The dog-ear flap as an alternative for breast reconstruction in patients who have already undergone a DIEAP flap

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Summary  Breast reconstruction in patients who have previously undergone deep inferior epigastric artery perforator flap (DIEAP) reconstruction or abdominoplasty is often challenging. Depending on patients' body habitus, several second-choice flaps have been described such as the transverse upper gracilis (TUG) flap, profundus femoris artery perforator (PFAP) flap, superior gluteal artery perforator (SGAP) flap, and lumbar artery perforator (LAP) flap.

Patients who have undergone a DIEAP flap reconstruction or abdominoplasty occasionally present with dog ears on both sides of the abdominal scar. The adipose tissue and skin of these dog ears are supplied by perforators of the deep circumflex iliac artery (DCIA). The DCIA flap was first described in 1979 by Taylor. We introduce this abdominal “dog-ear” flap for autologous breast reconstruction.

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Introduction

Breast reconstruction in patients who have previously undergone deep inferior epigastric artery perforator flap (DIEAP) reconstruction or abdominoplasty is often challenging. Depending on patients' body habitus, several second-choice flaps have been described such as the transverse upper gracilis (TUG) flap, profundus femoris artery perforator (PFAP) flap, superior gluteal artery perforator (SGAP) flap, and lumbar artery perforator (LAP) flap.

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Aims

We present the dog-ear flap, which is an alternative for breast reconstruction in patients who have previously undergone DIEAP flap reconstruction or abdominoplasty.

Materials and methods

The study is a prospective review of four consecutive breast reconstructions using an abdominal dog-ear flap. All patients underwent a prior breast reconstruction with a DIEAP flap. In this article, we describe the harvesting technique, patient characteristics, and outcome. A preoperative computed tomography (CT) scan was performed for all patients to locate the perforator. The distance of the perforator from the iliac crest was noted by the radiologist.

Anatomy

The flank region is richly vascularized by a number of source arteries. Perforators from the DCIA; the superficial circumflex iliac artery; and the intercostal, lumbar, and iliolumbar arteries can be found close to this region. The pedicle follows a zigzag course through the abdominal muscles (Figure 1). The ascending branch of the DCIA travels sandwiched between the transversus abdominis and the internal oblique muscles. The DCIA is a large vessel arising from the lateral or posterior surface of the external iliac artery, just above the inguinal ligament. The DCIA passes obliquely upward, parallel to the inguinal ligament, toward the anterior superior iliac spine (ASIS). Approximately 1 cm medial to the ASIS (after giving off an ascending branch that supplies the internal oblique muscle), the DCIA pierces the transversalis fascia and passes along the inner lip of the iliac crest. At the midpoint of the crest beyond the ASIS, the artery pierces the transversus abdominis muscle and anastomoses with the iliolumbar arteries. In its course along the inner lip of the iliac crest, the DCIA gives off several small perforators that penetrate the transversus abdominis, internal oblique, and external oblique muscles.

In 2007, Steven Morris and his colleagues conducted a cadaver study to document all DCIA perforators. They located these perforators, on average, 5–11 cm posterior to the ASIS and 1–35 mm superior to the iliac crest. The average diameter of the perforator was 0.7 mm.

Operative technique

First, the recipient side is prepared and the recipient vessels (mammary vessels) are dissected out in the supine position. Thereafter, the patient is repositioned in lateral decubitus to begin the flap dissection. The perforators are identified by preoperative CT. A handheld Doppler probe is used to confirm this location. An elliptical skin paddle is designed around this perforator including the lateral part of the abdominal scar of the previous DIEAP flap. In order to increase volume, while still enabling primary closure, an area to be beveled is marked around this ellipse (Figure 2). First, the lateral border of the flap is incised down to the underlying deep fascia of the external oblique muscle. It is then dissected from the lateral to medial direction. The dominant perforator is identified and carefully dissected through the abdominal wall muscles. The diameter of the perforator increases significantly as it begins to dip into the muscle. The different orientations of the muscle fibers of the external and internal oblique muscles as well as the transversus abdominis muscle can be clearly identified. During intramuscular dissection, the side branches are...
clipped. A self-retaining retractor is used to facilitate dissection. The distal end of the DCIA is then ligated to allow for proximal dissection of the parent DCIA. Deep circumflex iliac vessels are then dissected proximally in the iliac fossa until a desired pedicle length is reached. However, the pedicle need not often be dissected until the source vessel. As the pedicle follows a zigzag course through the oblique external and internal muscles, the pedicle length can be increased by meticulously unraveling the pedicle from these muscles (Figure 1).

The flap is then islanded with incision of the medial border and transferred as a free flap to a distant defect. The donor incision in the abdominal wall muscles and fascia is closed in a layered manner.

The contralateral dog ear is corrected in a second stage by liposuction or resection.

Results

Patient 1

The first patient was 53 years old in 2012, she underwent mastectomy and reconstruction of her left breast with a DIEAP flap. After adjuvant radiotherapy, she developed fat necrosis of the flap, resulting in a significant volume deficit. In March 2014, she underwent reconstruction with a dog-ear flap to replace this volume deficit (Figure 3).

Patient 2

The second patient was 43 years old in 2002, she underwent a subcutaneous mastectomy of the left breast as well as reconstruction with a DIEAP flap. In 2014, she developed a ductal carcinoma of the right breast in situ. In November 2014, she underwent a subcutaneous mastectomy of the right breast as well as primary breast reconstruction with a dog-ear flap.

Patient 3

A 58-year-old patient underwent a breast reconstruction of the left breast with a DIEAP flap, which partially failed, resulting in fat necrosis. On 11 May 2015, we performed reconstruction with a dog-ear flap.

Patient 4

A 65-year-old patient underwent a mastectomy of the right breast and reconstruction with a DIEAP flap. When she developed breast carcinoma in the left breast, a reconstruction with a latissimus dorsi flap was performed in combination with an implant. However, she developed capsular contracture and requested that the implant be removed and replaced with autologous tissue. On 11 June, we performed reconstruction with a tertiary dog-ear flap. The removed implant of 600-cc volume was replaced by a 534-g flap.

The postoperative course in all four cases was uneventful. The flaps demonstrated complete vascularity. Although the abdominal scar was included in the flap, no vascularity problems were noted. The reconstructed breast weight was comparable to the original breast volume (Table 1). As the dog ear was resected, the contour was

Figure 3  a. Preoperative photograph of a patient who previously underwent reconstruction with a DIEAP flap, which was partly necrotized by adjuvant radiotherapy, resulting in a significant volume deficit. b. Postoperative photograph after “dog-ear” flap from the contralateral side. Notice the better contour of the right donor side compared with the left (arrow).
improved, although the scar was lengthened and positioned very high above the crista iliaca.

Discussion

In 1998, Hartrampf described the Rubens flap, using the excess of skin and fat in the flank overlying the iliac crest as a donor site for breast reconstruction. To facilitate the dissection of the deep circumflex iliac artery and vein, he included a muscle cuff for the abdominal muscles. However, inclusion of these muscles may result in significant donor-site morbidity, such as abdominal hernia. The iliac crest flap is another well-known flap based on the DCIA pedicle, which is primarily used in head and neck reconstruction. In 1997, Safak et al. described a design of the iliac crest flap without including a muscle cuff, suggesting that a single dominant perforator could provide adequate flap perfusion. Presenting his research at the American Society for Reproductive Medicine (ASRM) meeting in 2015, Buchel stated that the perforator DCIA flap is an excellent option for secondary autologous breast reconstruction when anterior abdominal tissue is unavailable or as a DIE-AP–DCIA combination flap for increased volume.

We described the dog-ear flap, which essentially uses the same fat deposit in the flank as the Rubens flap. However, as it is based on one or two DCIA perforators, no muscle cuff is included in the flap, which reduces the incidence of hernias. Just as the DIEAP flap was an upgrade of its myocutaneous predecessor, the TRAM flap, so also is the abdominal dog-ear flap a more sophisticated version of the Rubens flap.

The term “abdominal dog-ear flap” was not chosen in accordance with the “Gent” consensus. This is because most authors in the literature on DCIA flaps refer to flaps that include the iliac crest, for example, in head and neck reconstruction.

We chose to dissect the flap in the lateral decubitus position, such that the flap could be extended more laterally and even dorsally. With the patient in the supine position, the flap can span an area medial to the ASIS, although lateral extension is limited by the operating table.

In our cases, the perforators were found to be slightly more cranial to the iliac crest than those in the study by Morris, namely 3–7 cm cranial to the iliac crest. Given the significant variability in the perforators to be harvested systematically and the 8% of patients without a DCIA perforator, a preoperative CT scan is necessary. We were able to locate the perforators beforehand as our skilled radiologist had experience in preoperatively locating perforators for DIEAP and ALT flaps.

As it is a dog-ear flap, the abdominal scar of the previous DIEAP flap is located in the middle of the flap. Due to this scar, vascularity problems are likely. However, in our cases, complete vascularity of the flaps was seen in all four patients; this was most probably due to neovascularization after closure of the donor site of the abdomen.

One limitation of using the donor site is that the scar can be very high, as the perforators can be located up to 7 cm above the iliac crest.

Conclusion

In selected patients, who present with excess skin and fat at the sides of the abdominal scar after a DIEAP flap, an abdominal dog-ear flap is a good alternative for breast reconstruction.

Lesser donor-site morbidity than for the Rubens flap is to be expected, as no muscles are included in the flap.

Conflict of interest

The authors did not have any conflict of interest or funding.

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