Myocutaneous Rectus-Free Flap

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The rectus abdominis (RA) myocutaneous flap was an early free tissue transfer successor to the often used pectoralis myocutaneous flap which was limited in its reach to more remote defects of the head and neck by is pedicle length. Both of these flaps offered the advantages of bulk to reconstruct large three-dimensional spaces with the added advantage of a potentially large cutaneous paddle as part of its design which could seal off closed large mucosal defects.

The RA has been used widely for defects from head to leg and often "competed" with the latissimus dorsi (LD) myocutaneous flap. The RA had the distinct advantage over the LD in that it could be harvested from the supine position concurrent with a head and neck tumor resection. Arm retractor technology has lessened this advantage as of late. This flap continues to be pre-eminent for post-mastectomy complex breast reconstruction.

The RA can be harvested in a variety of configuration (muscle only, paramedial skin paddle, muscle sparing, chimeric skin paddle, etc.) to suit the specific requirements of any given defect. Special attention to the unfamiliar anatomy of the rectus abdominis for a head and neck reconstructive surgeon is crucial. Anatomical details of significance for flap harvest and wound closure are outlined below.

7.1 Relevant Anatomy

- The rectus muscle has a double vascular supply: the deep inferior epigastric artery, which is 2–4 mm in diameter and the superior epigastric artery which is 1–2 mm in diameter and the terminal branch of the internal mammary artery (Fig. 7.1).
- The flap is based on the deep inferior epigastric vessels, which originate from the iliac vessels about 1 cm above the inguinal ligament. The vessels transverse superiorly and medially to enter the posterior aspect of the rectus muscle at the plane of the arcuate line.
- The deep inferior epigastric artery gives to multiple cutaneous perforators through the anterior rectus sheath. The periumbilical area (approximately 4 × 4 cm area surrounding the umbilicus) has the highest perforator concentration, so it is essential to include this segment of the muscle and anterior rectus sheath in the flap. The superior and inferior extent of the muscle harvest are variable and should be tailored to the reconstructive needs.
- The rectus sheath envelopes the muscle completely along its anterior surface. Posteriorly, the sheath is incomplete and extends from the xyphoid to the arcuate line, which is located at the midpoint between the umbilicus and the pubis. Caudal to the line, there is no aponeurotic plane behind the rectus, opening the risk of peritoneum injury during the dissection (Fig. 7.2). This is why it is important to close the anterior rectus sheath well following RA flap harvest.

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B. C. Stack Jr. et al. (eds.), *Matrix Head and Neck Reconstruction*, https://doi.org/10.1007/978-3-031-24981-5_7

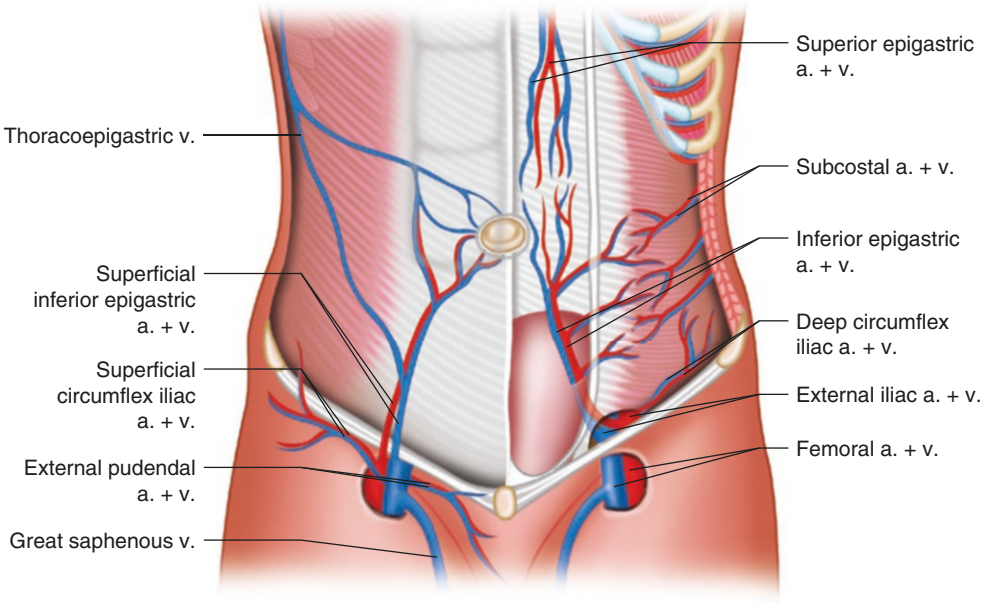

Fig. 7.1 Vascular anatomy of the abdominal wall

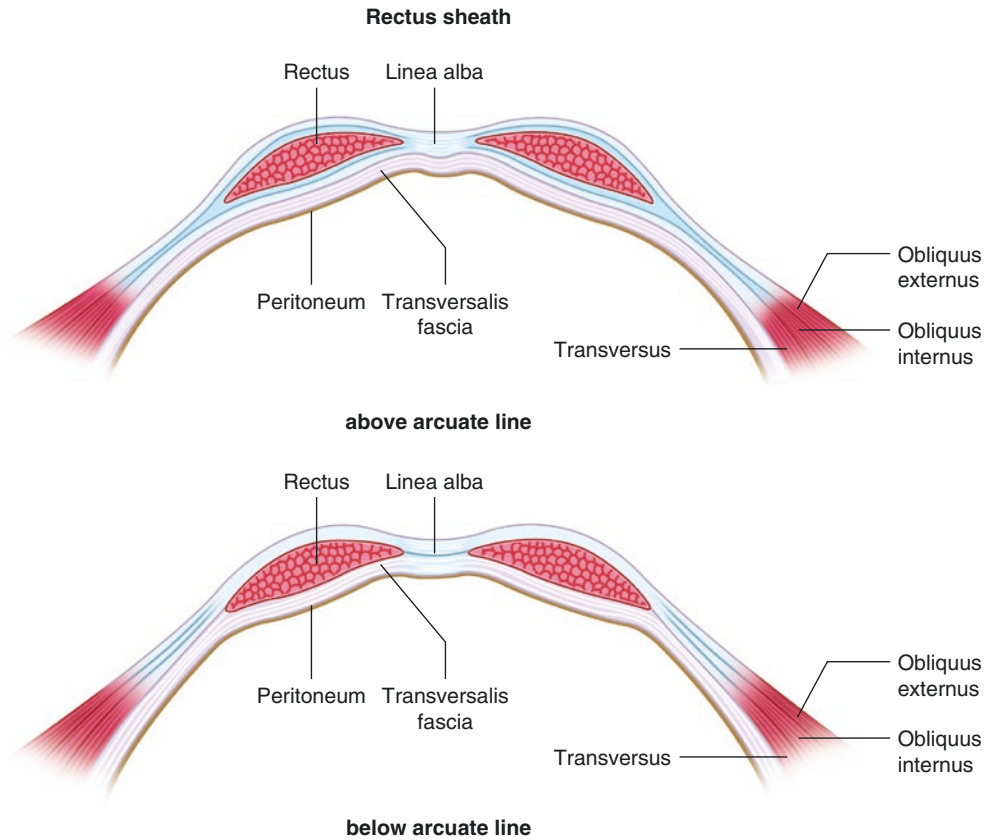

Fig. 7.2 Rectus sheath anatomy above and below the arcuate line

7.2 Technique

The patient is positioned supine on the surgical table. Surface marking include the xiphoid process, abdominal midline, lateral boundary of the rectus muscle, and line between the pubis and anterior superior iliac spine (ASIS) which denotes the location of the inguinal ligament. The approximate location of the vascular pedicle is also marked on the skin with line between the umbilicus and the midpoint of the inguinal ligament (Fig. 7.3).

The vertical (paramedian) skin paddle is designed over the surface area of the rectus muscle. An oblique orientation

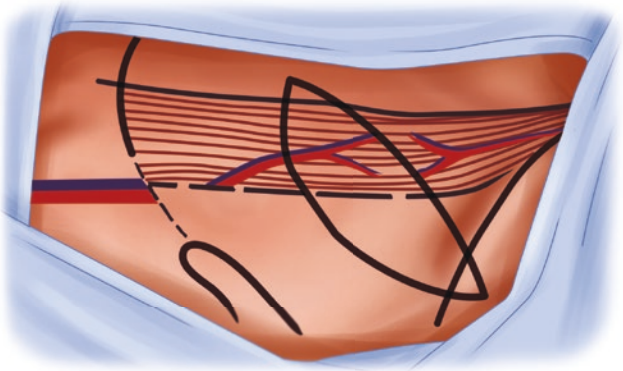

Fig. 7.3 Preoperative design of a rectus abdominis flap with salient adjacent anatomy highlighted. Patient is supine with head to the right

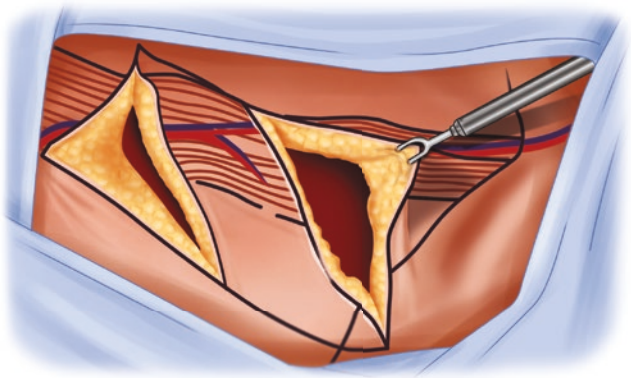

Fig. 7.4 Initial elevation of superior and inferior tissue flaps to expose rectus abdominis (RA) muscle and initiate formation of the flap skin paddle. Patient is supine with head to the right

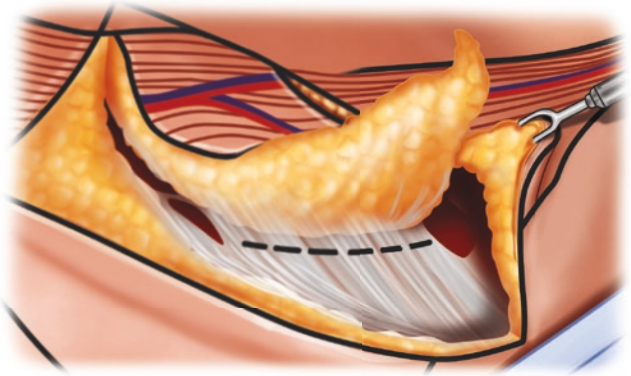

Fig. 7.5 The skin paddle is dissected down to the anterior RA fascia and lateral fascial incision is marked. Patient is supine with head to the right

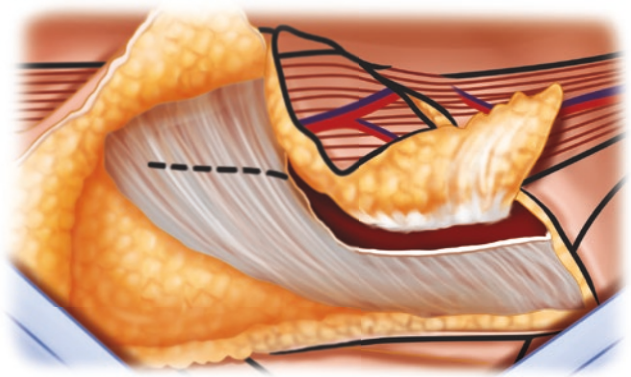

Fig. 7.6 Lateral fascial cut is made and the inferior cut is marked. Patient is supine with head to the right

Fig. 7.7 Flap skin paddle with underlying RA anterior fascia is left attached to the RA muscle in the 4 × 4 cm periumbilical area which contains musculocutaneous perforators. Patient is supine with head to the right

of the skin paddle, offset with the muscular axis, can also be used depending on the reconstructive needs (Fig. 7.3). The skin is incised over the entire perimeter of the skin paddle (Fig. 7.4), and the dissection proceeds through the subcutaneous tissues until the anterior rectus sheath is widely exposed (Figs. 7.5 and 7.6). The sheath is opened along its medial and lateral aspects (linea semilunaris and linea alba, respectively) leaving at least 1 cm of cuff to allow for primary closure of the aponeurosis. Once the sheath has been opened, the rectus muscle is exposed and retracted medially to expose the vascular pedicle in a posterolateral location at the level of the arcuate line (Figs. 7.7 and 7.8). Once the entry point of the pedicle has been established, the muscle and remaining anterior sheath are transected inferiorly in continuity with the skin paddle.

The vascular pedicle traverses superiorly along the posterior aspect of the rectus muscle, the vessels are dissected in an inferior to superior fashion as the muscle is dissected off the posterior sheath. The rectus muscle inscriptions are dense adherences to the sheath, so meticulous dissection is required to prevent pedicle injury while releasing these structures. Once the superior boundary for the dissection has been reached, the muscle is tran-

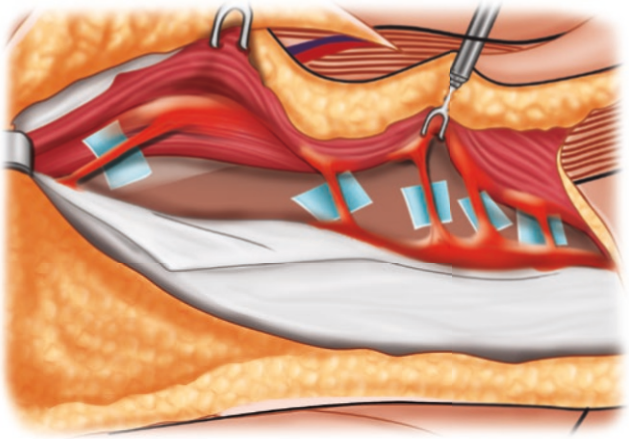

Fig. 7.8 RA is elevated, inferior epigastric pedicle is visualized on the left, the posterior RA fascia is displayed deep, and penetrating nerve fibers to the RA are displayed in the foreground. Patient is supine with head to the right

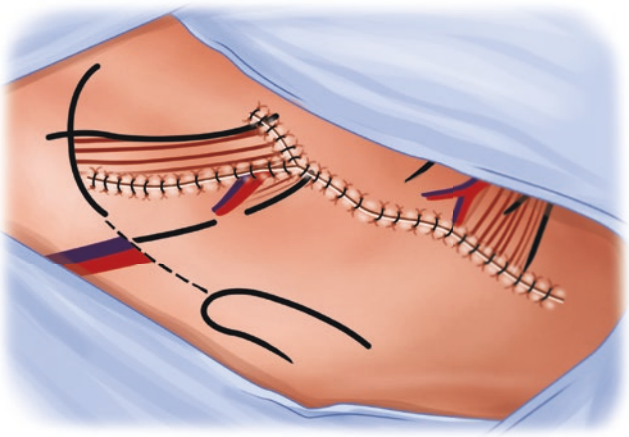

Fig. 7.10 Closure of the abdominal wall subcutaneous tissue and skin. Patient is supine with head to the right

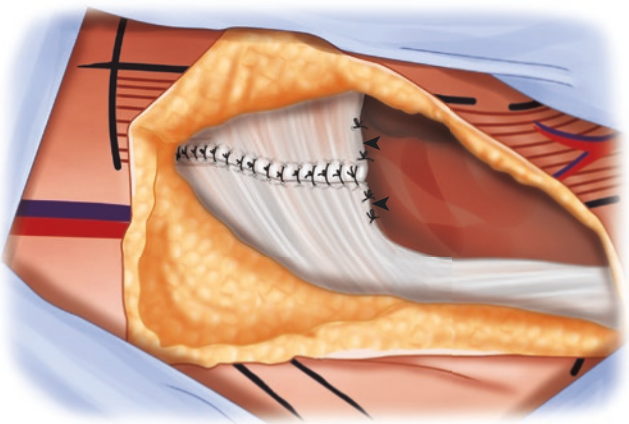

Fig. 7.9 RA flap is removed, anterior rectus fascia is closed up to where periumbilical area was resected for preservation of flap perforators. Patient is supine with head to the right

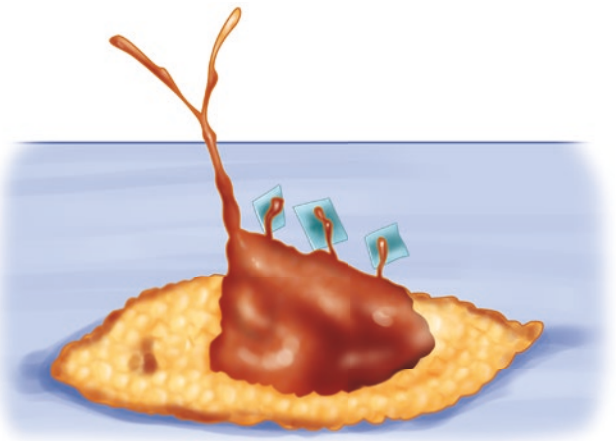

Fig. 7.11 RA-free tissue transfer is inverted to display the vascular pedicle and portion of harvested muscle and fascia. Patient is supine with head to the right

sected. The superior epigastric artery, which constitutes the superior vascular supply of the muscle, is ligated or transected with a harmonic scalpel. Finally, pedicle is dissected proximally, ligating all secondary branches until the point of origin from the iliac vessels is reached. The flap is then harvested and irrigated with heparinized saline.

The donor site closure is then performed. If a cuff of the rectus sheath has been left, primary closure of the aponeurotic planes is almost always feasible. The closure is performed with interrupted non-absorbable suture. A layered polypropylene mesh can be used over the closure line to reduce the risk of hernia. The skin is then closed over a subcutaneous drain (Figs. 7.9 and 7.10). The flap can be separated from the donor site to initiate ischemic time and free tissue transfer (Fig. 7.11).

7.3 Complications

There a several complications specific to the rectus abdominis donor site which warrant mention. Given the obesity of many patients, the subcutaneous tissue has potential for collection of hematomas and seromas. Rigorous hemostasis, judicious drainage, and initial postoperative restrictions in patient activity should be considered.

Ventral wall hernias are also possible following incision and closure of the RA fascia. This underscores the importance of fascial closure. Additionally, limitation of postoperative Valsalva maneuvers through activity restrictions and laxative may be employed. A ventral wall abdominal binder can also be used to reinforce the abdominal fascial closure in the early postoperative period.

Suggested Reading

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