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Running barbed suture quilting reduces abdominal drainage in perforator-based breast reconstruction

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KEYWORDS

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Summary Prolonged abdominal drainage after perforator-based breast reconstruction is a common problem that can result in seroma formation, patient morbidity, and increased duration of hospital stay. Abdominal quilting with progressive tension sutures has been effective in reducing abdominal drainage in abdominoplasty patients prompting a change of practice in our unit. We studied consecutive unilateral mastectomy patients undergoing breast reconstruction with a deep inferior epigastric artery perforator (DIEP) flap. The initial 27 patients underwent breast reconstruction without any form of abdominal flap plication. The subsequent 26 patients underwent an identical DIEP flap raise procedure after which the abdominal flap was progressively tensioned using a running barbed suture quilting technique. All patients had closed suction drains inserted bilaterally until daily drain output was <40 ml in 2 consecutive days. Primary outcome measures were total volume of abdominal drainage and length of hospital stay. Independent statistical analyses were performed using Welch's *t*-test. There were no demographic differences between the two groups. A statistically significant decrease in the mean total abdominal drainage was found after quilting (238 ml vs. 528 ml; $p = 0.0005$). Patients in the quilting group also showed a reduction in mean duration of

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hospital stay. Quilting of the abdominal flap helps to reduce abdominal drainage not only in abdominoplasty patients but also in patients undergoing breast reconstruction with DIEP flap. Crown Copyright © 2015 Published by Elsevier Ltd on behalf of British Association of Plastic, Reconstructive and Aesthetic Surgeons. All rights reserved.

Introduction

In 1994, Allen described the deep inferior epigastric perforator (DIEP) flap¹ as a muscle-sparing alternative to the already-popularized transverse rectus abdominus myocutaneous (TRAM) flap. Since its inception, there have been several improvements to the technical approach to DIEP flaps.^{2,3} The ability to preserve the rectus abdominis muscle in the DIEP flap has reduced donor-site morbidity compared to TRAM flaps, and thus the DIEP flap is now considered the preferred autologous breast reconstruction technique.^{4,5} However, seroma formation in the donor site remains a common postoperative complication with the incidence ranging from <1% to 14.6%.^{6,7} Our practice is to leave indwelling abdominal drains in situ until daily drain output is <40 ml on 2 consecutive days, and therefore we had no incidence of seroma in our series. The outcome measures which we sought to investigate were absolute volume of abdominal drainage and number of days until drain removal.

The mechanism of abdominal fluid collection after DIEP flap harvest is not yet completely understood. Fluid accumulates inside the dead space created by the undermined abdominal flap. This fluid has been shown to contain proteases and cytokines suggesting that seroma formation is at least partly an inflammatory process, rather than simply a passive serosanguineous event.^{8,9} It has also been suggested that friction between the tissue interfaces contributes to this inflammatory response leading to exudate production.¹⁰ The postoperative abdominal tissues are perpetually subjected to movement by respiration and mobilization, and thus are easily subjected to shearing forces.¹¹

The lymphatic network is responsible for interstitial fluid drainage and after disruption of vascular and lymphatic vessels, which occurs in DIEP, TRAM and abdominoplasty procedures, this network is disrupted.¹⁰

To reduce seroma formation in abdominoplasties,^{2–17} TRAM,^{10,18} and DIEP⁹ procedures, it has been recommended that quilting sutures be placed between the subcutaneous tissues of the flap and its underlying muscle aponeurosis.

Barbed sutures have traditionally been employed for facial aesthetic procedures but over the span of 30 years have been adopted into many parts of plastic and reconstructive surgery.²⁰ Barbed sutures are knotless, have the potential to deploy even tension across the wound bed, and may decrease wound complications.²⁰ Quilting sutures aim to close dead space, reduce shearing forces, and promote atraumatic wound healing which in turn diminish abdominal fluid collection.

In contrast to studies concerning abdominoplasty and TRAM flap breast reconstruction, there is a paucity of

research into the efficacy of quilting sutures and seroma outcomes post DIEP flap. It is with this in mind that we have decided to compare the drain outputs and absolute length of stay in patients who have undergone DIEP flap breast reconstruction with and without quilting sutures.

Methods

We studied consecutive unilateral mastectomy patients undergoing delayed breast reconstruction with a DIEP flap. The initial 27 patients were recruited from the senior author's (PM) previous study²¹ at the Charing Cross Imperial National Health Service (NHS) in a 10-month period between February and November 2009. These patients underwent breast reconstruction without any form of abdominal flap plication. The subsequent 26 patients were recruited from those who underwent an identical DIEP flap procedure by the senior author (PM) at Westmead Hospital (Westmead, New South Wales, Australia) and Prince of Wales Hospital (Randwick, New South Wales, Australia). However, in these groups of patients, the closure of the abdominal flap was progressively tensioned using a running barbed suture quilting technique with 2–0 V-Loc™ 180 absorbable wound closure device (Covidien, Dublin, Ireland). All patients received closed suction drains inserted bilaterally with drain measurements recorded every 24 h. Once the drain output was <40 ml per 24 h over 2 consecutive days, the drains were removed.

Data were collected on the patient's age, body mass index (BMI), length of hospital stay, smoking status, drain outputs, and complications if any.

Statistical analyses were performed using Welch's *t*-test. A *p* < 0.05 was considered statistically significant.

This research study was conducted both in accordance with our local policies for "low and negligible risk studies" and conforming to the World Medical Association Declaration of Helsinki (June 1964) and its subsequent amendments.

Operative technique

The DIEP flap harvest was identical in both patient groups. Abdominal quilting with barbed sutures was initiated after the midline abdominal diastasis was reduced, and the DIEP harvest fascial wound was closed. To prevent asymmetry and to achieve tension, the midline distal aspect of the superficial abdominal flap was sutured to its corresponding position with 0 nylon (Figure 1). Quilting is performed using 2–0 V-Loc™ 180 and begins 2 cm lateral to the midline of the abdomen at the level of the umbilicus. The suture is then run in continuously with the needle passing through

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