

VIDEO SURGERY TECHNIQUES

**HOW TO HARVEST DEEP INFERIOR EPIGASTRIC PERFORATOR
FREE FLAP**

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ABSTRACT

Summary : The Deep Inferior Epigastric Perforator (DIEP) free flap is a microsurgical breast reconstruction technique that uses skin and subcutaneous fat from the lower abdomen while preserving the rectus abdominis muscle. This approach provides a natural breast mound with minimal donor-site morbidity compared to TRAM flaps, reducing risks of muscle weakness and abdominal wall hernia. Advantages include improved postoperative recovery, better abdominal contour, and long-lasting aesthetic results, as the reconstructed breast maintains its volume over time. However, it is technically demanding, requires longer operative time, and carries risks of flap loss or vascular complications if microsurgery fails. The procedure involves dissecting perforator vessels from the deep inferior epigastric system, transferring the tissue to the chest, and connecting vessels under a microscope. Expected outcomes include a soft, natural breast shape with improved patient satisfaction, though surgical expertise and careful patient selection are essential to minimize complications and ensure optimal results.

Keywords: DIEP Free flaps; Breast reconstruction; Perforator dissection; Microsurgery

Ringkasan : Deep Inferior Epigastric Perforator (DIEP) free flap adalah teknik rekonstruksi payudara mikrosurgical yang menggunakan kulit dan jaringan lemak subkutan dari perut bagian bawah tanpa mengorbankan otot rektus abdominis. Pendekatan ini menghasilkan bentuk payudara yang tampak alami dengan morbiditas donor site yang minimal dibandingkan dengan TRAM flap, sehingga mengurangi risiko kelemahan otot dan hernia dinding perut. Keunggulannya meliputi pemulihan pascaoperasi yang lebih cepat, kontur perut yang lebih baik, serta hasil estetika jangka panjang karena payudara hasil rekonstruksi mempertahankan volumenya seiring waktu. Namun, teknik ini menuntut keterampilan tinggi, memerlukan waktu operasi lebih lama, dan memiliki risiko kegagalan flap atau komplikasi vaskular jika tidak berhasil. Prosedur dilakukan dengan membedah pembuluh perforator dari sistem epigastrik inferior profunda, memindahkan jaringan ke area dada, dan menyambungkan pembuluh darah di bawah mikroskop. Hasil yang diharapkan adalah bentuk payudara yang lembut dan alami dengan tingkat kepuasan pasien yang tinggi, meskipun keahlian bedah dan pemilihan pasien yang tepat sangat penting untuk meminimalkan komplikasi dan memastikan hasil optimal.

Kata Kunci: DIEP free flap; Rekonstruksi payudara; Diseksi perforator; Bedah mikro

Conflicts of Interest Statement:

The author(s) listed in this manuscript declare the absence of any conflict of interest on the subject matter or materials discussed.

INTRODUCTION

The Deep Inferior Epigastric Perforator (DIEP) free flap is a microsurgical technique widely regarded as the gold standard for autologous breast reconstruction. It involves transferring skin and subcutaneous fat from the lower abdomen to the chest using the deep inferior epigastric artery and vein while preserving the rectus abdominis muscle. Unlike

the traditional Transverse Rectus Abdominis Myocutaneous (TRAM) flap, which sacrifices muscle and fascia, the DIEP flap spares these structures, thereby reducing donor-site morbidity and maintaining abdominal wall strength.^{1,2}

The primary advantage of the DIEP flap is reduced donor-site morbidity. Because the rectus muscle is preserved, the risk of postoperative

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abdominal wall weakness, bulge, or hernia is significantly lower compared with muscle-sacrificing procedures such as TRAM flaps. Patients typically report less postoperative pain, shorter hospital stays, and faster return to normal activities. Additionally, the procedure provides ample, well-vascularized tissue for natural-looking breast reconstruction and incorporates abdominal contouring benefits similar to abdominoplasty.^{1,3,4,5}

Despite its benefits, the DIEP flap is technically demanding and requires advanced microsurgical expertise. The dissection of perforating vessels is time-consuming and adds complexity to the procedure. Intraoperative decision-making is critical because some patients have small, inconsistent, or unfavorably located perforators, making the harvest more challenging. Furthermore, although the abdominal wall is largely preserved, complications such as fat necrosis, delayed wound healing, seroma, and partial flap loss can still occur.^{1,6}

INDICATION

The DIEP Flap is considered in patients requiring soft-tissue reconstruction where a natural and durable result is desired such as post mastectomy breast reconstruction, correction of congenital breast hypoplasia or amastia, autogenous breast augmentation and chest wall reconstruction, and reconstruction of large area compound defects necessitating soft tissue bulk.¹

CONTRAINDICATION

Absolute contraindications to DIEP flap breast reconstruction encompass patient-related and procedure-specific factors inherent to microvascular free tissue transfer. Prior abdominal surgery that compromises the deep or superficial inferior epigastric vascular system, such as abdominoplasty, or procedures with ligation of the deep inferior epigastric artery/deep inferior epigastric vein (DIEA/DIEV), represents a clear anatomical contraindication.^{1,7} Additionally, systemic conditions such as severe peripheral vascular disease or poor peripheral perfusion—often evidenced by impaired wound healing—also preclude safe flap transfer due to increased risk

of microvascular failure and donor-site morbidity.⁸

PREPARATION

Preparation for DIEP flap surgery begins with meticulous avoidance of factors that compromise surgical outcomes. Patients are strongly advised to avoid smoking for at least 3 months before surgery.¹

At preoperative consultation, detailed history-taking explores prior abdominal surgeries (e.g., laparotomies or hernia repairs), comorbidities such as diabetes or vascular disease, and lifestyle factors including obesity and activity level. These elements influence both donor-site suitability and surgical risk.^{4,9}

Physical examination emphasizes assessment of abdominal wall integrity, evaluation of scars, body mass index, and available tissue volume. This ensures that enough healthy tissue is present for flap harvest and that donor-site morbidity risk is minimized.¹

Supporting examinations such as computed tomographic angiography (CTA) has emerged as the gold standard for perforator mapping. CTA enables surgeons to visualize the size, location, and intramuscular trajectory of perforators with high precision. It has been shown to significantly reduce flap harvest time and total operating room duration by approximately one hour, while also decreasing donor-site complications and enhancing overall outcomes.^{1,10} An alternate to angio-CT, duplex-doppler ultrasound allows the location and diameter of the vessels to be evaluated plus the blood flow and arborization patterns.¹

Some steps of intraoperative preparation begin with documenting the positions of abdominal wall perforators and identifying the dominant ones while coloring the skin surface.⁸ The main arterial and venous branches may be identified with color duplex ultrasonography or multidetector CT (MDCT).⁸ Once confirmed, the flap design will be tailored to the reconstructive requirements. The skin island portion is usually located transversely in the lower abdomen to complement transverse skin abdominoplasty incisions for direct closure.^{8,11}

After flap planning is completed, the abdominal incisions receive infiltration with 1% lidocaine and epinephrine along the superior and inferior borders, preserving the superficial

inferior epigastric veins (SIEV). The umbilicus is released with 3 periumbilical incisions and the flap is mobilized toward the xyphoid process where midline fascia is undermined for 3 to 4 centimeters and laterally to the length of required laxity. Dissection proceeds with the inferior incision where a scalpel incision is deepened with monopolar diathermy up to the SIEV, which is then dissected distally for 3 to 5 centimeters and clipped for anastomosis.¹¹

The flap is elevated laterally in a suprafascial plane using electrocautery with small perforators being controlled, while the dominant perforator is dissected and followed intramuscularly through the rectus abdominis after anterior sheath incision, while intercostal motor nerves are preserved. The deep inferior epigastric artery and vein are then exposed, rectus fibers retracted, side branches clipped, and the pedicle mobilized caudally to the lateral rectus border. Once sufficient length is achieved, the pedicle is divided and the flap is then delivered through the split rectus while muscle and innervation are preserved. Attention is directed to the receiving site marking the inframammary fold slightly above the desired breast position and preparing the internal mammary vessels through a rib sparing incision at the third intercostal space. The flap is rotated 180° and temporarily fixed, then sequentially medial and lateral end-to-end anastomoses are performed. In the case where venous outflow obstruction persists despite patent anastomoses, SIEV drainage, or interposition grafting is performed. The flap is inset without kinking or torsion, fixed as described above, and medial excess tissue is removed. The SIEV is preserved, drains are placed, and the skin is reapproximated with careful attention to detail.¹¹

At the same time, the abdominal donor site is prepared to minimize ischemia time, the anterior rectus sheath is closed to prevent bulging and drains are inserted while local infiltration with ropivacaine is performed, and final closure of the abdominoplasty with transposition of umbilicus is performed.¹¹

SUMMARY

The Deep Inferior Epigastric Perforator (DIEP) free flap is a microsurgical technique widely regarded as the gold standard for

autologous breast reconstruction. Indications and contraindications should be determined before surgery through history taking, physical examinations, and supporting examinations. However, despite its status as the gold standard, the DIEP free flap requires a high level of technical expertise and careful intraoperative planning. Surgeons must continuously refine their skills and remain vigilant to avoid complications, as its success depends on precise perforator dissection, meticulous flap handling, and thorough preoperative evaluation.

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REFERENCES

1. Wei FC, Mardini S, editors. Flaps and Reconstructive Surgery. 2nd ed. Edinburgh / New York: Elsevier (Saunders); 2016.
2. He WY, El Eter L, Yesantharao P, et al. Complications and patient-reported outcomes after TRAM and DIEP flaps: a systematic review and meta-analysis. *Plast Reconstr Surg Glob Open*. 2020
3. Smit JM, Zeebregts CJ, Acosta R, Werker PM. Complications and patient-reported outcomes after TRAM and DIEP flaps: a systematic review and meta-analysis. *Plast Reconstr Surg Glob Open*. 2020.
4. Nelissen SH, Perdieu D, Ackerman K, Niddam J, Stillaert F, Hens G. Bulging after Deep Inferior Epigastric Perforator Flap: New Insights and Suggestions. *Plast Reconstr Surg Glob Open*. 2023
5. Marwah A, Chandrappa AB, Vasudevan S, Rao AYN, Sreekumar D, Shetty P, Bharathkar S, Somashekhar SP. Outcomes of Deep Inferior Epigastric Artery Perforator (DIEP) Flap in Indian Population – A Prospective Single-Institute Study. *Indian J Plast Surg*. 2024
6. Alves AS, Tan V, Scampa M, Kalbermatten DF, Oranges CM. Complications of immediate versus delayed DIEP

- reconstruction: a meta-analysis of comparative studies. *Cancers (Basel)*. 2022;14(17):4272.
7. Murphy BD, et al. Indications and controversies for abdominally-based complete autologous tissue breast reconstruction. *Plast Reconstr Surg*. 2016.
 8. Blondeel PN, Morris SF, Hallock GG, Neligan PC, eds. *Perforator Flaps: Anatomy, Technique, & Clinical Applications*. St. Louis: Quality Medical Publishing; 2013.
 9. Srinivasa G, Alvarez RD, Singh NK, et al. Risks of autologous abdominal free flap breast reconstruction in patients with elevated body mass index. *Plast Reconstr Surg Glob Open*. 2025
 10. Mahajan A, et al. Role of CT angiography in identifying ideal perforators during DIEP flap planning. *Clin Radiol*. 2022
 11. Nahabedian MY. The DIEP Flap: Principles, anatomy, and technique. *Plast Reconstr Surg*. 2002;110(1):88-98