Novel Technique for Venous Augmentation in a Free Deep Inferior Epigastric Perforator Flap

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Abstract: Venous congestion in a free deep inferior epigastric perforator flap threatens the viability of the flap and can lead to eventual flap loss. We describe a novel technique for flap salvage by anastomosing the ipsilateral superficial inferior epigastric vein to a venae comitantes of the deep inferior epigastric pedicle. When recognized intraoperatively, venous congestion can be relieved immediately without the need for additional dissection of recipient vessels. This technique can also be used during reexploration for flap congestion. We routinely preserve length on the superficial inferior epigastric vein for potential flap salvage.

Key Words: DIEP flap venous augmentation

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The deep inferior epigastric perforator (DIEP) flap is a relatively recent option for autologous breast reconstruction.[1–4] The rectus abdominis muscle is preserved with advantages of decreased postoperative pain and donor site morbidity. However, perforator veins are occasionally inadequate to sustain venous drainage of the flap, and venous congestion then compromises a DIEP flap, despite patent anastomosis. We present a novel technique for venous augmentation in these cases.

TECHNIQUE

Patients are evaluated preoperatively using Doppler ultrasound to identify the location of possible perforators to supply the DIEP flap. The superficial inferior epigastric system is also assessed. These vessels are marked on the abdomen to serve as an intraoperative guide.

During harvesting of the abdominal flap, the superficial vessels are evaluated for possible use as nutrient vessels to the flap. Even if they are found to be inadequate, we routinely dissect the superficial inferior epigastric vein from its surrounding tissue and branches, and preserve a length of approximately 6 cm for possible flap salvage. This dissection adds minimal time to the procedure.

We then dissect the deep perforators and deep inferior epigastric pedicle out from the surrounding rectus abdominis muscle and harvest the flap. The pedicle is anastomosed to the internal mammary vessels and the flap is inset.

A few times in our experience, the flap has appeared congested during flap insetting. After confirming that the pedicle anastomosis and perforators are patent, we have still needed additional venous drainage. Because the superficial inferior epigastric vein stump lies just superior to the deep pedicle of the flap, we have been able to easily bring the vein down and anastomose it to one of the vena comitantes that communicates with the other vena comitantes, merging to form the single deep inferior epigastric vein. By dividing one vena comitantes proximally, the anastomosis can be done in an end-to-end fashion. The vena comitantes of the deep system functions as an in situ vein graft (Fig. 1). This method has enabled venous drainage of both the superficial and deep systems into the internal mammary vein without the need for dissection of an additional recipient vein.

CASE REPORTS

Case No. 1

A 46-year-old woman underwent a left mastectomy and primary reconstruction with an ipsilateral DIEP flap. Preoperative Doppler analysis demonstrated adequate perforator signals as well as a strong signal from the superficial inferior epigastric system. We evaluated the superficial vessels but found the artery to be of inadequate size to serve as the flap pedicle. However, as is our routine, we carefully dissected and maintained a length of the superficial inferior epigastric vein. The DIEP pedicle was anastomosed to the ipsilateral internal mammary vessels. The flap appeared hyperemic with rapid capillary refill as it was being inset. The arterial and venous anastomoses were patent, as were the perforators within the flap. The superficial inferior epigastric vein appeared distended and therefore was anastomosed to one of the vena comitantes of the pedicle before it merged with the other to form a single, deep inferior epigastric vein. There was good flow that relieved the flap congestion. The patient had an uneventful postoperative course with no flap loss.

Case No. 2

A 54-year-old woman underwent bilateral mastectomies with immediate bilateral DIEP flap reconstructions. The

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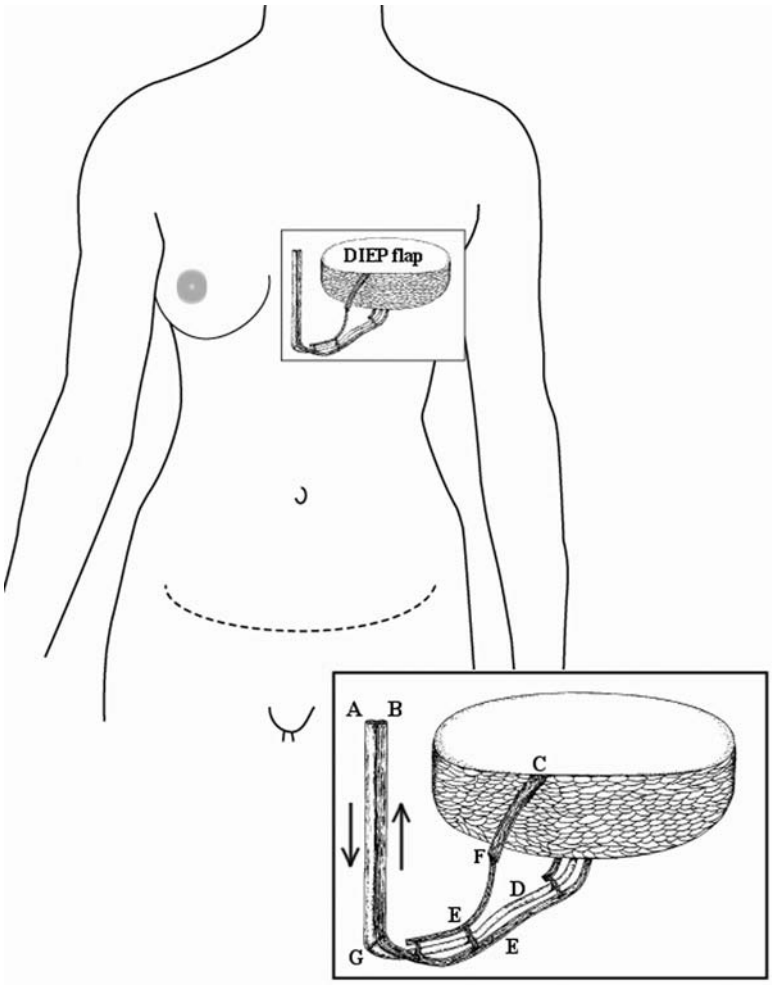

FIGURE 1. Illustration of in situ venous vein graft (deep inferior vena comitantes) drainage of the superficial inferior epigastric vein in a deep inferior epigastric perforator flap. Arrows indicate direction of flow. Arterial flow is in white; venous flow is shaded. (A) Internal mammary artery; (B) internal mammary vein; (C) superficial inferior epigastric vein; (D) deep inferior epigastric artery of flap pedicle; (E) venae comitantes of the deep system with connecting branches; (F) anastomosis between superficial and deep veins providing additional venous drainage of the flap; (G) anastomosis between internal mammary and deep inferior epigastric vessels.

pedicles were anastomosed to the internal mammary vessels. Although the flaps initially appeared viable, the left flap became progressively more congested in the recovery room. The patient was taken back to the operating room where exploration revealed a patent anastomosis and adequate flow within the perforators. However, the superficial inferior epigastric vein was engorged, confirming insufficient venous drainage.

The preserved length of superficial inferior epigastric vein was anastomosed to a vena comitantes of the pedicle proximal to the anastomosis to the internal mammary vein. With this additional drainage, the flap appearance immediately improved and remained viable.

DISCUSSION

Even when a microsurgical anastomosis is technically adequate, a free flap may be compromised by insufficient venous drainage. In these cases, it becomes necessary to provide additional outflow. Given the possible donor and recipient vessels available in free flap breast reconstruction, a number of options exist for salvage of a congested flap. A common necessity for all these techniques, however, is the preservation of a length of secondary vein, whether it is an inferior epigastric or superficial circumflex iliac vein (ipsilateral or contralateral). Only a few extra minutes are required to preserve adequate length on the donor salvage vein, and this time can mean the difference between reexploration or flap failure and successful reconstruction.

Blondeel et al describe salvaging congested DIEP and free transverse rectus abdominis myocutaneous (TRAM) flaps by interposition grafting of the superficial inferior epigastric vein to the internal mammary vein.[2,5] The topographic positions of these vessels during reconstruction necessitated an interposition graft. Wechselberger et al solved insufficient venous drainage by anastomosis of the superficial inferior epigastric vein to a thoracodorsal, lateral thoracic, or intercostal vein.[6] Barnett et al report a technique of venous supercharging free TRAMs by dividing the cephalic vein distally and rotating it about the infraclavicular fossa before anastomosing it to the superior inferior epigastric vein.[7] For their cases of venous congestion, Niranjan et al used several different anastomoses: superficial circumflex iliac vein to cephalic vein, superficial inferior epigastric vein to lateral pectoral vein, or an interposition vein graft between the cephalic vein and opposite pedicle.[8] When he encountered venous insufficiency in a DIEP flap, Cavadas used the vein of

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the pedicle as a venous interposition graft to anastomose another perforating vein to the internal mammary vein.[9] These techniques all require dissection of a separate recipient system and/or harvesting of an interposition graft, adding to the operative time.

We describe a novel technique for DIEP flap salvage when the primary pedicle is patent using the superficial inferior epigastric vein anastomosed to a vena comitantes of the deep inferior epigastric vein. These vessels have a good size match, and the anastomosis enables drainage of both the superficial and deep systems. Based on our results, we agree with the observation that draining the combination of the superficial and deep inferior epigastric systems seems to provide adequate venous outflow in congested flaps.[4] We believe that this technique can also be applied to augment venous drainage in a free TRAM because the anatomy for the anastomosis is the same.

This technique does not require additional dissection of separate recipient vessels such as the thoracodorsal vein (if primary anastomosis is performed to the internal mammary vein). It relies only on flap vessels, saving recipient vessels from further manipulation. In addition to being efficient, this anastomosis has a favorable configuration; the superficial system is directly superior to the deep system. A minimal distance needs to be traversed to connect 2 vessels that are in close proximity to each other. With a deep vena comitantes acting as an in situ vein graft, the length of the superficial vein only needs to reach the undersurface of the flap. Therefore, neither a very long superficial stump nor an interposition vein graft is necessary.

In a perfect world, a perfect anastomosis produces a perfectly healthy flap. In reality, however, additional venous drainage may be necessary, and it is important for the surgeon to have options for flap salvage. Basically, any available donor vein can be anastomosed to an available recipient vein. We present an efficient, conveniently configured method of venous augmentation for DIEP and free TRAM flaps.

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