INTRODUCTION

The use of deep inferior epigastric perforator (DIEP) flap, first described for breast reconstruction by Koshima in 1989 and later popularized by Allen and Blondeel in the 1990s, has been shown to decrease morbidity when compared with sacrificing the entire rectus muscle. A major advantage of the DIEP flap is the predictable location and course of its pedicle. The deep inferior epigastric artery and vena comitantes are commonly 9–14 cm in length and 3–5 mm in diameter. Anatomical studies have shown that these vessels course along the fibers of the rectus abdominis muscle or deep into it. Access to the vessels is achieved by splitting the fibers of the rectus abdominis muscle or by retracting the muscle either medially or laterally away from the pedicle’s course. The predictable anatomical location of the perforators and pedicles typically ensures a reliable and straightforward flap dissection. We present 2 patients with an intra-abdominal course of the deep inferior epigastric vessels, resulting in an unexpected challenge during flap harvest but with no significant impact on the final reconstruction outcome.

CASE 1

A 48-year-old woman with left breast cancer and a BRCA1 mutation desired a bilateral immediate DIEP flap reconstruction. Her surgical history included a prior laparoscopic cholecystectomy and 2 cesarean sections. She was otherwise healthy. A computed tomography angiogram (CTA) of the abdomen and pelvis demonstrated seemingly routine anatomy, with the inferior epigastric vessels coursing posterior to the rectus muscle.

The patient was taken to the operating room for bilateral mastectomies and immediate DIEP flap reconstruction on April 12, 2016. Large medial row myocutaneous perforators were identified bilaterally, and these demonstrated excellent perfusion of each hemi-abdomen. These perforators were dissected circumferentially through the rectus abdominis muscle when it became apparent that the medial row pedicle ran intra-abdominally for 10 cm (Fig. 1A). There was complete absence of posterior rectus sheath, and only a clear shiny layer consistent with peritoneum separated the vessels from the small intestine. All tissue planes were pristine, with no scar tissue to suggest that the course of the vessels was postoperative in nature (Fig. 1B). As dissection proceeded proximally, the peritoneum overlying the vessels was harvested with the pedicle due to its ability to adhere to the vessels. During this dissection, the bowel was carefully retracted.

Disclosure: The authors have no financial interest to declare in relation to the content of this article.
The remainder of the bilateral breast reconstruction proceeded as planned. For the abdominal closure, the peritoneum was re-approximated where possible, after which the anterior rectus sheath edges were re-approximated with permanent sutures. An onlay partially absorbable mesh (Ultrapro; Ethicon, Inc., Somerville, N.J.) was used to reinforce the fascial closure to minimize the possibility of evisceration in case of fascial dehiscence. A retrorectus repair was not feasible due to the absence of a posterior sheath, and to avoid complications associated with intra-abdominal mesh placement, an onlay approach was selected. The remaining abdominal closure procedure proceeded as per routine.

Postoperatively, return of bowel function was only slightly delayed (1 additional day inpatient stay), and the patient had no nausea, vomiting, or need for a nasogastric tube. The patient was discharged on postoperative day 5. At 15 months follow-up, she had no evidence of hernia and had no obvious clinical sequelae from her intra-abdominal dissection.

**CASE 2**

A 44-year-old woman with breast cancer who had previously undergone unilateral skin-sparing mastectomy and immediate tissue expander placement due to planned postmastectomy radiotherapy presented for removal of her tissue expander and a delayed unilateral DIEP flap reconstruction on January 10, 2017. Her prior surgical history otherwise included a cesarean section. The pre-operative CTA demonstrated a seemingly normal course of the pedicle. The DIEP flap was dissected in the standard fashion, and medial row perforators that adequately perfused her flap were identified. As the perforators were dissected proximally, they entered the abdomen and ran posterior to her posterior rectus sheath but anterior to her omentum (Fig. 2A). The pedicle was dissected by harvesting a small cuff of posterior rectus sheath with the vessels (Fig. 2B). Below the arcuate line, a strip of full-thickness peritoneum was taken with the pedicle. The unilateral breast reconstruction continued as planned, the abdomen was closed in the standard fashion, and the patient had an uncomplicated recovery.

**DISCUSSION**

To our knowledge, this is the first report of intra-abdominal courses of the deep inferior epigastric artery and vein discovered during a DIEP flap harvest for breast reconstruction. Between August 2012 and August 2017,
Helm et al. • Intra-abdominal DIEP Flap Vessels

the senior author (J.E.S.) performed 181 free flap breast reconstruction cases as either primary or secondary surgeon, which gives rise to an incidence of intra-abdominal vessel location of 1 in 90 patients in our practice. Because of the absence of scar tissue and the pristine appearance of the peritoneum, we believe these vessel locations were present at birth and did not result from a prior abdominal surgery. This anatomical variant did not adversely affect the outcome of the reconstructions but did cause a mild postoperative ileus and has the potential to cause adhesions and bowel injury. The rationale for reporting these cases is (1) to alert surgeons of this potential unforeseen surgical challenge, (2) to report that DIEP flap reconstructions can be performed safely in these cases with utmost care to avoid bowel injury, and (3) to report that preoperative CTA is unlikely to identify this variant preoperatively. Therefore, DIEP flap reconstruction need not be aborted upon discovery of an intra-abdominal pedicle location. The decision can also be made to proceed with a shorter pedicle when appropriate to avoid further intra-abdominal dissection.

Postoperatively, both CTAs were reviewed with our senior cardiovascular radiologist (M.L.S.) on high-resolution monitors to assess whether any distinct radiographic findings were present. In both cases, the CTAs demonstrated the vessels posterior to the rectus muscle; however, the peritoneal reflection was not easily identified as is typical in these scans. Since the peritoneum is thin compared with the vessels, the vessel may appear above or below this structure during image reconstruction. Preoperative CT scanning has been shown to decrease operative time by aiding in planning for the reconstruction, but the reconstructive surgeons should be aware that this variant may still be encountered despite a normal appearing scan.5

Jessica Erdmann-Sager, MD, FACS
Division of Plastic Surgery
Brigham and Women’s Hospital
Harvard Medical School
75 Francis St.
Boston, MA 02115
E-mail: jerdmannsager@bwh.harvard.edu

REFERENCES