

Laparoscopic-assisted deep inferior epigastric artery perforator (DIEP) flap in breast reconstruction

A 51-year-old otherwise well female, with BMI 24, underwent left nipple-sparing mastectomy and targeted axillary dissection with immediate autologous breast reconstruction following neoadjuvant chemotherapy for node-positive invasive lobular carcinoma. There was sufficient abdominal donor-site tissue for unilateral reconstruction and no history of previous abdominal surgery. Preoperative computed tomography angiography (CTA) demonstrated a dominant right infraumbilical perforator with a 4.5 cm intramuscular course (Fig. 1). Informed consent for autologous reconstruction was obtained including a laparoscopic-assisted deep inferior epigastric artery perforator (DIEP) flap harvest. This is the first reported experience in Australia/New Zealand.

The DIEP flap was raised in the standard fashion until the dominant infraumbilical perforator was identified. A 3.5 cm fascial incision was made adjacent to the perforator for dissection of its intramuscular course. The fascial incision was temporarily closed

before the laparoscopic portion of the DIEP flap harvest commenced.

The camera and working port placement were as per standard fashion for a totally extra-peritoneal (TEP) inguinal hernia repair (Fig. 2(a)). After umbilical cut-down to fascia, a 10 mm transverse right infraumbilical fascial incision was made with retraction of the underlying rectus abdominis muscle. Balloon dissection of the pre-peritoneal space of the right hemi-abdominal wall was completed. A balloon camera-port was inserted. Under vision, two midline 5 mm working ports were inserted. A thirty-degree 10 mm scope was utilized. The DIEP vascular pedicle was clearly visualized on the under surface of the rectus abdominis (Fig. 2(b)), and dissection was carried out from caudal to cranial toward the previously dissected perforator. Blunt dissection was performed with Maryland's and round-nosed graspers. Liga-clips were used to control all branches along the course of the pedicle between the

Fig. 1. Axial (left) and sagittal (right) views of the computed tomography angiography showing the intramuscular course (blue circle) of the chosen right sided DIEP perforator.

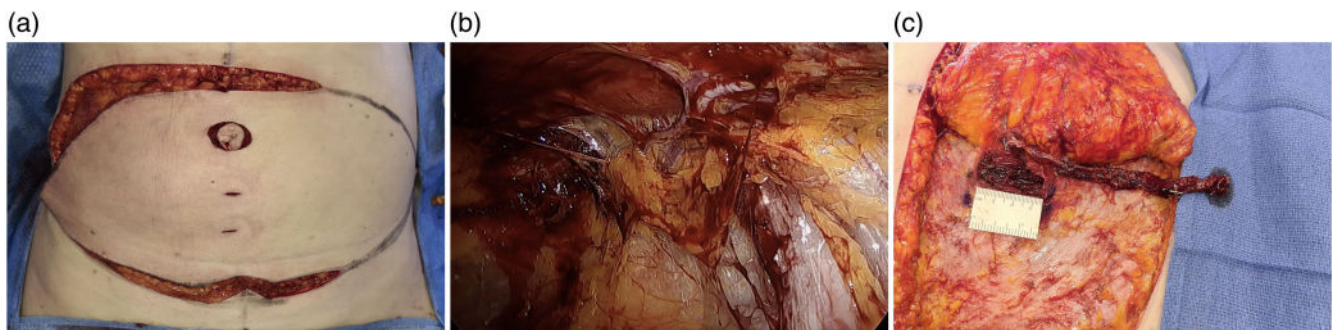
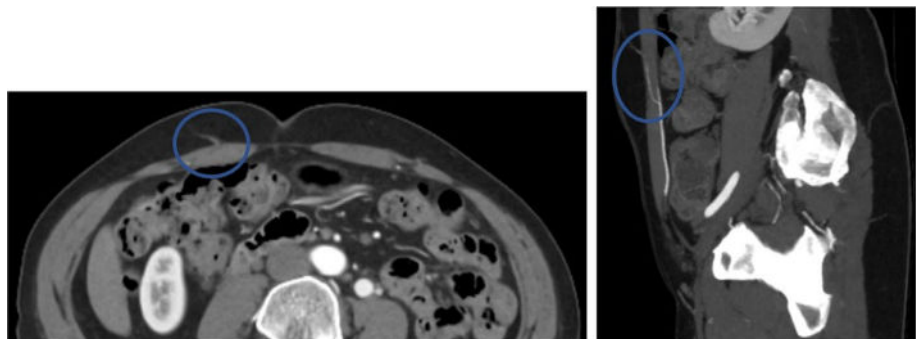


Fig. 2. Laparoscopic-assisted DIEP flap harvest. (a) Abdominal incision for flap harvest including camera and working port placements for laparoscopic-assisted DIEP harvest. (b) Laparoscopic view of the pedicle under the right rectus abdominis muscle. (c) Sheath incision (3.5 cm) for dissection of intramuscular course of perforator with delivery of pedicle after laparoscopic dissection.



Fig. 3. Full measured length of pedicle (15 cm) adjacent to sheath incision.

perforator and pedicle origin. Dissection was continued until the intramuscular course of the perforator was identified. The pedicle was divided at its origin from the external iliac vessels. This concluded the laparoscopic portion of the DIEP flap harvest, and the pedicle was delivered through the 3.5 cm fascial incision (Fig. 2(c)).

The total length of the pedicle delivered through the sheath incision was 15 cm (Fig. 3), with approximately 10.5 cm of pedicle length harvested laparoscopically (Supplementary Information, Video). The microvascular anastomoses were performed in the standard fashion to internal mammary vessels, and standard flap inset, and shaping was performed to complete the reconstruction. The patient was discharged home day 5 postoperatively, and there were no post-operative complications.

Several approaches for laparoscopic-assisted DIEP harvest have been described.¹⁻⁴ We proceeded with the technique described in this report as it is a modification of a procedure familiar to the general surgeon, namely TEP inguinal hernia repair.³ Although the dissection involves a vascular pedicle, the operative territory and instrumentation is familiar. Close intra-operative collaboration between the laparoscopic and plastic surgeon was important in ensuring a successful procedure. This included incision placement and extent of dissection. The reported learning curve includes minor changes to technique and operative time from 90 to 15 min.³ Operative time for our first case was 60 min. Use of a bipolar vessel sealer would reduce operative time. Visualization and dissection of the distal portion of the pedicle may be improved with minor changes in port placements.

The reported advantages of a laparoscopic-assisted approach relate to minimizing the fascial incision length and limiting the open dissection process – potentially reducing the incidence of nerve damage and elevation of the lateral part of the rectus abdominis muscle which may result in a weakened abdominal wall.^{5,6} It is hypothesised that this may translate to improved patient outcomes – quicker recovery, less pain and less donor-site morbidity.³ Current evidence consists of case reports and a retrospective cohort study, but more robust evidence is required.²⁻⁴ Additionally, it is unclear if similar outcomes would be observed with other limited fascial incision techniques.

Limitations to this approach are: increased resource utilization including laparoscopic equipment and need for an experienced laparoscopic surgeon; similar to other minimally invasive techniques, there is a low risk of major vascular injury and conversion to an open procedure. There is a need to carefully select patients with suitable perforator anatomy – proximal perforators with a short intramuscular course are suitable.

Breast reconstructive centres need to evaluate every procedure based on patient outcomes and resources available – equipment, personnel and cost. Laparoscopic-assisted DIEP flap harvest is a novel minimally invasive approach that is no exception to these considerations. This case demonstrates feasibility in our setting, however we will continue to evaluate the technique.

Author contributions

Bishoy Soliman: Conceptualization; writing – review and editing. **Negin Sedaghat:** Conceptualization; writing – original draft; writing – review and editing. **Lawrence Yuen:** Conceptualization; writing – review and editing. **Varun Harish:** Writing – review and editing. **James French:** Conceptualization; writing – review and editing.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Video S1 Video demonstrating the total length of the pedicle (15 cm) being delivered through the limited 3.5 cm sheath incision.

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