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Case Report
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Abdominal Surgeries Prior DIEP Flap Breast Reconstruction - Case Report

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Abstract

Deep Inferior Epigastric Artery Perforator (DIEP) flap technique has gained prominence in autologous breast reconstruction procedures. Preoperative imaging, particularly contrast-enhanced Computed Tomography Angiography (CTA), has emerged as the gold standard for comprehending the flap's intricate anatomy. Meanwhile, femoral hernias, constituting 4% of groin hernias, frequently yield discomfort and pain. Surgical approaches to rectify these hernias encompass the Cooper ligament method, preperitoneal technique, and laparoscopic intervention. Successful repair necessitates meticulous sac dissection, defect closure, and potential mesh integration, with laparoscopy gaining favor for bilateral groin hernia correction.

Contraindications for DIEP flap encompasses factors such as previous abdominoplasty, inadequate flap blood supply, severe obesity, uncontrolled diabetes, and debilitating cardiovascular conditions. Relative contraindications involve smoking and patient motivation. Notably, bilateral inguinal or femoral hernia repair with mesh remains non-contraindicated and is undocumented in the literature.

We present a case study of a 64-year-old female with cardiovascular comorbidities undergoing unilateral breast reconstruction after mastectomy. Notably, she had previously undergone laparoscopic bilateral femoral hernia repair with mesh. While preoperative CTA indicated patent blood vessels, the intraoperative exploration of the DIEP flap revealed mesh fragments adhered to vasculature, rendering vessel separation arduous. Surgical choices included terminating the autologous procedure or proceeding with compromised vessel separation.

The procedure continued with the flap elevated alongside mesh-attached vessels, followed by meticulous anastomosis. To prevent mesh-related complications, fragments were secured to the chest wall, mitigating the risk of rupture near the anastomotic sites. Despite the unfavorable odds, the patient achieved successful recovery with flap integrity.

In conclusion, our case underscores the challenges posed by mesh remnants in autologous breast reconstruction using the DIEP flap technique. It demonstrates the surgical adaptability required to navigate unexpected complexities, ensuring successful outcomes in the face of challenging conditions. Further research is warranted to enhance understanding and address unforeseen challenges in autologous breast reconstruction procedures.

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Introduction

The abdomen has remained the preferred donor site for autologous breast reconstruction since the advent of transverse rectus abdominis flaps in the early 1980s [1-3]. However, patients seeking autologous breast reconstruction often present with a history of prior abdominal surgeries, which can pose a significant challenge to the successful execution of reconstruction from an abdominal donor site. Notably, previous research by Parrett et al. has demonstrated the feasibility of performing the Deep Inferior Epigastric Perforator (DIEP) flap in patients with a history of abdominal surgery [3,4]. Nahabedian et al. introduced a classification system for these "muscle-sparing" flaps, categorizing the degree of muscle preservation [5]. These muscle-sparing techniques have gained popularity, with the DIEP flap emerging as a preferred choice for many patients.

However, the utilization of pedicled and free abdominal flaps in individuals with multiple preexisting abdominal scars raises numerous potential challenges. Firstly, the vascularity of the flap, either in part or in entirety, may be unreliable in these patients, discouraging its use as the primary reconstructive option [6-8]. Additionally, concerns arise regarding the surgical disruption of the abdominal wall integrity, which can lead to issues such as weakness, laxity, bulges, or even frank

herniation.

Moreover, prior abdominal operations can further complicate the successful execution of abdominally based flaps by potentially affecting perforator vessels and promoting the formation of scar tissue, thereby increasing the difficulty of flap elevation. While Parrett et al. conducted the only cohort study to date, revealing no significant differences in flap complications among patients with a history of prior abdominal operations, who underwent DIEP flap surgery but observed a higher incidence of donor-site complications [4], no study has yet explored the impact of prior abdominal surgery on the blood vessels intended for anastomosis following the transfer of the abdominal flap to the chest.

Hence, the primary objective of this paper is to present a case study that adds valuable insights to a field with limited scientific literature. Our investigation seeks to shed light on the consequences of prior abdominal surgeries on the blood vessels crucial for anastomosis following the transfer of an abdominal flap to the chest.

Case Presentation

Our patient, a 64-year-old female with a history of cardiovascular comorbidities, presented for unilateral breast reconstruction following a mastectomy. Notably, seven years prior, she had undergone laparoscopic bilateral femoral hernia repair with a prolene mesh. Preoperative imaging, including a computed tomography angiogram (CTA, Figure 1), indicated patent blood vessels.

However, during the intraoperative elevation of the Deep Inferior Epigastric Perforator (DIEP) flap, unexpected complications emerged. Mesh fragments were unexpectedly discovered adhered to the vasculature, presenting a substantial challenge in separating the vessels (Figure 2A, 2B). Faced with this dilemma, the surgical team had to make critical decisions. The available options included either terminating the autologous procedure or proceeding with compromised vessel separation. Initially, the Superficial Inferior Epigastric Artery (SIEA) and Superficial Inferior Epigastric Vein (SIEV) were identified but were deemed too short and of insufficient diameter for use. A collective decision was made to cautiously continue with the DIEA separation, while simultaneously retaining mesh fragments that could not be safely separated, all in conjunction with the flap.

The procedure persevered, with the flap successfully elevated alongside the mesh-attached vessels, followed by meticulous anastomosis. To mitigate the risk of mesh-related complications, the remaining fragments of mesh were securely anchored to the chest wall, thereby reducing the chances of rupture near the anastomotic sites. Despite the daunting circumstances and unfavorable odds, the patient achieved a successful recovery with the flap's integrity fully preserved.

Subsequent to the surgery, a postoperative VR model of the patient's preoperative CTA was obtained (Figure 3), revealing the presence of mesh in the inguinal canal. This new data could have significantly informed the reconstructive decision-making process preoperatively.

This intricate surgical journey, characterized by the navigation of unforeseen complications stemming from prior procedures, serves as a testament to the adaptability of the surgical team, ensuring the patient's well-being and the ultimate success of the reconstructive endeavor.

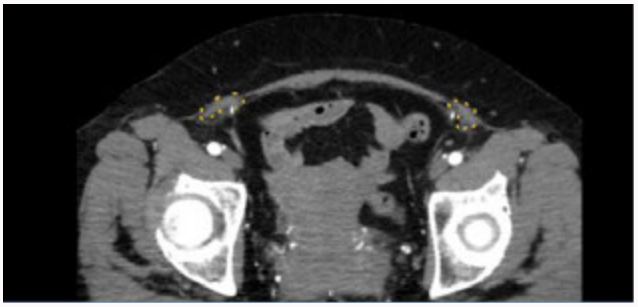

Figure 1: Patient's CTA. Dashed yellow line is marking the prolene mesh. The hyperdense vessels bilateral which are seen right at their entrance point to the mesh are deep inferior epigastric arteries.

Figure 2: Intraoperative images. The DIEA pedicle with attached prolene mesh particles, marked dashed green line. A) Pedicle is positioned upright B) The pedicle turned.

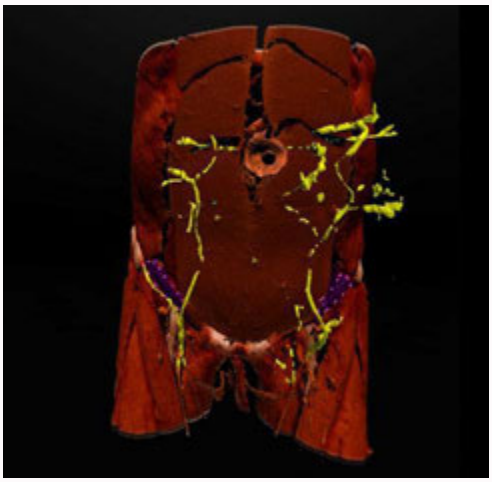

Figure 3: Post-op virtual reality 3D model based on patient's CTA prior to the procedure. Purple colored mesh encircled by pink dashed is marking the prolene mesh exact position.

Discussion

In 1983, Hartrampf and Bennet demonstrated that TRAM flap breast reconstruction could be safely performed with outstanding aesthetic outcomes and acceptable morbidity in a carefully selected patient population. However, patient selection criteria excluded individuals who were heavy smokers, obese, had major medical

issues, or had prior abdominal surgeries that interfered with the blood supply to the proposed flap [3]. These contraindications were subsequently applied to DIEP flap breast reconstruction procedures [9]. As of the present date, a history of past groin hernia repair using mesh is not considered a contraindication.

A comprehensive literature review revealed several studies that reported an increased incidence of donor-site complications following breast reconstruction with abdominal flaps in patients with a history of previous abdominal operations [10-13]. Furthermore, numerous studies have investigated the impact of prior abdominal surgeries on the suitability of DIEP flaps for breast reconstruction, examining the influence of various surgical scars on flap viability. Most of these studies have indicated that a history of abdominal procedures, including multiple surgeries, should not be considered contraindications [4,8,14,15].

However, only a limited number of studies have specifically addressed the challenges associated with harvesting flaps in patients with prior abdominal operations. In our case, we encountered a unique scenario in which the bilateral Deep Inferior Epigastric (DIE) arteries were intimately attached to a prolene mesh, rendering them inseparable by dissection. A similar case has been reported in the scientific literature by Mulvey et al., who described the inaccessibility of DIE perforator flaps following laparoscopic hernia repair. In their case, as they dissected the perforators toward the DIE vessels, they discovered that the preperitoneal Parietex composite mesh (Covidien, Dublin, Ireland) used for hernia repair had become incorporated into the posterior rectus sheath, tethering the deep inferior epigastric vessels to the mesh. After attempting to release the vessels using sharp dissection, they concluded that the blood vessels were inaccessible, precluding the use of the DIEP flap. Consequently, they opted for a Superficial Inferior Epigastric Artery (SIEA) based flap on the right side and a single-perforator DIEP flap on the left side. Both flaps achieved successful outcomes [16].

In our case, we faced a critical decision point concerning whether to proceed with our original plan. We were particularly concerned about two main factors: Firstly, the risk of inadvertently damaging the Deep Inferior Epigastric Artery (DIEA) while attempting to separate it from the mesh, and secondly, the viability of anastomosing to an artery covered by a sharp foreign body. Despite recognizing these significant risks and lacking established protocols or similar cases in the literature at the time of the operation, we chose to proceed with the original plan. In our two-month post-operative follow-up, we observed the flap's survival without complications. At this stage, we are less concerned about ischemic complications, as we assume collateral vessels have likely developed. Therefore, we regard previous laparoscopic femoral or inguinal hernia repair with preperitoneal mesh as a relative contraindication to DIEP flap reconstruction, underscoring the importance of careful consideration and surgical expertise in such cases.

Conclusion

In this case, we encountered a unique challenge related to a previous intervention near the DIE artery, which immediately prompted questions regarding the feasibility and safety of proceeding with our original surgical plan. Our experience underscores the importance of considering a history of groin hernia repair involving mesh as a relative contraindication. Therefore, it is essential to establish a tailored patient selection protocol for cases with such a history.

The utilization of a preoperative Virtual Reality (VR) model would have provided us with valuable insights, significantly enhancing our spatial understanding of the involved vessels and identifying potential external devices that might impede flap viability. In retrospect, had we obtained a VR model before the operation, it is highly likely that our surgical plan would have been adjusted accordingly. This underscores the potential transformative impact of incorporating VR technology in preoperative planning, particularly in complex cases involving vascular structures and prior interventions.

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