did not complain of cold intolerance and the postoperative angiogram showed good patency of the ulnar artery after an average follow-up of 1 year.

**Conclusion:** For the majority of plastic surgeons, this method provides a reliable and comfortable anastomosis when transferring a flap with small vessels. The only concern is to repair the donor artery carefully and ensure coverage of the repair site with local tissue.

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## Introduction

Supermicrosurgery is the anastomosis of vessels with a diameter of  $<0.8$  mm. The technique is often used in some free flaps known to have naturally small perforator pedicles.<sup>1–3</sup> Examples include the anteromedial thigh (AMT) flap, the free groin flap, and the ulnar artery perforator (Becker's) flap. During conventional supermicrosurgery, an end-to-end anastomosis is performed to coapt the recipient and donor pedicles, and this procedure may be technically difficult to perform for an inexperienced microsurgeon, may require a longer operative time, and may be associated with postoperative complications including vessel thrombosis. Thus, the free flaps described above are less commonly used due to the difficulties listed. The senior author designed the end-to-patch technique as a method to overcome the technical challenges associated with perforator-to-perforator anastomosis.

The AMT flap can be chosen as an alternative to the anterolateral thigh flap especially when anterolateral thigh perforators are small or absent. Among the sources of perforators of the AMT flap, the perforators from the femoral artery hinder the anastomosis because of their small diameter, which is usually  $<0.8$  mm.<sup>4,5</sup>

There are many advantages associated with the use of a free groin flap. These include concealment of the donor-site scar, relatively thin thickness, possibility of being raised together with the iliac bone, and presence of non-hair-bearing skin. However, the disadvantages of this flap include small diameter of the pedicle, relatively unreliable vascular anatomy, and limited pedicle length.

The free Becker's flap has advantages including thinness, pliability, and presence of non-hair-bearing skin. There is a reliable and consistent perforator located 3 cm proximal to the wrist crease. This perforator can be used as a pedicle without sacrificing the ulnar artery. But, the diameter of the perforator is usually  $<1.0$  mm.<sup>6</sup>

The supermicrosurgery technique has a steep learning curve and it requires expensive instruments and material. Supermicrosurgery has been successfully used for the transfer of free flaps with small vessels, but it remains a difficult technique in certain situations, such as wounds that are vulnerable to infection. Moreover, it is usually limited to smaller flaps. For most surgeons, anastomosis of large vessels is still safer for transfer of a large flap. With the confident application of the end-to-patch anastomosis

technique, especially by inexperienced microsurgeons, the indications for these classic free flaps may be expanded.

## Patients and methods

From 1983 to 2013, soft tissue defects in 93 patients were reconstructed with the AMT flap, the groin flap, and the free Becker's flap using the end-to-patch method by the senior author (H.C.C.; Table 1). The flap-raising technique and the selection of recipient vessels were performed in the usual manner. An end-to-patch anastomosis was performed when the diameter of the pedicle was  $<0.8$  mm. Cases of use of the AMT flap, in which the pedicles did not originate from the femoral artery, were excluded from this series; the cases in which the pedicle originated from the descending branch of the femoral artery or directly from the deep femoral artery were included. In cases where a free groin flap was harvested, the superficial circumflex iliac artery (SCIA) was included as a pedicle. In cases where the free Becker's flap was used, the dorsal ulnar artery perforator was used. The flaps were raised in the usual manner and retrograde dissection was performed to trace the perforator to the parent vessel. The artery was then harvested including the flap perforator as well as a patch of the parent vessel.

Proximal and distal control of the femoral artery was initially obtained with the use of bulldog clamps. The patch was then harvested by cutting an elliptical cuff of the femoral artery surrounding the flap perforator. Considering the morbidity of the donor vessels, when a patch was acquired from the femoral artery, the size of the patch was about 1–1.2 mm and direct repair was performed using 5/

**Table 1** Recipient sites of this series.

Flaps	Location				Total case number
	Head and neck	Upper limb	Lower limb		
			Leg	Foot	
Anteromedial thigh flap	7				7
Groin flap	8	28	41	4	81
Free Becker's flap		5			5

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