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Background

- Robotic-assisted DIEP flap harvest reduces donor-site morbidity by minimizing fascial incision, muscle disruption, and nerve injury.
- Current robotic DIEP criteria typically limit use to perforators with short intramuscular courses (<3.5–4 cm).
- The totally extraperitoneal (TEP) approach avoids intra-abdominal entry, potentially reducing risks such as adhesions and bowel injury.
- TEP remains underutilized due to technical complexity and limited working space within the retro-rectus plane.
- Expanding robotic DIEP criteria beyond strict perforator length thresholds may increase patient eligibility and improve reconstructive outcomes.

Case Description

- 54-year-old female with history of left breast cancer
- Previously underwent bilateral nipple-sparing mastectomies with prepectoral tissue expander placement
- Presented for delayed autologous breast reconstruction
- Planned bilateral DIEP flap reconstruction
- Right abdominal flap: robotic-assisted harvest using TEP approach → left breast
- Left abdominal flap: traditional open harvest → right breast
- Preoperative CTA with 3D modeling performed for perforator mapping (Figure 1)
- Dominant right-sided perforator identified with a long intramuscular course (91.6 mm)

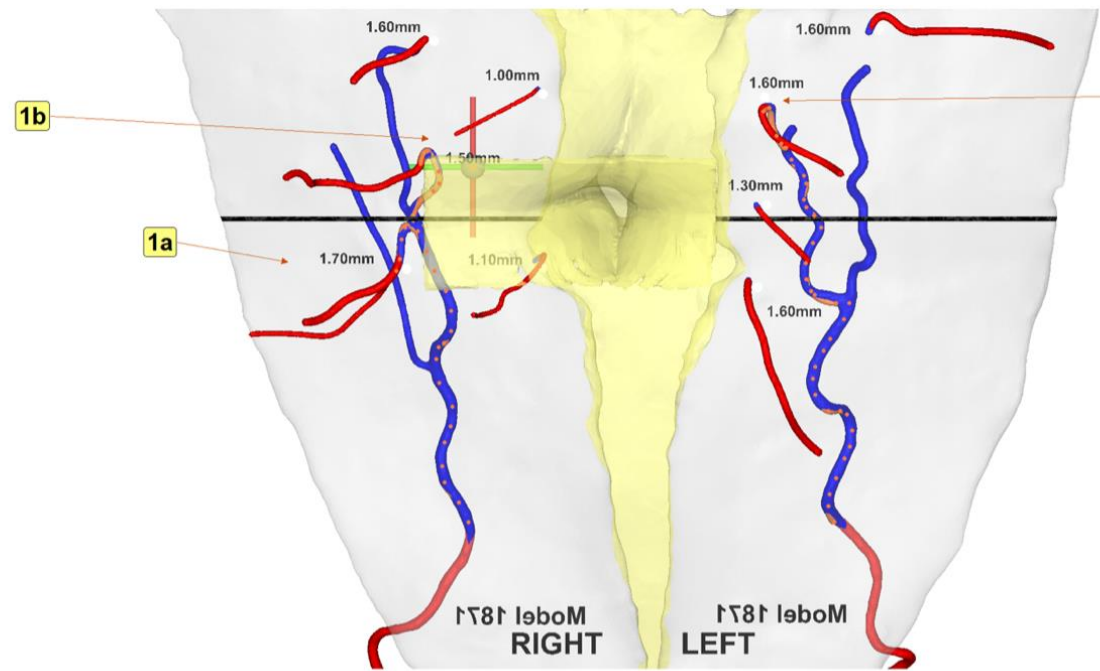


Figure 1: Preoperative CTA and 3D modeling of the vascular pedicle. Dissected perforators were 1a on the left side and 1b on the right side.

Surgical approach

- Robotic-assisted DIEP harvest performed using a multi-port da Vinci Xi system, enabling precise intramuscular dissection within a confined operative field
- Totally extraperitoneal (TEP) plane created laparoscopically, avoiding entry into the peritoneal cavity and reducing intra-abdominal risk
- Hybrid dissection technique utilized: limited 3 cm anterior fascial incision for initial exposure, followed by predominantly robotic intramuscular pedicle dissection
- Achieved 17 cm pedicle length without muscle harvest or mesh, compared to 7 cm fascial incision on contralateral open side

Literature review

- 9 published studies on robotic DIEP identified, majority TAPP approach
- Only 2 studies (n=20) reported use of the TEP approach
- Most studies restrict robotic candidacy to short intramuscular perforators (<3.5–4 cm) to minimize fascial incision length
- Reported fascial incision lengths range from 2.7–4.3 cm, with minimal data on robotic harvest in long intramuscular perforators

Author and Year	Patients (n), Flaps (n)	Age	BMI	Device	Technique	Patient Selection	Fascial Incision (cm)/Pedicle Length (cm)
Shakir et al., 2021	3, 5	53.2± 8.5	29.8± 4.2	da Vinci XI	TAPP Robotic	Robotic: Patient with concurrent intrabdominal surgery	NR
Tsai et al., 2023	13, 15	46 ± 11.0	23.5 ± 3.0	da Vinci XI	TAPP Robotic	No previous pelvic operation IM course <2.5 cm	2.67 +- 1.13 / 9.83 ± 1.58
Daar et al., 2021	4, 7	52.3 ± 6.95	27.4 ± 5.78	da Vinci XI	TAPP Robotic	Single or two closely approximated perforator	2.5 / 11.2
Wittesaele and Vandervoort, 2022	10, 13	53.1 ± 9.35	25.9 ± 9.35 ± 3.57	da Vinci*	TAPP Robotic	Short intramuscular course or Subfascial course	2.97 / NR
Moreira et al., 2024	23, 46	49.3 ± 10.7	29.5 ± 5.1	da Vinci X/XI	TAPP Robotic	NR	4.1 ± 1.4 / 12.82 ± 2.62
Bishop et al., 2020	21, 21	54.6 ± 7.6	30.4 ± 3.9	da Vinci*	TAPP Robotic	One or two closely grouped perforator	3.6 ± 1.6 / 13.3 ± 1
Gundlapalli et al., 2018	1, 1	51	NR	da Vinci*	TAPP Robotic	NR	1.5 / 10
Benjoar et al., 2018	1, 1	45	NR	da Vinci SI	TEP Robotic	NR	4 / NR
Lee et al., 2022	19, 19	48.5 ± 6.6	23.9 ± 3.6	da Vinci SP	TEP Robotic	Single or closely grouped perforators with a short intramuscular course (<5cm)	4.3 / NR
Abbreviations: Length, IM: intramuscular course, TEP: Totally Extraperitoneal, TAPP: Transabdominal preperitoneal, NR: Not Reported *da Vinci XI or SI, not specified							
Table 1: Surgical characteristics of all included studies							



Figure 2 (Left): Intraoperative image following DIEP flap harvest. The right abdominal flap harvested using a robotic-assisted totally extraperitoneal (TEP) approach, resulted in a 3 cm anterior fascial incision. The left abdominal flap harvested via open technique required a 7 cm fascial incision.

Figure 3 (Right): Postoperative result at 7 months following bilateral DIEP flap breast reconstruction.

Discussion

- Robotic DIEP harvest is typically limited to short intramuscular perforators, but this case demonstrates feasibility in long-course anatomy with appropriate planning
- Anatomy-based selection (orientation, depth, accessibility) may be more important than strict length-based criteria
- TEP approach avoids intra-abdominal entry, reducing risks such as adhesions and bowel injury
- Despite a steep learning curve, robotic TEP harvest is achievable with increasing surgeon experience

Conclusion

- Robotic TEP DIEP harvest is feasible and safe in patients with long intramuscular perforators
- Successful dissection can be achieved with minimal fascial incision and preservation of abdominal wall integrity
- This case supports expanding robotic DIEP candidacy beyond traditional length-based criteria
- Broader adoption of TEP techniques and anatomy-driven selection may improve access to minimally invasive breast reconstruction

References

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