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Mastering the Deep Inferior Epigastric Artery Perforator Flap (DIEP): Refining Techniques and Improving Efficiency

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Additional information is available at the end of the chapter

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1. Introduction

1.1. Patient selection

Most women seeking breast reconstruction are candidates for Deep Inferior Epigastric Perforator (DIEP) flaps. The only absolute contraindication is prior abdominoplasty [1]. Other types of abdominal surgery including liposuction are relative contraindications [2], and need to be evaluated with respect to the extent of the abdominal surgery and the result of the magnetic resonance angiogram (MRA.) If a patient is too thin and simply does not have enough abdominal tissue for the breast reconstruction (one or two breasts), she can either have a low-volume reconstruction with the intent to augment the reconstruction later, or use another donor site, like the thighs or buttocks. We tend not to operate on patients with BMI over 36, and require that they lose weight prior to elective DIEP surgery. We also require that patients quit smoking for three months prior to surgery, but exceptions may be made in select patients.

2. Preoperative imaging

Our technique for MRA of the abdomen has been published [3-5]. We obtain MRA on all patients undergoing perforator flap procedures. This includes patients who have expanders or implants in place at the time of MRA. In our experience, there have not been adverse effects from performing MRA on patients with expanders or implants. The appropriate

Figure 6. Fish hook providing adjustable static retraction.

Figure 7. Rake retractor providing static tissue retraction.

Figure 8. Use of both “fish hook” and Gelpi retractors.

5. Third surgeon: Internal mammary vasculature dissection

The third surgeon prepares the chest wall for anastomosis. For a delayed procedure with explantation of implants, the skin over the implants is elevated off the pectoralis muscle and internal capsule, creating a large space for the flap. The space between the skin and muscle is created up to the clavicle superiorly, and should be about 1.5X the predicted size of the flap. The implant is then removed, and the pectoralis muscle is tacked back down on the chest all (where it belongs). We prefer the second or third intercostal space since the vessels are 1.5-2.5 mm in diameter and a good size match with DIEP vessels.

At the second or third intercostal space, a transverse incision is made parallel to the fibers of the pectoralis muscle exposing two consecutive rib cartilages. An incision is made in the perichondrium longitudinally in each rib. The perichondrium is stripped off with a Freer

elevator and the intervening intercostal muscle is removed. At the costochondral junction, rib is sometimes removed to provide enough space for anastomosis. The internal mammary vessels can be found in a thin layer of fat under the intercostal muscle and are dissected. A branching point of the internal mammary vein is identified and can allow for greater diameter for improved size match with a DIEP vein. Care is taken to leave enough distal artery and vein stump of internal mammary vessels in case an anastomotic revision becomes necessary. These vessels can be successfully used for retrograde anastomosis in case of an anastomotic failure or damage to proximal vessels.

Previous implants with or without radiation therapy can result in a significantly thick posterior capsule making the initiation of the internal mammary dissection more difficult; once through this capsule and into the proper plane below the intercostal muscle, dissection proceeds more easily. An internal mammary lymph node can frequently be encountered. Although it may demonstrate inflammatory changes only, the identified node should be sent for permanent pathology in patients with a cancer history, as this can change stage and treatment. Of note, the internal mammary vessels are typically smaller in caliber on the left than the right side[8].

6. Flap harvest

Before division of the DIEP vessel we mark the anterior surface of the vessels with ink for later anatomic orientation and to avoid kinking of the vessels during inseting. It is also helpful to reconfirm the position of the Doppler signal on the skin prior to harvest.

After the dissection is finished, the abdominal flap is harvested and weighed. The abdominal flap weight can be compared with the mastectomy specimen weight. The flap is held up above the chest wall and the vessels are dangled free over the chest to find the natural orientation of this long pedicle. The ink mark on the anterior wall of DIEP vessels may help with orientation. The flap is secured to the chest wall with sutures. At this point, the arms, which had been prepped into the field are brought into adduction and clamped to the sheets. The arm boards are removed. This allows for two microsurgeons to approach the table and work together under the microscope. The table is slid caudally so that there is room for the surgeons' knees when sitting for the microsurgery. The microscope pedal is used so that the scope can be adjusted while operating with two hands.

7. Under the microscope

The vein is coupled with the coupler (Synovis, Microcompanies Alliance, Inc. Birmingham, AL) and the artery is hand sewn. Arterial coupling can also be done. Once the anastomosis is complete, skin signals are marked on the flap and flap is carefully placed under chest wall skin flaps. Careful positioning of the flap is done under direct vision of the pedicle. Many failures can be attributed to pedicle kink at the anastomosis due to long pedicle length.

8. Insetting

The excess skin on the flap is de-epithelized and adequate bleeding is evaluated. The flap is tacked into position to avoid movement, and to cover the depression created medially at the anastomosis. In cases of nipple sparing mastectomy, a skin paddle is left in the mastectomy incision for monitoring. This skin paddle can be excised 4 days later and closed before the patient leaves the hospital.

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