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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI
Surgery/Cerrahi

Breast Reconstruction with Free DIEP Flap: Analysis of the First 14 Cases at an Oncology Branch Hospital

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ABSTRACT

Purpose: The Deep Inferior Epigastric Perforator (DIEP) flap is the gold standard for autologous breast reconstruction due to its aesthetic outcomes and high patient satisfaction. This study evaluates the clinical outcomes and complications of the first 14 DIEP flap reconstructions performed at an oncology hospital.

Methods: Twelve patients (14 reconstructions) who underwent DIEP flap breast reconstruction between 2023 and 2024 were included. Preoperative CT angiography was used to map perforator vessels. Patient demographics, operative details (ischemia time, perforator count, and operative duration), and postoperative outcomes were analyzed. Patients were followed for at least six months.

Results: The mean patient age was 47.17 years. Operative times averaged 5 hours 23 minutes for unilateral and 7 hours 28 minutes for bilateral reconstructions. Two patients experienced venous congestion, successfully managed with superficial inferior epigastric vein (SIEV) anastomosis. Partial flap necrosis occurred in one patient, and fat necrosis was observed in two. Donor site dehiscence occurred in two smokers, one with diabetes mellitus. No total flap loss or vascular re-exploration was required. Four patients underwent corrective surgeries for aesthetic purposes. The complication rates were consistent with the literature.

Conclusion: The DIEP flap is a safe and effective option for breast reconstruction with favorable aesthetic and functional outcomes. While technical expertise is essential, this study demonstrates the feasibility of implementing DIEP flap procedures in oncology centers. Larger studies with extended follow-up are needed to validate these findings and optimize complication management.

Keywords: Deep Inferior Epigastric Artery Perforator Flap, Breast Reconstruction, Autologous Breast Reconstruction, Breast Cancer

ÖZET

Amaç: Derin İnferior Epigastrik Perforatör (DIEP) flebi, estetik sonuçları ve yüksek hasta memnuniyeti nedeniyle otolog meme rekonstrüksiyonu için altın standarttır. Bu çalışma, bir onkoloji hastanesinde gerçekleştirilen ilk 14 DIEP flep rekonstrüksiyonunun klinik sonuçlarını ve komplikasyonlarını değerlendirmeyi amaçlamaktadır.

Yöntemler: 2023-2024 yılları arasında DIEP flep rekonstrüksiyonu yapılan 12 hasta (14 rekonstrüksiyon) çalışmaya dahil edilmiştir. Perforatör damarların haritalanması için ameliyat öncesinde BT anjiyografi kullanılmıştır. Hasta demografik verileri, ameliyat detayları (iskemi süresi, perforatör sayısı ve ameliyat süresi) ve ameliyat sonrası sonuçlar analiz edilmiştir. Hastalar en az altı ay boyunca takip edilmiştir.

Bulgular: Hastaların yaş ortalaması 47,17 idi. Ameliyat süreleri tek taraflı rekonstrüksiyonlar için ortalama 5 saat 23 dakika, çift taraflı rekonstrüksiyonlar için ise 7 saat 28 dakika olarak hesaplandı. Venöz konjesyon gelişen iki hasta, yüzeyel inferior epigastrik ven (SIEV) anastomozu ile başarıyla tedavi edildi. Bir hastada kısmi flep nekrozu, iki hastada yağ nekrozu tespit edildi. Donör bölge dehisansı, biri diyabetik olan iki sigara içicisinde görüldü. Hiçbir hastada total flep kaybı ya da vasküler yeniden girişim gerekmedi. Dört hastada estetik amaçlarla düzeltici cerrahi uygulandı. Komplikasyon oranları literatürle uyumluydu.

Sonuç: DIEP flebi, estetik ve fonksiyonel olarak olumlu sonuçlar sunan güvenli ve etkili bir meme rekonstrüksiyon yöntemi olarak öne çıkmaktadır. Teknik uzmanlık gerektirse de bu çalışma, DIEP flebin onkoloji merkezlerinde uygulanabilir olduğunu göstermektedir. Daha geniş hasta grupları ve uzun takip süreleriyle yapılacak çalışmalar, bu bulguları doğrulamak ve komplikasyon yönetimini optimize etmek için gereklidir.

Anahtar Kelimeler: Derin İnferior Epigastrik Arter Perforatör Flap, Meme Rekonstrüksiyonu, Otolog Meme Rekonstrüksiyonu, Meme Kanseri

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Breast reconstruction has become an integral part of breast cancer treatment. Patients diagnosed with cancer who undergo breast reconstruction are discharged in better psychological and physiological condition (1,2). As a result, following the trends in developed countries, there is an increasing demand for reconstruction in developing nations as well.

Breast reconstruction can be performed using either autologous tissue or prosthetic devices. While prosthetic breast reconstruction offers several advantages, such as ease of application, shorter surgery time, and lower morbidity, it also carries risks of complications related to radiation therapy and the inherent nature of implants (3). Autologous reconstruction, on the other hand, requires technical expertise and experience, and involves longer operative times. However, long-term follow-up studies have shown that autologous reconstruction provides better aesthetic outcomes, higher patient satisfaction, and is more cost-effective compared to prosthetic reconstruction (4,5).

Although there are various options for autologous breast reconstruction, the current gold-standard technique is the use of the free Deep Inferior Epigastric Perforator (DIEP) flap (6,7). The DIEP flap was first described by Koshima in 1989 as a flap that could be harvested from the lower abdomen while preserving the muscle (8). Following the introduction and development of the perforator concept, the DIEP flap became better understood and was popularized by Blondeel and his team for its use in breast reconstruction (9,10,11). Today, while it is employed for covering various wounds, its primary use remains in breast reconstruction (12). With the increasing adoption of the DIEP flap, what was once a reconstruction option available in only a few specialized centers is now being performed in many hospitals.

This study analyzes the first 14 DIEP flap cases performed at an oncology hospital, evaluating patient outcomes and complications, while also providing a real-world reflection of the initiation of a DIEP flap program within an oncology-focused institution—highlighting the early institutional challenges, team-based learning curve, and strategic transitions that shaped the establishment of a sustainable microsurgical breast reconstruction service.

Materials and Methods

Patients who underwent breast reconstruction with free DIEP flaps in our clinic between 2023 and 2024 were included in the study. Patients who did not attend regular follow-up appointments after discharge and those who could not be followed up for at least 12 months postoperatively were excluded from the study.

Demographic data of the patients, the reason for mastectomy, and the timing of reconstruction were recorded. Additionally, the number of perforators used in the flaps, ischemia time, and overall operation time were evaluated. Postoperative complications were documented and analyzed within a cause-effect relationship framework.

All reconstructive surgeries were performed by a single surgeon.

Surgical Technique:

Preoperatively, it is crucial to assess the adequacy of abdominal fat tissue, as this directly affects breast volume.

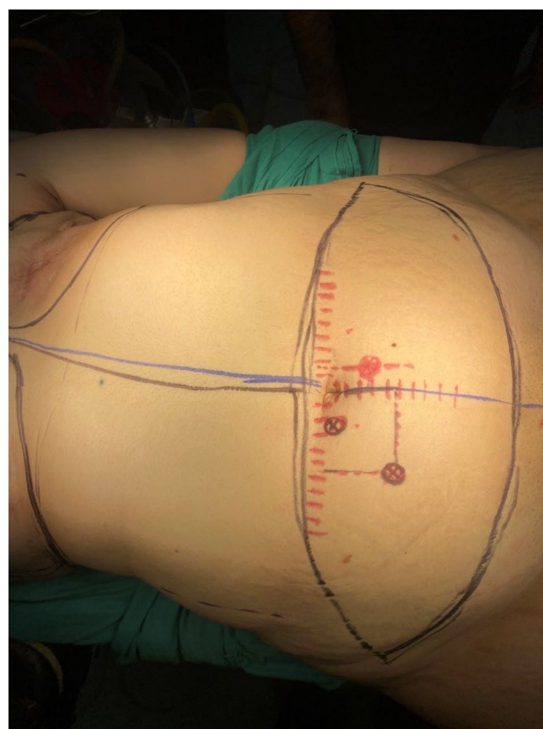


Figure 1. The appearance just before the operation shows the DIEP flap drawn between the umbilicus and the groin line. The previously identified perforators have also been marked.

If the volume is insufficient, alternative options should be considered. Following this, a CT-angiographic scan is used to map the deep inferior epigastric artery and vein (DIEA and DIEV) perforators and to identify the dominant perforators. Based on the location of these perforators, the lower abdomen from the umbilicus to the groin is designed elliptically for the flap **(Figure 1)**. Each half of the flap is used for the reconstruction of a single breast.

The patient is positioned supine for the surgery. Due to the prolonged duration of the operation and the extended period of postoperative immobility, applying pneumatic compression to the lower extremities is effective in preventing deep vein thrombosis.

The patient is draped in a manner that leaves both the breast and abdominal regions exposed. For immediate reconstruction, the recipient site is prepared directly. In delayed reconstruction, after elevating the mastectomy skin flaps, the pectoral muscle is incised at the level of the 3rd rib, for exposing the rib. The sternum end of the rib is then excised to access the internal mammary artery and vein (IMA, IMV), and the recipient vessels become prepared.

Once the recipient vessels are ready, they are covered with moist gauze, and preparation of the flap begins. The abdominal skin is elevated above the fascia, preserving the previously identified perforators. At the points where the perforators penetrate the fascia to the skin, the fascia is incised, and perforator dissection begins. After a short intramuscular course, the perforators are followed to the DIEA and DIEV, and the vessels are dissected free, tracking them to their origins from the iliac system **(Video 1).**

In all cases, the superficial inferior epigastric vein (SIEV) was dissected and preserved as a precaution. Intraoperatively, if venous congestion was observed, the SIEV was anastomosed to the internal mammary vein to facilitate drainage. Although this was required rarely, routine preservation of the SIEV is a part of our operative protocol

After the flap is fully prepared with the vessels, its arterial and venous sufficiency is monitored for approximately 20 minutes. If the flap circulation is adequate, the pedicles are ligated and cut to transferred to the breast pocket, where it is anastomosed to the IMA and IMV. Once the anastomosis is complete, the flap is shaped to resemble a breast, and the reconstruction is finalized by suturing the subcutaneous tissue and skin. Due to the high risk of hematoma, placing a drain is recommended.

If the contralateral DIEP flap is not being used for the abdominal region, it is excised, and the abdomen is closed using a standard abdominoplasty technique **(Figure 2)**.

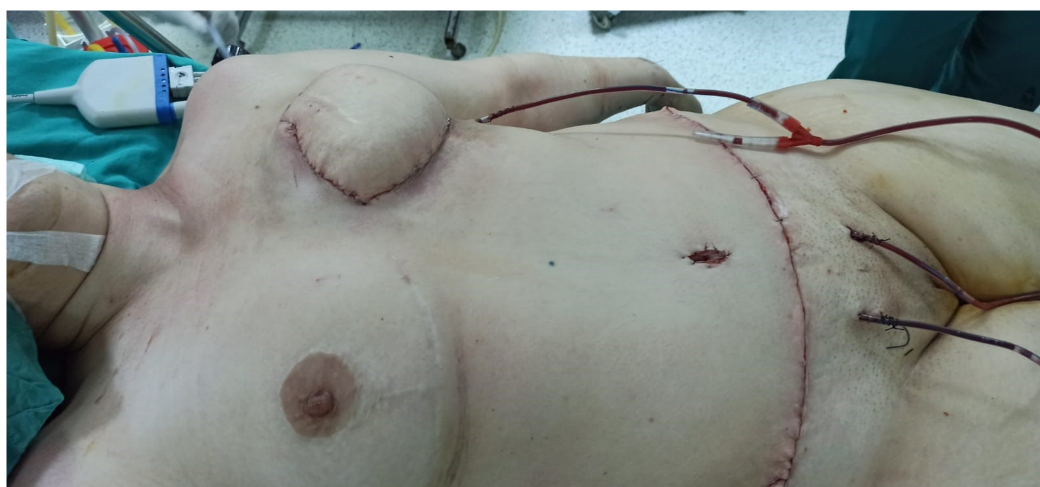


Figure 2. Immediately after the flap transfer was performed, the donor site was closed in a manner similar to the abdominoplasty technique.

Postoperatively, patients were managed with prophylactic doses of enoxaparin and 100 mg of acetylsalicylic acid once daily. Oral intake was initiated after the first passage of gas or stool. Patients without complications during hourly flap monitoring were discharged on the seventh postoperative day **(Figure 3)**.

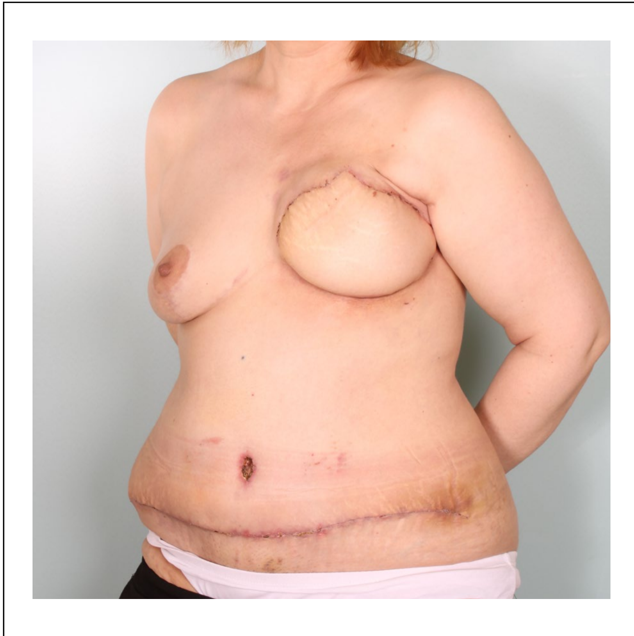


Figure 3. 47-year-old female patient, 1 week after late-stage flap reconstruction, at the time of discharge.

Results

A total of 12 patients with a mean age of 47.17 years (range: 34–57) were included in the study. Among these patients, 3 underwent left breast reconstruction, 7 underwent right breast reconstruction, and 2 patients received bilateral reconstruction. The average weight of the patients was 69.38 kilograms (range: 51–89). Two patients had concomitant Type 2 diabetes mellitus, and three were smokers, while no additional comorbidities were observed in the remaining patients.

In patients who underwent bilateral reconstruction, the mastectomies of one side was prophylactic, whereas in all other patients, the mastectomy was due to carcinoma. One patient had previously undergone an unsuccessful prosthetic reconstruction attempt, and two patients, despite having undergone expansion with an expander, opted for autologous reconstruction instead of prosthesis replacement. All other patients underwent their first reconstruction attempt.

Regarding the number of perforators in the prepared flaps, 5 flaps had two perforators, and 9 flaps had one perforator each. The average ischemia time for the flaps was 47.8 minutes (range: 43–59). The average operative time was 5 hours and 23 minutes for unilateral repairs and 7 hours and 28 minutes for bilateral repairs.

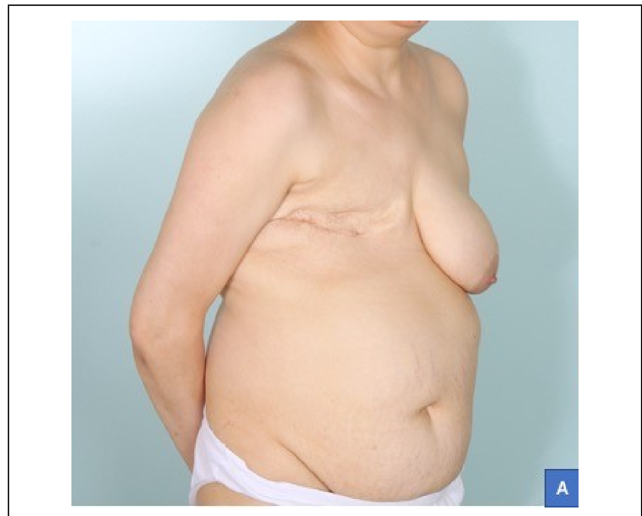
In one patient, venous congestion developed just after pedicle dissection, leading to the decision that the DIEV was insufficient. An anastomosis was made between the previously preserved superficial inferior epigastric vein (SIEV) and the IMV. Postoperative follow-up of this patient showed no deterioration in flap perfusion or venous return.

None of the patients required vascular re-exploration or experienced total necrosis. One patient developed necrosis in a 3x6 cm^2 area at the distal end of the flap; this patient underwent debridement in the first week, and the necrotic area was cleaned and covered again with flap advancement. Two patients showed firmness in the flap due to fat necrosis at the 3-month postoperative follow-up.

In patients who underwent immediate reconstruction, one patient developed a hematoma in the lateral region during the first postoperative week. This patient was treated with serial percutaneous drainages. No seroma or infection was observed in any of the patients.

Dehiscence of the donor site occurred in two patients, both of whom were smokers and one of whom also had diabetes mellitus. These patients were followed up with wound care, and after the wound was deemed suitable, primary closure was performed.

In the late postoperative period, three patients underwent contralateral breast lifting to correct asymmetry. One of the patients who had bilateral reconstruction also received unilateral skin resection to correct breast asymmetry. Nipple reconstruction was performed at the 6-month postoperative mark in four patients **(Figure 4).**



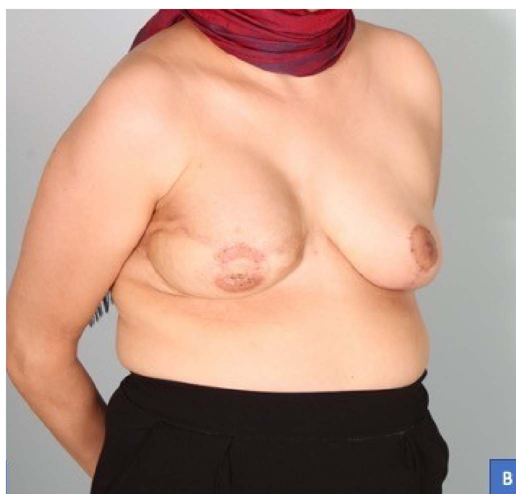


Figure 4. 43-year-old female. A-) Before breast reconstruction. B-) Patient underwent nipple reconstruction in the 6th month following breast reconstruction with a DIEP flap.

Discussion

Our study aimed to examine the clinical outcomes and complications of the first 14 DIEP flap cases performed at an oncology center that had not previously used free flap for breast reconstruction and receives over 500 breast cancer cases annually. This case series, which includes the practices of a single surgeon, makes a significant contribution to the literature by demonstrating that complex reconstructions can be successfully performed by a single surgeon when the necessary conditions are met.

The identification of perforator vessels using CT angiography before surgery provided comfort and safety during the operation. Furthermore, the absence of complications such as the inability to locate or damage the perforator vessels is a result of this pre-evaluation. The literature indicates that CT angiography has become the standard imaging technique used before DIEP surgeries (13). Identifying the location of perforator vessels preoperatively should be recommended as a necessary pre-assessment.

The decision by two of our patients to pursue autologous reconstruction, even after initiating tissue expansion processes, along with another patient choosing autologous reconstruction following the failure of a prosthetic reconstruction, highlights a growing preference for autologous reconstruction among patients in developing countries. This trend suggests that patients are increasingly valuing the benefits and outcomes associated with autologous reconstruction over other methods. Based on this information, it can be anticipated that the number of autologous reconstructions will increase in the future.

While high body weight in our patients might initially seem to increase the risk of complications, excessive abdominal fat can actually be advantageous in DIEP flap breast reconstruction by providing a larger breast volume. Additionally, larger perforator vessel diameters in more adipose abdomens facilitate flap dissection (14).

One patient developed intraoperative venous congestion, which was attributed to DIEP vein insufficiency. As a solution, the venous anastomosis was performed with the SIEV already present in the flap, thus ensuring the venous return of the flap. The dominant venous system in DIEP flap can be the superficial system, and in such cases, anastomosis with SIEV is required (15). Therefore, it is important to include SIEV in the flap preparation and to preserve it for potential use in cases of congestion.

Fat necrosis developed in two patients (%14.29) in the chronic period, which is consistent with the literature (15). In such cases, if the patient has complaints, surgical removal of fat necrosis and, if necessary, additional fat grafting to provide volume would be appropriate. No additional intervention was performed in our case series as there were no patient requests.

In one of the immediate breast reconstructions, a hematoma occurred but was managed with drainage without threatening the flap. It is known that hematoma complications are more common in immediate reconstructions (16,17). Therefore, surgeons are advised to be more careful.

Dehiscence of the donor site in two smokers may be related to the negative effects of smoking on microvascular circulation. Additionally, one of these patients with diabetes mellitus might have aggravated this situation. Therefore, it is essential to ensure that patients completely cease smoking before this operation.

Postoperative corrective surgeries were performed in four patients for aesthetic reasons. Reduction mammoplasty, mastopexy, lipofilling, liposuction, and reshaping are commonly applied after DIEP flap procedures (18). These

options should be kept in mind for better aesthetic results in the late postoperative period.

Our study demonstrates the applicability and successful outcomes of the DIEP flap technique in oncology centers. However, the study has some limitations. First, the limited number of cases and short follow-up period may restrict the generalizability of the findings. Additionally, larger datasets on complication management and long-term outcomes are needed. Future studies with larger patient groups and extended follow-ups can validate these findings and improve the effectiveness of techniques.

In conclusion, the first 14 DIEP flap breast reconstruction cases performed in our clinic show that this technique is a safe and effective option with positive aesthetic and functional results for patients. The data obtained supports the widespread adoption of DIEP flap applications and encourages more centers to embrace this technique. However, ongoing improvements in technical challenges and complication management could enhance future success rates.

Declarations

Funding

There is no funding

Conflicts of interest/Competing interests

None of the authors has a conflict of interest

Ethics approval

This study was approved by the Ethics Committee of Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital (Approval No. 2024-11/184).

Availability of data and material

Data is available

Authors' contributions

M.S.K.: Conceptualization, study design, data collection, supervision

C.O.: Surgical procedures, and critical revision of the manuscript.

B.D.: Data interpretation, and literature review.

M.F.S.: Preparation of figures, data verification, and manuscript editing.

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