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Umbilical necrosis rates after abdominal-based microsurgical breast reconstruction

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ABSTRACT

Background: Umbilical stalk necrosis represents a rare, yet important complication after abdominal-based microsurgical breast reconstruction, which is both underrecognized and understudied in the literature. Once identified, umbilical reconstruction can be an extremely challenging problem.

Methods: All consecutive breast free flaps at a single institution from February 2004 to February 2016 were reviewed, excluding non–abdominal-based flaps. Patients were divided based on the development of umbilical necrosis postoperatively. Demographics, surgical characteristics, and other complications were compared between the groups.

Results: A total of 918 patients met the inclusion criteria, with 29 developing umbilical necrosis identified (3.2%). Patients developing necrosis tended to be older (49.4 yrs *versus* 52.9 yrs; $P < 0.01$); have higher BMI (31.3 *versus* 27.8; $P < 0.01$); and were more likely to be smokers (27.5% *versus* 11.6%; $P = 0.01$). Umbilical necrosis was also associated with increased flap weight (830 g *versus* 656 g; $P < 0.01$), decreased time of perforator dissection (151 min *versus* 169 min; $P = 0.02$); bilateral cases (68.9% *versus* 44.7%; $P < 0.01$), and increased number of perforators per flap (2.5 *versus* 2.2; $P = 0.03$). There was no association with flap type (deep inferior epigastric perforator, superficial inferior epigastric artery, or free TRAM), diabetes, previous abdominal surgery, or use of preoperative imaging. Umbilical necrosis was not associated with any concomitant complications.

Conclusions: Umbilical stalk necrosis was found to occur in 3.2% of patients and was associated with several preoperative comorbidities and intraoperative characteristics. This information should help influence intraoperative decision-making to prevent the development of this undesirable complication.

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Introduction

Despite the fact that microsurgical breast reconstruction has become more widely available over the past few decades, pedicle thrombosis and subsequent flap loss represent the most feared complications. Failure rates as high as 5% has been reported, despite meticulous surgical technique.[1-10] However, there are other lesser complications which must also still be considered, including umbilical necrosis, whose incidence has never been studied following abdominal-based microsurgical breast reconstruction.

In an adult, the umbilicus is just a remnant scar from functional fetal structures. During intrauterine development, the umbilical cord exchanges both nutrients and waste between the fetus and the mother. These cord structures obliterate soon after birth, in usual circumstances, becoming nothing more than inert ligaments, produce the characteristic normal umbilical depression seen in adults.[11,12] Normally, the umbilicus receives a dual arterial supply. It's primary, deep supply comes in the form of perforators coming off the deep inferior epigastric vessels, ligamentum teres, and the medial umbilical ligament. In addition, there is a secondary, superficial contribution from the subdermal plexus.[13] After a cosmetic abdominoplasty, or likewise, after an abdominal-based breast reconstruction, typically the umbilicus is perfused only through the remaining deep system, after the superficial contribution has been divided.[13] Perhaps even more importantly, after a bilateral abdominal-based breast reconstruction, it is conceivable that both the subdermal plexus and the deep inferior epigastric vessels are sacrificed. This leaves the ligamentum teres and medial umbilical ligament as potentially the only remaining source of perfusion to the umbilicus.[13]

While there does exist a wide variability in umbilical phenotypes among the general population, the "ideal" umbilicus is apparently small, oval, and nonprotuberant. However, asymmetries in the umbilicus are frequently found, and these discrepancies should be noted and discussed with the patient prior to performing any abdominal-based surgery.[14-17] When umbilical necrosis occurs, reconstruction can be attempted via a wide variety of methods.[18,19] Most patients who desire umbilical reconstruction have an acquired absence secondary to surgical interventions like abdominoplasty or autologous abdominal-based breast reconstruction.[18,20] In addition, umbilical reconstruction may also need to be performed as a result of congenital anomalies.[21] Unfortunately, for such a seemingly simple anatomic structure, the wide array of reported techniques for reconstruction represents a lack of familiarity with this problem among surgeons as well as the lack of a universally appropriate procedure.

Despite the fact that it is of no functional significance in adults, the umbilicus is a key esthetic landmark of the anterior abdominal wall. For both patients and surgeons alike, its absence, distortion or misplacement after surgery can be distressing and can be a source of frequent patient complaint.[22,23] To date, there have been no studies in the literature evaluating umbilical necrosis rates. Furthermore, most studies merely report on techniques for reconstruction, largely occurring after cosmetic abdominoplasty.[18,19] This study aims to describe this previously unreported incidence of umbilical necrosis among patients with abdominal-based microsurgical breast reconstruction in a large single center, multisurgeon experience.

Patients and methods

We performed a retrospective review of a prospectively maintained database including all immediate and delayed autologous microsurgical free tissue transfers for breast reconstruction from February of 2004 to February of 2016. This study was approved by the institutional review board at our medical center, and a waiver was obtained for patient consent and chart review. All procedures were performed by three experienced microsurgeons (S.J.L., A.M.T., and B.T.L.). Electronic patient records were queried for patient demographics, intraoperative data, and postoperative complications for each flap. Reconstruction types included for analysis were abdominal-based free flaps, including deep inferior epigastric perforator (DIEP) flap, free transverse rectus abdominis myocutaneous (TRAM) flap, and superficial inferior epigastric artery (SIEA) flap. Nonabdominal-based flaps such as the superior gluteal artery perforator (SGAP) flap and profunda artery perforator (PAP) flap were excluded. Confirmation bias was reduced by means of prospective data collection.

Patients were divided into 2 consecutive cohorts stratified by the presence ($n = 889$) or absence ($n = 29$) of umbilical stalk necrosis postoperatively. Demographics, intraoperative findings, and postoperative complications were analyzed and compared between groups. All flaps were monitored with our standard clinical protocol. Patients are typically seen at 1-2 weeks postoperatively with subsequent follow-up at 1 and 3 months postoperatively unless there are any issues requiring more frequent visits.

Umbilical necrosis was defined as either partial or complete. Partial loss was defined as umbilical necrosis that was treated by local wound care and did not require any operative intervention, either debridement or reconstruction. Local wound care was provided with wet-to-dry saline dressings if there were open or infected wounds or silver sulfadiazine cream if there was a dry eschar present. Complete loss was when the entire umbilical stalk was involved and an operative intervention was required. In these situations, the stalk was debrided and closed primarily, unless there was evidence of infection, in which case local wound care was performed. In cases of complete umbilical loss, reconstruction was discussed with the patients but only undertaken at the request of the patient; not all patients who underwent complete umbilical necrosis requested reconstruction. The primary outcomes of interest included differences between the groups with respect to patient characteristics and intraoperative findings. Secondary outcomes that were also reported included any complications concurrent with umbilical necrosis. Full *versus* partial thickness umbilical loss was recorded as well as the number of patients who progressed to reconstruction.

Continuous variables, such as age or time of perforator dissection, were analyzed with a two-tailed *t*-test while categorical variables, such as the presence of diabetes or