The Outpatient DIEP: Safety and Viability following a Modified Recovery Protocol

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Background: Breast reconstruction with autologous tissue is considered the current state-of-the-art choice following mastectomies, and the deep inferior epigastric perforator (DIEP) flap is often among the favored techniques. Commonly referred to patients as a combination between a tummy tuck and a breast augmentation, it significantly differs by the required expertise and long hospital stays. We present a series attesting to the feasibility and effectiveness of performing this type of reconstruction in an outpatient setting following our recovery protocol.

Methods: Patients undergoing DIEP flap breast reconstruction followed a recovery protocol that included intraoperative local anesthesia, microfascial incision technique for DIEP harvest, double venous system drainage technique, rib and chest muscle preservation, and prophylactic anticoagulation agents.

Results: Fourteen patients totaling 27 flaps underwent breast reconstruction following our protocol. All patients were discharged within the initial 23 hours, and no take-backs, partial, or total flap failures were recorded. A case of abdominal incision breakdown was seen in 1 patient during a postoperative visit, without evidence of frank infection. No further complications were observed in the 12-week average observation period.

Conclusion: With the proper use of a microfascial incision, complemented by rib sparing and appropriate use of injectable anesthetics, routine breast reconstructions with the DIEP flap can be safely performed in an outpatient setting with discharge in the 23-hour window. *(Plast Reconstr Surg Glob Open 2018;6:e1898; doi: 10.1097/GOX.0000000000001898; Published online 14 September 2018.)*

INTRODUCTION

Breast reconstruction has become the standard of care and an integral step in the successful treatment of breast cancer, and autologous reconstruction with the deep inferior epigastric perforator (DIEP) flap remaining one of the favored techniques.[1] Patients are often explained that this procedure is analogous to a tummy tuck, or abdominoplasty, combined with a breast augmentation, making it a very attractive option. Although the DIEP flap is well-known for its reduced donor-site morbidity when compared with other autologous techniques, many patients require long hospital stays, resulting in increased total costs.[2–5]

Abdominoplasties and breast augmentations are often performed in an outpatient setting, which diverge from microsurgical breast reconstructions such as the DIEP flap, commonly performed as an inpatient with an extended length of stay. Reasons for extended hospitalization periods include the meticulous and wide-spread operative dissection and the required monitoring of the flap.

We present a case series of 14 consecutive patients that have undergone breast reconstruction with the DIEP flap following our recovery protocol, aimed at consistently perform autologous tissue-based breast reconstructions as an efficient and safe outpatient procedure.

MATERIALS AND METHODS

Patients undergoing autologous tissue-based breast reconstruction with the DIEP flap from November 2017 to March 2018 were included in a database for retrospective analysis. All procedures were performed by the senior author. A modified recovery protocol was implemented in all cases, designed at improving postoperative pain management and early mobilization.

Multimodal Pain Control

Before the dissection of the abdominal perforator flap, all patients underwent multilevel intercostal and transverse abdominis plane blocks with a combination of standard bupivacaine hydrochloride and liposomal bupivacaine variant (Exparel). We used this combination before incision to stimulate immediate plus prolonged anesthesia, which both reduces intraoperative anesthetic requirements and reduces the associated postoperative pain. The blend typically includes 20 cc of liposomal bupivacaine (Exparel) diluted in 60 cc of 0.25% bupivacaine. Intraoperatively, 18 cc are placed in each hemiabdomen and 4 cc in each intercostal space from the third through sixth space, and 3 cc at each of the 3 drain sites in bilateral cases. In unilateral cases, the bupivacaine is changed to 0.5% and the solution is injected on the operative side alone. For both areas, a 20-gauge needle, blunted with 3 taps on a malleable to allow proprioceptive feedback when passing through fascial layers, is used to precisely inject the agents into the plane between the internal oblique and tranversalis fascia, and the internal intercostal and parietal pleura or innermost intercostals, for the abdomen and chest sites, respectively. We find that this technique is the key to safe and effective injection in the correct plane for routinely efficacious blocks.

Postoperatively, patients are given a multimodal oral regime including Ibuprofen 600 mg every 6 hours along with proton pump inhibitor daily, acetaminophen/hydrocodone (Norco) 10/325 mg every 6 hours, diazepam (Valium) 5 mg every 6 hours. Hydromorphone (Dilaudid) 0.2 mg intravenous (IV) every 2 hours is given during the first evening in-house if necessary for breakthrough pain, but is discontinued the next day prior discharge.

Microfascial Incision

The entire length of the pedicle to the iliac vessels is dissected through a limited incision with dimensions averaging 2 centimeters (Fig. 1). If 1 perforator is used, the incision is typically between 1.2 and 2 centimeters, and if multiple perforators are taken, the incision is limited to the distance between the perforators, always aiming and prioritizing avoiding damage during dissection over minimizing fascial incision length. Variability in incision length used with each flap dissection is overall a function of the perforator anatomy and number chosen. In patients with previous abdominal surgeries, computerized angiography can be used to assess the caliber and condition of the abdominal perforators. However, we rarely obtain preoperative imaging and use it in less than 5% of cases.

Preservation of the Rib

When accessing the internal mammary (IM) system, no portions of the rib are excised (Fig. 2). By sparing the rib, the respiratory effort in the postoperative patient is eased, minimizing pain, opioid use, and promoting early ambulation.[6]

Anticoagulation Regimen

In the past, we have noticed instances of late vascular compromise in a small percentage of our postoperative
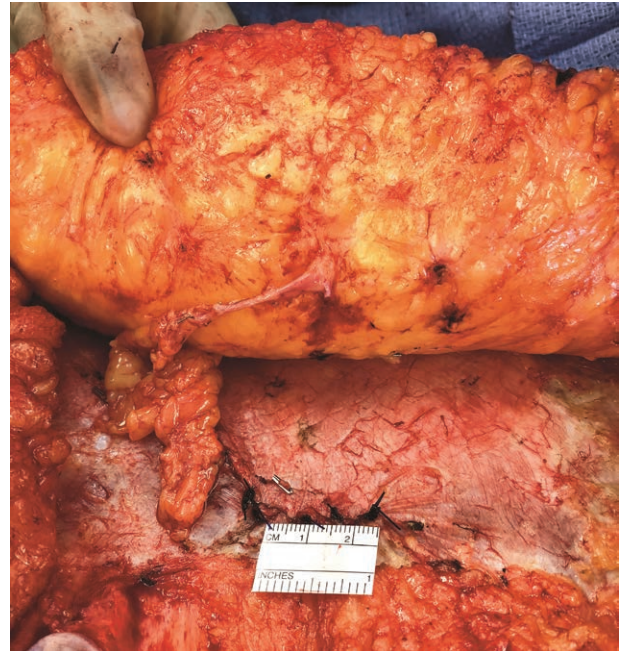

Fig. 1. Microfascial incisions are often kept around 2 cm if the number of perforators and the safety of the pedicle allows it. An incision of approximately 2.5 cm is shown.
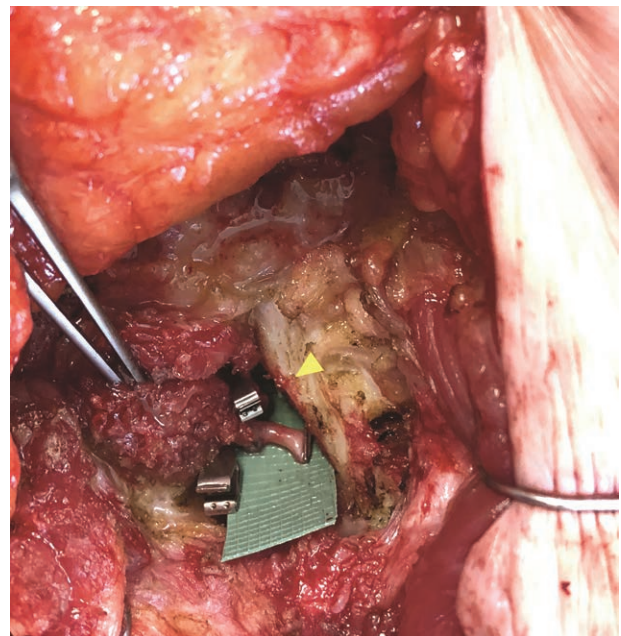

Fig. 2. The anastomosis of the flap pedicle to the IM vessels is performed without disruption of the rib (marked with an arrowhead), minimizing postoperative pain.

patients, typically beyond the third postoperative day, similar to instances seen by Nelson et al.,[7] albeit without total flap loss. Following this, we began to place all patients in postoperative rivaroxaban (Xarelto) for 9 days on a daily 20 mg dose, which we find convenient as the oral administration simplifies patients' compliance, and has shown similar efficacy and safety than traditional subcutaneous

enoxaparin (Lovenox).[8] Additionally, patients receive 1,500 units of IV heparin before incision and also receive 30 mg of enoxaparin subcutaneously in the evening after surgery, for both DVT and anastomotic thrombosis prophylaxis.

Double Venous Drainage System

This technique was previously published by the senior author[9] and has become a standard of care in our practice ever since. The addition of the secondary superficial epigastric venous drainage system to DIEP flaps, anastomosed to either an IM perforating vein at the parasternal border or within the medial mastectomy flap or a second IM vena comitans, has shown a significant decrease in the rate of postoperative take-backs secondary to vascular complications when compared with flaps with single venous drainage systems.[10–14]

RESULTS

A total of 14 consecutive patients, totaling 27 flaps, underwent autologous tissue-based breast reconstruction with DIEP flaps following our outpatient recovery protocol. Mean age for the series was 52.1 years ± 9 (range, 36–69 years). Mean body mass index was 25.3 kg/m^2 ± 3.9 (range, 19–33 kg/m^2). Thirteen patients underwent bilateral reconstruction and 1 unilateral. A total of 6 patients had a delayed approach (totaling 11 flaps, 5 bilateral, and 1 unilateral); 5 of these patients underwent prereconstruction neoadjuvant radiation and/or chemotherapy, and none underwent postreconstruction adjuvant therapy. Twelve patients had a diagnosis of unilateral breast cancer, and 2 patients underwent prophylactic mastectomies due to positive genetic testing. American Society of Anesthesiologists surgical risk score was 2 for all patients. No intraoperative complications were observed. The mean length for the microfascial incisions was 2.4 ± 0.8 cm (range, 1.2–3.8 cm). Similarly, the mean number of perforators per flap was 2 (range, 1–5). Mean time for immediate bilateral cases was 503 ± 71 minutes (range, 422–584 minutes), and 474 ± 52 minutes (range, 446–582 minutes) for delayed bilateral cases, while the delayed unilateral case was 270 minutes. Ischemia times averaged 37 ± 9 minutes per flap (range, 25–54 minutes), with as estimated blood loss for all patients of less than 200 cc. All patients were discharged within the initial 23 hours, and no take-backs, partial or total flap failures, or instances of clinically palpable fat necrosis were recorded. Average follow-up for the series was 12 ± 3.8 weeks (range, 5–17 weeks). One case of minor abdominal incision breakdown requiring conservative wound care was seen in 1 patient during a postoperative visit, without signs of infection. No further complications were observed.

DISCUSSION

The DIEP flap is an excellent choice for breast reconstruction. As previously mentioned, it is often described to patients as analogous to a tummy tuck combined with a breast augmentation. In our experience, abdominoplasties combined with submuscular breast augmentations with or without mastopexy are performed as an outpatient. Following this analogy, we believe and have shown that DIEP flaps can safely and effectively be performed in the outpatient setting.

The main factors that contribute to the extended hospitalizations, and consequently the center points of our discussion, are postoperative pain control and required monitoring of the flap.

The pain associated with standard abdominoplasties, regardless if suction lipectomy is performed, is in our experience mostly a consequence of the complete midline diastasis and subsequent corset-like plication repair that is required,[15] whereas diastasis correction during DIEP flap reconstructions is even more limited in its nature in our practice. We routinely perform diastasis repair for superior aesthetic outcomes, however, less aggressively than in a purely cosmetic case.

Considering this, we believe that the postoperative pain experienced by patients following breast reconstruction with the DIEP flap should be comparable, if not lesser, to that experienced with most abdominoplasties, even in the absence of dissections with microfascial incisions. Hence, if the dissection of the flap pedicle is performed with a microfascial incision, not only are we able to decrease the already minimal abdominal morbidity associated to the DIEP flap, but we can improve its postoperative course. The trauma to the patient's abdominal fascia is minimal and, in many cases, comparable with the size of the abdominal fascia incisions required for blunt or single-incision laparoscopic trocars, usually in the 10–12 mm range.[16] By performing a limited incision followed by precise repair of the fascia in conjunction with short- and long-acting local injectable anesthetics employed for transverse abdominis plane and intercostal nerve blocks, these patients present with minimal overall morbidity and pain, leading to immediate ambulation, decreased narcotic requirements, and following a lower incidence of stereotypical narcotic side effects. By decreasing the length of hospitalization, the total cost of care to the patient, the insurer, and the health system overall can be greatly reduced, serving to somewhat mitigate the higher initial cost associated with autologous tissue reconstruction.[2–5]

In the field of breast reconstruction, many patients undergoing submuscular tissue expansion or direct implant reconstruction are consistently able to be discharged within the next postoperative day. Patients who undergo prepectoral placement of implants have less pain and are often discharged in the same day. In the case of our DIEP flap, the tissue is placed in the less painful supra-pectoral location without additional pectoralis dissection, thus minimizing postoperative chest pain. The contouring and shaping of the flap is no more invasive or pain-inducing than the suturing of a dermal matrix, as seen in prepectoral implants, therefore should not significantly increase morbidity. Moreover, access to the IM vessels can be more painful if the rib is removed; however, if the rib, periosteum and perichondrium, is spared, then the patients do not have any sig-

nificant intervention other than the division of the small area of the pectoralis muscle in an L-shaped design as described by Antony et al.,[17] and dissection of the intercostal muscles off of the inferior rib. The resulting pain is adequately controlled with local anesthetic protocol we have presented and, in our experience, does not increase morbidity, pain, or hinder early ambulation. Anecdotally, we found at first surprising, but now commonplace, for patients to state that the most uncomfortable thing the morning after surgery are the abdominal and breast drains.

Monitoring the flap's vascularity is without a doubt one of the main challenges to the outpatient DIEP; identifying and distinguishing between arterial and venous potential problems is a critical step when troubleshooting a failing flap, as their causes and proper management differs. Thrombogenic events, vasospasm, and technical errors with the microvascular anastomosis are the principle factors leading to arterial insufficiency and flap compromise.[18,19] Nonetheless, venous insufficiency in DIEP and other perforator flaps is well known to be the most common cause of flap take-backs and partial or total failure.[11,12,14,20] As previously mentioned, the double venous system drainage, which is routinely performed in all our patients, has shown its effectiveness in decreasing the incidence of venous thrombosis-related complications.[9]

Flap failure and take-backs secondary to arterial insufficiency typically occur within the first 12 hours, with the majority of those ensuing within the initial 6 hours as opposed to venous complications, which present with more time variability.[20] In our experience, with the routine use of anticoagulants, any delayed propensity for clot formation will be reduced, allowing for improved overall outcomes. We also feel that routine use of venous couplers versus microsurgical venous anastomoses, not only minimizes intraoperative time, but more importantly serves to keep the thinner less muscular walled veins stented open at the anastomotic site and ensure the highly thrombogenic subintimal vessel edges are everted away from the intimal anastomotic interface. Furthermore, though anecdotal, issues discovered after 23 hours are unlikely to be completely salvageable. Even in the event that a failing flap is salvaged, we feel and have found in our experience that there is a critical amount of ischemia and reperfusion injury resulting in significant fat necrosis and unacceptable aesthetic and functional results, thus raising the question of the value of delayed flap salvage past the 23-hour window.[21] It is due to this fact that we believe routine monitoring is not necessary after 23 hours.

We do recognize that this technique is not for everyone. Likewise, performing the minimal incision technique can be extremely challenging and should be performed by surgeons with significant flap experience in our opinion. We emphasize that the use of longer fascial incisions is better than the risk of injury to the pedicle, potentially resulting in flap thrombosis and failure, and recommend that this technique should be performed in a gradual manner, decreasing the fascial incision length until a dimension that accomplishes both the safety of the pedicle while minimizing the injury to the abdominal wall is achieved.

CONCLUSIONS

In our experience, with the proper use of a microfascial incision, complemented by rib sparing and appropriate use of injected anesthetics, routine breast reconstructions with the DIEP flap can be safely performed in a 23-hour observation setting.

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