Refractory Donor-Site Seroma Following DIEP Breast Reconstruction

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Abstract
Donor-site seroma formation is a complication of autologous breast reconstruction reported most commonly with the use of latissimus dorsi flaps. First-line treatment is percutaneous aspiration which leads to resolution in the majority of cases. Those that persist may progress to a chronic, refractory seroma, which can prove challenging in terms of treatment. The aim of this article is to provide an updated literature review of interventions for chronic donor-site seroma and present the case of a 65-year-old female with a recalcitrant abdominal seroma following deep inferior epigastric perforator (DIEP) flap breast reconstruction. Literature review revealed a single article that reported 2 cases of persistent donor-site seroma after DIEP flap breast reconstruction. The patient presented here underwent repeat aspiration, drain placement, and multiple surgical procedures to achieve resolution. In total, the post-reconstruction seroma history of the patient extended over approximately 14 months. We conclude with evidence-based suggestions for chronic, donor-site seroma prevention and treatment.

Keywords
breast reconstruction, DIEP, postoperative complication, seroma

Introduction
In the United States, more than 100 000 breast reconstructions are performed each year, with autologous techniques representing 20% of these procedures.¹ Deep inferior epigastric perforator (DIEP) flap reconstruction has increased in popularity² owing to acceptable cosmetic results with less post-operative pain, shorter recovery time, and low donor-site morbidity.³⁻⁸ Donor-site seroma formation is a relatively rare post-operative complication reported in an estimated 2.7% to 3.7% of DIEP flap breast reconstructions.³⁻⁴⁻⁹ By comparison, donor-site seroma formation is estimated to occur in 8% of transverse rectus abdominis (TRAM) flap breast reconstructions,³ and in 21% to 79% of latissimus dorsi flap reconstructions.⁰ Seroma is a localized accumulation of serous fluid that develops in a dead space created by surgical intervention. A multifactorial mechanism of seroma formation has been proposed that includes lymphatic leakage in response to subclinical bacterial infection and/or local inflammation; recurrent trauma due to shearing forces and micro-motion; and idiopathic reasons secondary to reconstructive surgery after malignancy.¹¹⁻¹³ Others note that the trauma of elevating and cauterizing a flap results in major disruption of lymphatics that predisposes to seroma formation.⁹⁻¹⁴⁻¹⁵ Identified risk factors include obesity, use of electrocautery, dissection deep to Scarpa’s fascia, and excessive post-operative surgical site motion.¹⁶⁻¹⁸ However, the exact pathophysiology underlying the development of seroma is unknown, which confounds prevention and management strategies. Percutaneous aspiration is the first-line treatment. Seromas refractory to aspiration pose a challenge to surgeons, given a lack of consensus regarding seroma formation.¹⁹ Currently, there are few reports of persistent DIEP donor-site seroma to guide surgical decision-making. Here, we present the case of a 65-year-old woman

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who underwent delayed breast reconstruction with a DIEP flap and developed a donor-site seroma refractory to percutaneous aspiration. We present an updated literature review on the prevention and management of seroma.

Case Presentation

A 65-year-old female with a history of ductal carcinoma in situ of the right-side breast underwent mastectomy in 2011. Post-operatively, her course was complicated by chronic seroma of the mastectomy site that required serial aspiration. This seroma resolved after ~14 weeks.

In April 2016, she underwent unilateral, autologous breast reconstruction using a DIEP flap. Both left and right lower abdominal flaps were raised, and the left deep inferior epigastric vessels were dissected. During closure of the abdomen and rectus fascia incision, a midline plication was also performed using 0 Nurolon (Ethicon, Belgium) and was reinforced with a running 0 Nurolon suture as the fascia was noted to be very weak. Two 7-mm suction drains were placed and brought out through the skin by lateral incisions. Scarpa’s fascia was closed with interrupted 2-0 Vicryl (Ethicon, Belgium) sutures. Skin was closed with interrupted 3-0 Monocryl (Ethicon, Belgium) sutures at the dermis and running 3-0 Monocryl at the subcuticular layer. The patient tolerated the procedure well, and there were no immediate complications.

Two-weeks after surgery, the right-side abdominal drain was producing approximately 100 mL serous fluid per day, and a fluctuant mass was noted in the region of the left-side groin. Abdominal ultrasound was repeated and demonstrated 3 fluid collections measuring 5.3 × 8.5 × 2 cm³, 5.5 × 0.8 × 2.3 cm³, and 6.5 × 1.2 × 7.2 cm³, located in the epigastrium, midline, and left lower quadrant, respectively. The patient was taken back to the operating room 8 months after her DIEP flap reconstruction. A sinus tract was identified, de-roofed, and debrided with a curette. A large fragment of Nurolon suture was found that traced up the umbilicus to the end of the sinus tract. This suture was completely removed. The wound was irrigated with iodine and saline and closed. The patient was again given antibiotic therapy (amoxicillin/clavulan 875/125 BID), which she took for 3 weeks before being cleared by infectious disease.

The patient progressively improved over the next 3 months and resumed her usual activities. Follow-up ultrasound in April 2017 revealed a small collection measuring 1.9 × 1.5 × 2.5 cm³, which was not symptomatic. The patient was discharged from regular follow-up approximately 14 months after her DIEP reconstruction.

Discussion

Seroma is an unfortunate complication of breast reconstruction, carrying with it the risk of infection, need for additional surgery, and reduced quality of life. Literature review revealed a single case report describing 2 patients with persistent donor-site seromas after DIEP breast reconstruction.17 These seromas corrected after surgical excision of the capsule and drain insertion. In our case, multiple washouts were undertaken without symptom relief. Ultimately, the dead space created by surgical intervention needs to be closed for seroma to resolve. Several studies have investigated ways to achieve this, including the use of sclerosants, fibrin sealant, quilting sutures, and drains.

Sclerotherapy by instillation of tetrac, or pro-inflammatory substances like erythromycin, has been explored.18,20,21 In a case series, 4 patients with persistent seroma (one superior gluteal artery perforator flap donor-site; 3 inguinal lymphadenectomy sites) were treated with 1 to 2 g erythromycin administered directly into the seroma cavity.21 In each case, the authors reported cessation, or significant reduction, in seroma fluid accumulation. Despite evidence of benefit in the treatment of seroma, pro-inflammatory substances are associated
with a significant increase in seroma formation when administered prophylactically.18 In contrast, available literature supports the use of talc both prophylactically and in the treatment of seroma.20,22

Butler23 examined the use of fibrin sealant in patients who developed refractory seroma after autologous breast reconstruction (latissimus dorsi muscle and TRAM flaps). Here, seroma was considered refractory if it persisted more than 6 weeks postoperatively with serial aspiration and/or drain insertion. All 4 patients treated with percutaneous fibrin instillation experienced complete resolution of their seroma after a single dose. Similarly, a randomized controlled trial comparing quilting sutures plus fibrin to quilting sutures alone for primary donor-site closure in latissimus dorsi breast reconstruction found that the addition of fibrin significantly reduced seroma formation.24 A recent systematic review identified a protective effect of fibrin instillation during initial closure but noted that the quality of evidence is low and cited several studies that do not support the use of fibrin.18

Bercial et al25 compared the use of fibrin sealant, quilting sutures, or drains during primary closure in 43 female abdominoplasty patients. Patients were prospectively randomized to receive either a suction drain, quilting sutures, or fibrin sealant. The authors determined that as a single intervention, quilting sutures were most effective in preventing seroma formation. A retrospective observational study examining the use of quilting sutures in primary closure of the mastectomy site in breast cancer patients arrived at a similar conclusion.26 Here, closure with quilting sutures alone was compared to suction drains in 119 consecutive mastectomies. Quilting sutures were associated with a significant reduction in the percentage of symptomatic seromas and shorter length of hospital stay.

Use of drains to reduce dead space is perhaps the best studied seroma intervention.18,26 Placement of suction drains during closure has been shown to be effective in reducing seroma formation, although the quality of available evidence is low.18,22 Smaller studies have examined the utility of specific drain modifications, including timing of drain removal27-29 and strength of vacuum drain suction.30,32 Aggregate data support volume-controlled timing of drain removal (output less than 20-50 cc/d) and the use of high-intensity (500-750 mm Hg) vacuum drains.18 As an intervention for refractory donor-site seroma, Jagadeesan et al10 described the case of a 65F with a 3-year history of seroma and infections following breast reconstruction with a latissimus dorsi flap. Authors successfully treated this seroma using a vacuum drain with digitated foam insert customized to the seroma cavity contours.

In the case presented here, several of the strategies described above were employed without symptom resolution. Based on the chronology of events, it seems that identification of a sinus tract, and removal of a braided, non-absorbable suture therein, provided definitive treatment. Evidence from the literature supports this conclusion. In a systematic review of optimal fascial closure materials, Ceydeli et al33 found that non-absorbable sutures were associated with higher rates of suture sinus formation. These findings were echoed in a recent meta-analysis by Henriksen et al.34 In addition, use of braided sutures for abdominal fascial closure has been associated with higher rates of infection than monofilament sutures.33,35 It is hypothesized that capillary forces between fibres in braided sutures pick up bacteria, then allow them to evade phagocytosis by immune cells.35 As previously stated, no clear pathophysiology for seroma formation has been identified, but subclinical infection and/or inflammation has been proposed as a potential etiology. Given our patient’s recurrent symptomatic infections, it is possible that a braided, non-absorbable suture provided a durable nidus of infection, resulting in recalcitrant seroma.

In conclusion, we present a rare case of persistent donor-site seroma following DIEP flap breast reconstruction. Given that removal of a braided, non-absorbable suture was followed by symptom resolution in our patient, this suture is the most likely cause of her recalcitrant seroma. A review of literature specific to chronic, donor-site seroma revealed evidence in support of talc sclerotherapy, fibrin sealant, quilting sutures, and the use of suction drains as methods of seroma prevention and management. However, the quality of available evidence is low.18,36 Further studies are warranted to determine the pathophysiology of seroma formation and to determine optimal prevention strategies and treatment interventions.

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Statement of Human and Animal Rights
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Statement of Informed Consent
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