Figure 8.12 Groin lymph node flap isolated on the superficial circumflex iliac artery and vena commitante with the inguinal ligament retracted superiorly with a double hook.
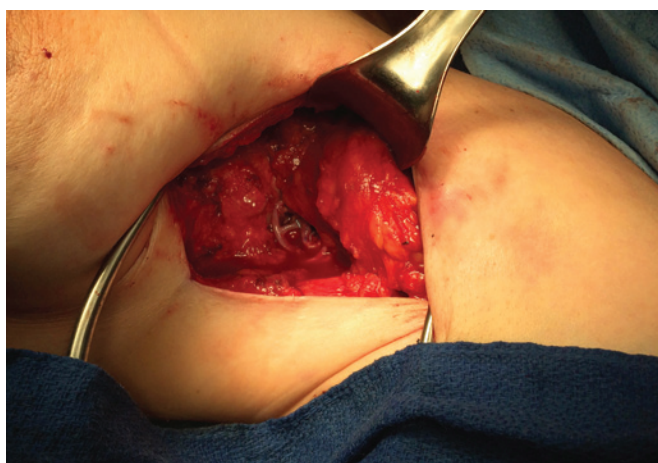

Figure 8.13 Groin flap inset directly on top of the axillary vein following anastomosis to thoracodorsal vessels. Flap spans the defect created by scar removal from lateral chest wall to normal upper limb subcutaneous fat.

to preserve the critical lymph nodes draining the lower limb, their vascularity must be maintained as well. Small feeding branches to "hot" nodes must be carefully preserved and flap division should not occur in tight quarters to these nodes, but with a healthy distance allowing for preservation of not only the lymph node but its perinodal fat. Anastomosis is then performed to the thoracodorsal vessels and the flap is carefully inset directly onto the axillary vein with closure over a closed-suction drain (Fig. 8.13).

TREATMENT OF LOWER EXTREMITY LYMPHEDEMA WITH VASCULARIZED LYMPH NODE TRANSFER

The proximal versus distal recipient site dilemma exists in lower extremity lymphedema as well. However, many forms of lower extremity lymphedema are a result of hysterectomy and radiotherapy for gynecologic tumors. Venturing deep within the pelvis to restore lymphatic continuity is often impractical, and consequently, most lymph node transfers

are performed distally, and with good success. These are commonly performed to either the posterior tibial or dorsalis pedis vessels at the ankle, which requires a skin flap. The bulk is unfortunately unsightly and may also interfere with footwear.

To address the shortcomings of the ankle recipient site, we now routinely use the medial sural vessels in the calf as a recipient site, obviating the need for a skin paddle. The axillary lymph node transfer to the medial sural vessels is often our first choice for treatment of gynecologic tumor-related lower extremity lymphedema with the supraclavicular flap as a back-up, if the axillary nodes are too close in proximity to the lymph nodes draining the upper limb. The axillary flap scar is well-concealed and there is minimal pain in our experience compared with the supraclavicular flap. For melanoma or sarcoma-related lower extremity lymphedema where the lymphatic defect is on the limb itself, consideration is given to placing the lymph nodes at the site of the defect, particularly if there is an acquired severe vein stenosis due to surgery and/or radiotherapy that warrants treatment.

VASCULARIZED AXILLARY LYMPH NODE TRANSFER WITH REVERSE LYMPHATIC MAPPING

DONOR SITE

Patients with an MRA demonstrating plentiful lymph nodes inferiorly situated well below the level of the axillary vein (presumably far away from lymph nodes draining the upper limb) are the best candidates for vascularized axillary lymph node transfer. There is considerable variability seen on MRA, and it is common for one side to be preferable in terms of lymph node caliber, number, and position. Lymph nodes on the anterolateral chest wall are often supplied by the lateral thoracic vessels while lymph nodes along the undersurface of the latissimus and posterolateral chest wall are typically supplied by the thoracodorsal artery. Ultimately, a decision to use one or both of these pedicles must be made during the course of the procedure. Of paramount importance is to avoid lymph nodes close to the axillary vein, which should never be skeletonized or visualized during dissection. The patient should be aware that there is a risk of losing sensation under the arm if the intercostobrachial cutaneous nerve is divided, although dissection typically remains just below this nerve. If the thoracodorsal vessels are used, there is a possibility that the thoracodorsal nerve is intertwined between the pedicle and lymph nodes and must be divided and reapproximated following flap harvest.

The technique of reverse lymphatic mapping is critical in this procedure because axillary nodes are in a highly mobile mass of adipose tissue where they can easily change position. The morning of surgery the patient has 0.2 mL of filtered technetium injected into the first and second web spaces of the hand. For those embarking on this procedure for the first time, a longitudinal incision along the lateral chest wall is most straightforward, although this often results in a widened scar. We typically mark a transverse axillary incision at least 4–5 cm below the axillary crease for better cosmesis (Fig. 8.14). Four 0.1 mL intradermal injections of
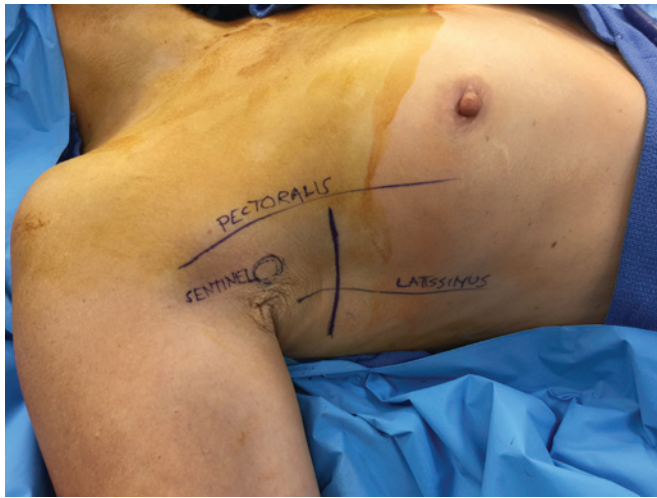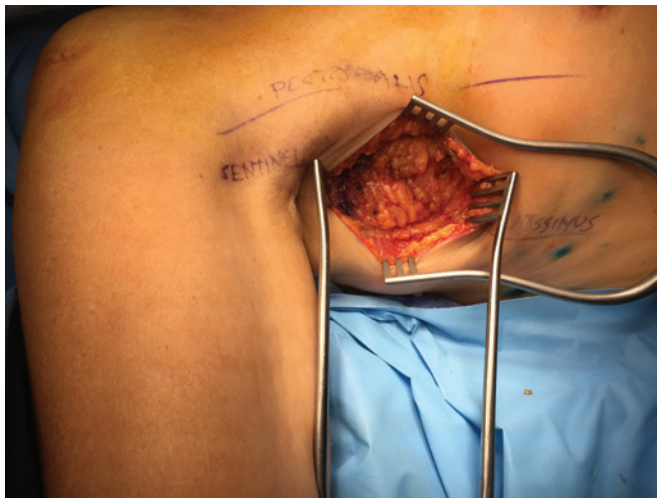
Figure 8.14 Axillary flap markings.

Figure 8.15 Axillary flap exposed. Depending on the patient's anatomy, flap is based on either or both the lateral thoracic and thoracodorsal vessels.

Figure 8.16 Axillary flap harvested. The superior pedicle is the lateral thoracic vein. In this case, the lateral thoracic artery was absent so the thoracodorsal vessels and corresponding lymph nodes were included as well. One artery and both veins were anastomosed.

indocyanine green is injected approximately 10 cm below the planned incision across the back an lateral chest wall. The gamma probe is used to identify the location of the sentinel nodes draining the upper limb, which are marked and carefully avoided. These lymph nodes are on the undersurface of the superolateral border of the pectoralis major muscle (Fig. 8.3). Subcutaneous flaps are then elevated to expose the flap (Fig. 8.15). The SPY/PDE is used to identify the presence of nodes and make an assessment of where the greatest number of nodes is located. The gamma probe is used again to determine the superior extent of the flap where no technetium signal is present. This level is marked with a marking pen and is continuously examined with the gamma probe throughout the dissection. There should be almost no signal present in the flap. The trick here is to ensure the presence of nodes in the flap, while keeping a safe distance from any lymph nodes draining the upper limb. At this point, dissection is carried directly to the anterolateral chest wall just posterior to the pectoralis major muscle. A subfascial plane is used to capture the lateral

thoracic vessels. The proximal lateral thoracic vessels are explored to determine if an artery is present or not. If there are plentiful lymph nodes supplied by the lateral thoracic vessels and an adequate artery and vein are present, the decision to harvest this flap alone may be made. If there is not a lateral thoracic artery present or if more lymph nodes are desired, dissection proceeds posteriorly to include the thoracodorsal vessels as well. Conversely, if the MRA demonstrated plentiful thoracodorsal-based lymph nodes, the flap could solely be based on the thoracodorsal pedicle. However, we have observed a trend toward improved efficacy with a greater number of lymph nodes and will often harvest both pedicles provided that there is no technetium signal present (Fig. 8.16). Distal pedicles of the lateral thoracic and thoracodorsal vessels are divided and care is taken to avoid the long thoracic nerve. The gamma probe is used throughout this process to ensure that the superior extent of the lymph node flap does not encroach upon any hot lymph nodes draining the upper limb. One final key in this process is not to skeletonize the proximal pedicles more proximally in the territory of the nodes draining the upper limb. Even if these nodes are preserved, *proximal skeletonization of the pedicles may devascularize the lymph nodes draining the upper extremity and should be avoided*. If a small branch is feeding a hot node from the pedicle of your flap, the pedicle should be harvested distal to this branch to preserve circulation to the sentinel node.

RECIPIENT SITE PREPARATION

MEDIAL SURAL VESSELS

The medial sural artery and vein can be rapidly prepared for lymph node transfer to the calf. The medial gastrocnemius muscle is palpated and a 10 cm longitudinal incision is marked from the popliteal crease inferiorly over the center mass of this muscle belly. The location of the greater saphenous vein is marked anteriorly and the sural nerve is marked in the median raphé to designate the outer limits