

inferiorly, deep to the costal cartilages and superficial to the pleura. As this vessel exits underneath the costal margin, it becomes the superior epigastric artery (see Fig. 11.3). The internal mammary artery is usually accessed by removing the third costal cartilage. Perforating vessels just above the second, third or fourth costal cartilages are common and can be used as recipient vessels in this region if large enough.

A direct incision may be made overlying the third costal cartilage (Fig. 11.2). This can be identified by palpating the sternal angle which is at the level of the second costal cartilage. Moving one cartilage lower identifies the third costal cartilage. The skin and soft tissues are dissected just above the pectoralis muscle fascia. The pectoralis muscle is separated on top of this cartilage and the cartilage is removed through a subperichondrial dissection. The deep perichondrium is incised and reflected lateral to medial to expose the internal mammary vessels and lymphatics. The intercostal musculature is divided up to the bottom of the second costal cartilage. This muscle can also be divided to the top of the fourth costal cartilage if additional pedicle length is required. There is usually a perforating branch at the level of each costal cartilage that needs to be divided in order to free up these vessels. There are also other small branches that will need to be divided as well. The artery and vein are usually easily separated from each other. At this level, there is usually only one vein on each side, with the left vein tending to be smaller than the right. The vein is usually thin walled and the artery is also subject to easy trauma, resulting in segmental thrombosis. These vessels, in particular, require gentle dissection. The artery's intima separates easily and the surgeon must be assured that the sutures capture arterial adventitia in order to obtain adequate strength for the anastomosis.

Perforators off the internal mammary system should be evaluated as the skin and soft tissues are elevated off the pectoralis muscle. A sufficiently large perforator can be considered as a recipient vessel, avoiding further soft tissue dissection and removal of the costal cartilage. These perforating vessels can be traced up into the subcutaneous tissue, dividing small branches and developing a reasonable length of recipient vessels.

THE ANATOMY AND EXPOSURE OF THE LATERAL THORACIC ARTERY

The lateral thoracic artery (Figs 11.1, 11.5) is a direct branch off the axillary artery and follows with the lateral thoracic vein (Fig. 11.8). This vessel is more superficial within the axilla as compared to the thoracodorsal artery. The same incision and approach are used to harvest the lateral thoracics, as done in dissecting the thoracodorsal vessels. The lateral thoracic vein is usually easily identified within the more superficial axillary fat. The lateral thoracic vein is typically larger than the thoracodorsal vein. The lateral thoracic artery is just posterior to the vein and is considerably smaller in caliber. On occasion, this artery is as large as the thoracodorsal artery.

THE ANATOMY AND EXPOSURE OF THE THORACOACROMIAL ARTERY

The thoracoacromial artery comes off the subclavian artery to supply the pectoralis major muscle (Figs 11.1 and 11.5).

It typically enters the undersurface of the pectoralis major between the middle and lateral thirds of the muscle. An incision is made just below the lateral half of the clavicle. The skin and soft tissue are elevated to expose the pectoralis major muscle. The clavicular portion of the pectoralis muscle is divided to expose the thoracoacromial vessels. Their location can first be identified with a handheld Doppler. After dividing the muscle, the vessels are usually within a sheath of fatty tissue with two accompanying veins. The vessels can be dissected away from the muscle and then toward their origin on the axillary vessels.

ADVANTAGES AND DISADVANTAGES OF RECIPIENT ARTERIES FOR RECONSTRUCTION OF THE CHEST REGION

The advantages of the thoracodorsal artery include dependable anatomy and a generally consistent caliber. The artery is usually easily identified along with the vein and, more importantly, the thoracodorsal nerve. The thoracodorsal artery is easily dissected and is not sensitive to manipulation during dissection. It is generally useful even in the setting of previous axillary dissection. The main disadvantage is the need to dissect through a moderate amount of axillary fat and lymphatic contents to expose this artery when an axillary dissection has not been part of the procedure. Although this artery can be transposed to a more superficial position after dissection and distal division, the axilla still tends to be a deeper, confining recipient site requiring longer instruments and additional skill to perform anastomoses.

The advantages of the internal mammary artery include dependable anatomy, a consistently large vessel caliber, and its superficial location, which allows greater ease for performing anastomoses. This artery provides for an excellent alternative to the thoracodorsal artery in the setting of previous axillary dissection. The disadvantages include this artery's susceptibility to injury even with gentle dissection. The attachments of its intima are also fragile, with intimal separation and injury occasionally occurring during routine anastomoses. The accompanying vein, particularly on the left side, can be too small despite a very adequate recipient artery, necessitating a move to another recipient site. The internal mammary perforators have the advantage of eliminating the need for the removal of a costal cartilage. Their primary disadvantage is a small caliber.

The advantages of the circumflex scapular include consistent anatomy and a large-caliber vessel, which is usually larger than the accompanying thoracodorsal artery. On occasion, the thoracodorsal artery is injured as a result of the axillary surgery; however, it would be rare to injure the circumflex scapular in this particular setting. The circumflex scapular artery can be dissected as it courses toward the triangular space and transposed into a more superficial location in the axilla. The disadvantages include the same depth issues in performing the anastomosis as in the thoracodorsal vessels. Congenital absence of the circumflex scapular artery is uncommon but has been reported.

The advantages of the lateral thoracic artery are its superficial location and its very large accompanying vein. The lateral thoracic vein is usually larger than the thoracodorsal vein. The main disadvantage of the lateral thoracic artery is its routinely small caliber, making the thoracodorsal artery a better choice in this setting.

THE ABDOMEN

THE ANATOMY AND EXPOSURE OF THE INFERIOR EPIGASTRIC ARTERY

The deep inferior epigastric artery is a direct branch off the external iliac artery. This artery continues moving superiorly and medially for 4–6 cm before it enters the rectus abdominis muscle. The artery gives off several small branches as it runs from the external iliac artery to the muscle (Fig. 11.6 and see Fig. 11.3).

Access to these vessels is usually obtained through the anterior rectus fascia to expose the lateral border of the rectus abdominis muscle. Retractors are placed so as to elevate the lateral border of the muscle to expose the inferior epigastric vessels. The intercostal motor nerves are kept intact to preserve the motor innervation to the rectus abdominis muscle. The vessels course just below these motor nerves so they can be preserved while still preparing a useful segment of these vessels. The inferior epigastric vessels can be followed as they course away from the muscle, moving inferiorly and laterally to join the external iliacs. The inferior epigastrics can also be followed superiorly within the muscle. These vessels can be dissected away from their attachments to the rectus abdominis muscle, thus increasing the potential length of recipient vessels.

The superior epigastric artery is an extension of the internal mammary vessels. A vertical or transverse incision can be made in the upper portion of the abdomen. The anterior rectus fascia is entered, also either transversely or vertically. The medial border of the rectus abdominis muscle is identified and elevated off the posterior rectus sheath. A portion of the medial aspect of the rectus abdominis may need to be divided at the level of the costal margin. On the under-surface of the muscle, along its medial aspect, the superior epigastric vessels are seen coursing just underneath the costal margin and then into the muscle. These vessels can be dissected off the muscle but usable vessel length remains limited and vessel caliber is also unpredictable at this level.

THE ANATOMY AND EXPOSURE OF THE FEMORAL ARTERY

See Chapter 13, Figure 13.2.

THE ANATOMY AND EXPOSURE OF THE SUPERFICIAL INFERIOR EPIGASTRIC AND CIRCUMFLEX ILIAC ARTERIES

The superficial inferior epigastric and superficial circumflex iliac arteries come off the common femoral artery (Fig. 11.6). Due to their smaller caliber, they are not commonly used as recipient vessels in abdominal or groin reconstruction; however, knowing the anatomy can be useful in harvesting vascularized lymph nodes.

An incision is made parallel to and just above the inguinal ligament. The skin and soft tissues are typically dissected through Scarpa's fascia. Just deep to Scarpa's fascia, the superficial circumflex iliac vessels can be found at or near the anterior superior iliac spine. The superficial inferior epigastric vessels may be found just medial to the anterior portion of the iliac crest. The superficial inferior epigastric vessels are also found just below Scarpa's fascia but in a more medial location. Both the superficial inferior epigastric

vessels and superficial circumflex iliac can be dissected back to their origin on the femoral artery and vein. On occasion, these two vessels will share a common origin on the femoral vessels.

THE ANATOMY AND EXPOSURE OF THE INTERCOSTAL ARTERY

The intercostals are located deep to the periosteum, on the inferior border of each rib and can be dissected for whatever length is required (Figs 11.2 and 11.6). The more proximal ribs tend to have larger diameters so the highest possible rib is selected. An incision is made directly overlying a rib near the site of the defect. Dissection courses directly onto the selected rib and the periosteum is incised. A subperiosteal dissection is performed and a segment of rib is removed. The deep periosteum is incised along the inferior aspect of the removed rib.

ADVANTAGES AND DISADVANTAGES OF RECIPIENT ARTERIES FOR RECONSTRUCTION OF THE ABDOMEN AND GROIN REGIONS

For abdominal and groin reconstruction, the femoral artery has the advantage of consistent anatomy and a superficial location. Its disadvantages include the need to perform end-to-side anastomoses and the thicker wall of the femoral artery. Other disadvantages include the presence of atheroma in older patients, which can make the performance of the anastomosis challenging.

The advantages of the inferior epigastric artery include its consistent anatomy, caliber, and length of vessel from its origin to where it enters the rectus abdominis. This length allows for transposition to a superficial location for both abdominal and groin reconstruction. The disadvantage with this recipient artery is the potentially smaller caliber veins at the level of artery division and transposition. Transposing the saphenous vein helps to get around this potential problem. The other disadvantage is the potential for lower abdominal wall hernia formation. The anterior rectus sheath is incised in order to reach this artery. If the artery is transposed to a more superficial location for abdominal wall or groin reconstruction, some portion of the anterior rectus sheath must remain open so as not to kink or occlude the recipient artery. This opening, even if small, does allow for the late development of an abdominal wall hernia.

The advantages of the superior epigastric artery are consistent anatomy and its location for upper abdominal wall and chest reconstruction. The disadvantages are its short length and its tendency toward a smaller caliber.

The advantages of the superficial epigastric and circumflex iliac arteries are their superficial location. The disadvantages are their very small caliber in the superficial location and their inconsistent anatomy.

The advantage of an intercostal artery as a potential recipient artery, is its close proximity to lumbar and posterior thoracic defects. These types of defects are usually challenging because of the absence of straightforward nearby recipient vessels. Removal of an adjacent rib and dissection of the intercostal vessels provides for usable recipient vessels in these otherwise difficult locations. The disadvantages of the intercostals are their small caliber.