Endoscopically harvested latissimus dorsi: a scarless technique in immediate partial breast reconstruction

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ORIGINAL PAPER

Endoscopically harvested latissimus dorsi: a scarless technique in immediate partial breast reconstruction

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Abstract
Background Harvesting the latissimus dorsi muscle flap endoscopically is a well-known and well-documented technique, though it is still not widespread in clinical practice. This approach provides autologous tissue for the oncological resection bed, creating the most favorable conditions for subsequent radiotherapy. The endoscopic approach minimizes scarring at the donor site.
Methods Between September 2010 and November 2012, a total of 29 patients were operated on for breast cancer and immediately reconstructed using a latissimus dorsi muscle flap obtained endoscopically. In all cases, the tumor location was the upper and outer pole of the breast. In this paper, we present the results obtained in 19 patients operated on between September 2010 and November 2011 with a minimum follow-up of 12 months after surgery and at least 6 months after adjuvant radiotherapy. The filling volume obtained with the transposition of the flap was studied using magnetic resonance imaging within 6 months postradiotherapy.
Results The mean hospital stay was 3 days. In all cases, suction drains in the breast and the donor site were removed within 8 days. No surgical revision was required. No necrosis was documented in any of the flaps. Minimal to moderate seroma was documented in nine cases (48 %). MRI studies revealed degenerative changes of the muscle fibers but which did not affect final breast volume because 30 % more muscle than necessary had been recruited. When interviewed a year after the intervention, none of the patients reported changes in the type of bra cup.
Conclusions The use of the latissimus dorsi muscle flap obtained endoscopically is a highly effective technique in the reconstruction of partial breast defects immediately after cancer surgery. It is particularly useful when the tumor is located in the upper or outer quadrants. The endoscopic approach offers less associated scarring than the classical technique and minimal anatomical variability compared with the use of thoracodorsal artery perforator flaps.
Level of evidence: Level IV, therapeutic study.

Keywords Endoscopic plastic surgery · Endoscopically latissimus dorsi · Scarless breast reconstruction

Introduction

Immediate reconstruction in breast cancer surgery has many advantages over delayed reconstruction, such as improved quality of life, better image perception, and less stigma and is therefore far less traumatic for the patient [1]. Oncoplastic surgery in the context of breast-conserving therapy is a common practice in European centers of reference and in recognized functional breast units and achieves survival rates comparable to those associated with more aggressive treatment [2]. Endoscopic harvesting of latissimus dorsi muscle flap is a well-known and well-documented technique but is still not widespread in clinical practice. This procedure provides autologous tissue in the oncological resection bed, which is the best condition for the subsequent application of radiotherapy. It allows the filling of a wide spectrum of defects, from simple tumorectomy to defects equivalent to hemimastectomies, minimizing the scar at the donor site [3].

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The latissimus dorsi muscle flap obtained endoscopically is an excellent tool for the oncoplastic surgeon and its safety in cancer follow-up has been demonstrated [4–9]. At our hospital, the plastic surgeon performs both cancer surgery and the immediate reconstruction. In this article, we present our experience in the use and indications of endoscopically harvested latissimus dorsi flaps in the immediate reconstruction of breast defects after cancer resection.

Materials and methods

Between September 2010 and November 2012, 29 patients were operated on of breast cancer and underwent immediate reconstruction with an endoscopically harvested latissimus dorsi muscle flap. In this paper, we present the results obtained in 19 patients operated on between September 2010 and November 2011 with a minimum follow-up of 12 months after surgery and at least 6 months after completion of adjuvant radiotherapy. The locations of the tumors are shown in Fig. 1 and clinicophatologic patient aspects in Table 1.

Preoperative landmarks and surgical technique

The marking is performed with the patient awake and in the standing position (Figs. 2 and 3). The breast defect is traced leaving approximate margins, using ultrasound or radioguided localization wires. The limits of the desired muscle flap, the axillary incision, and the lumbar contraincision are marked, and the tip of the scapula and the posterior superior iliac crest are identified as reference points. After tumor resection, review of hemostasis, and axillary surgery, the patient is placed in lateral decubitus with the ipsilateral arm flexed at 90°.

Table 1 Clinicopathologic patient aspects

Age	43 (29–64)
Comorbidities	Smoking, 3/19 (15 %)
	Hypertension, 4/19 (21 %)
	Hypothyroidism, 4/19 (21 %)
	Diabetes mellitus, 1/19 (5 %)
Breast size (bra cup; before and after surgery)	A, 2/19; B, 5/19; C, 10/19; D, 2/19
Surgical time (min)	Perioperative: mean, 206; range, 140–321
	Endoscopically assisted: mean, 70; range, 55–180
Tumor cTNM	Tx, 0/19; Tis, 5/19; T1, 5/19; T2, 6/19; T3, 3/19
Tumor location	Fig. 1
Axillary disease	Lymphadenectomy, 10; sentinel node biopsy, 8
Pathology	CDI: 11/19
	CID: 5/18
	CDI+CID: 2/19
	CLI: 0/19
	Phyllodes tumor: 1/19
Neoadjuvant chemotherapy	Radiologic response: 9/19
	Complete response: 5/19
	Partial response: 4/19
Breast defect	Lumpectomy: 5/19
	Quadrantectomy: 12/19
	Hemimastectomy: 2/19

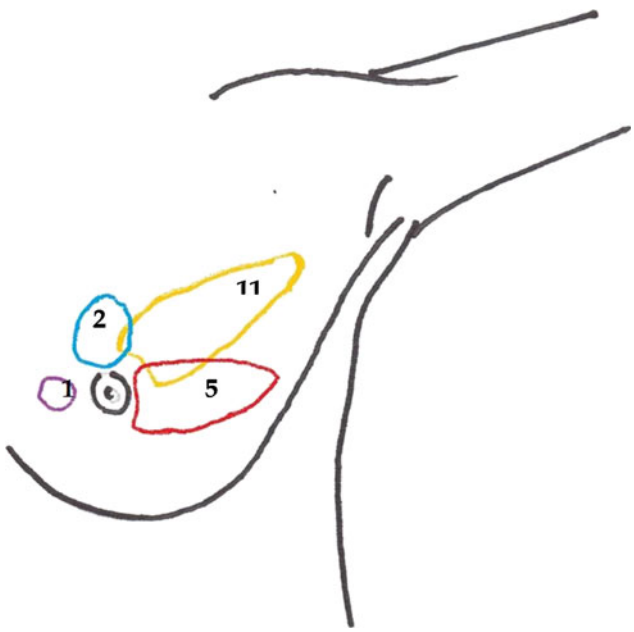

Fig. 1 Tumor location

The endoscopic equipment comprises a Hopkins II Forward telescope (STORZ type 5023 BA) at an angle of 30°, 10 mm in diameter, and 31 cm long, with incorporated fiber optic light transmission (Karl Storz GmbH & Co. KG. Tuttlingen, Germany) and an optical retractor at 25 mm wide adapted to a Hopkins II telescope (STORZ, LG 5021). For dissection and hemostasis of the latissimus dorsi muscle, we use monopolar electrocautery and grasping and dissecting forceps with a connection for monopolar coagulation of 30 cm in length (STORZ 33221 MD).

The dissection of the latissimus dorsi starts with the identification, under direct vision, of the thoracodorsal pedicle via an axillary incision created previously to perform nodal surgery (SLNB or lymphadenectomy) not exceeding 7 cm in length. Also under direct vision and using a cold light lamp retractor, cranial portion of the anterior border of the latissimus dorsi is dissected and detached from the serratus anterior muscle. Then, the endoscopy-assisted surgery begins, with the dissection in the superficial plane from lateral to medial until the trapezius muscle is identified. The dissection proceeds caudally in the superficial plane until the desired amount of latissimus dorsi muscle is obtained. Thus, in performing endoscopic dissection of the deep plane of the

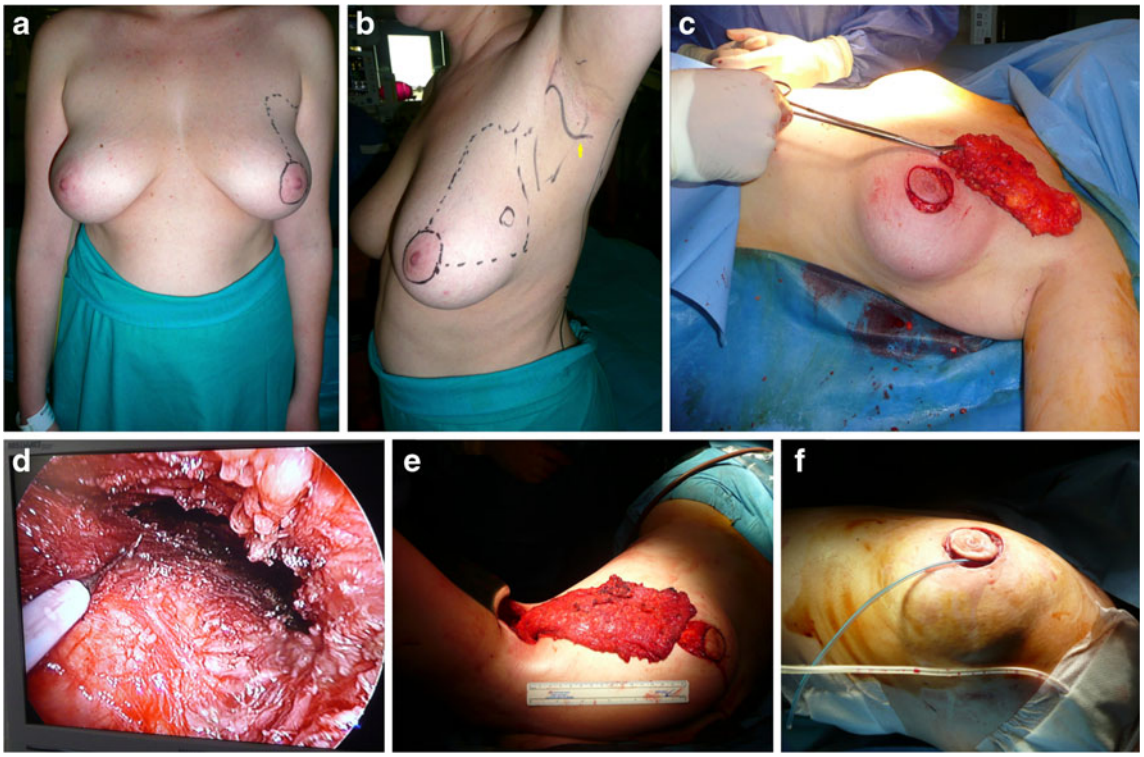

Fig. 2 Female, 29 years old with ductal infiltrant carcinoma, left breast cT1N1 and primary chemotherapy. **a**, **b** Presurgical tumor resection design. **c** Lumpectomy. **d** Latissimus dorsi muscle superficial layer endoscopically assisted dissection. **e** Latissimus dorsi dissected. **f** Final surgical latissimus filling result

latissimus dorsi, perforators emerging from thoracolumbar fascia are identified, clipped, and transected. Once the amount of tissue required has been obtained, the lower edge of the flap is transected under direct vision through an accessory incision of 3 cm at the lateral edge of the latissimus dorsi approximately 25–30 cm caudally from the axillary fossa. Also under direct vision, the humeral insertion of the latissimus dorsi muscle is transected to allow its transposition to the breast defect. The thoracodorsal nerve is then identified and transected. Again in the decubitus position, we insert the flap in the breast defect. In the more central portion of the breast, the area with the highest projection, we suture the latissimus dorsi muscle over itself, thus obtaining greater volume and final projection (see video, Supplemental digital content 1 in Electronic supplementary material).

Results

Nineteen patients (mean age, 43) received partial breast reconstruction with an endoscopically harvested latissimus dorsi muscle flap. Patient characteristics are summarized in Table 1. The mean size of the resection was 71×197×21.4 mm (lateral, cranio-caudal, and antero-posterior, respectively; range, 40×60×12 to 130×75×32 mm). Mean operating time for the endoscopic dissection of the flap was 70 min. Mean hospital stay was 3 days. In all cases, suction drains in breast and donor site were removed within 8 days. Nine cases (48 %) had minimal or moderate seroma (30–105 cm^3) which was drained by needle aspiration in the postoperative controls. In two cases, periareolar pexia was performed in the contralateral breast in the same surgical intervention. No surgical revision was necessary. No flap necrosis, infection, or hematoma was recorded. The filling volume obtained with the muscle transposition was studied by clinical control, photography, and MRI T2 sequence 6 months after completion of radiotherapy. These studies revealed degenerative changes characteristic of fat necrosis of the muscle fibers, but the final volume was not reduced as intentionally 30 % more muscle volume was recruited. When interviewed, none of the patients reported changes in bra cup size within a year of surgery. In 17 of the 19 cases, the length of the lumbar contraincision was 3 cm (range, 2.5–3.6 cm). In two cases, the dissection was completed by axillary approach without any other associated incision (Fig. 4).

Discussion

Latissimus dorsi flaps obtained endoscopically are not often applied in breast reconstruction. The procedure was

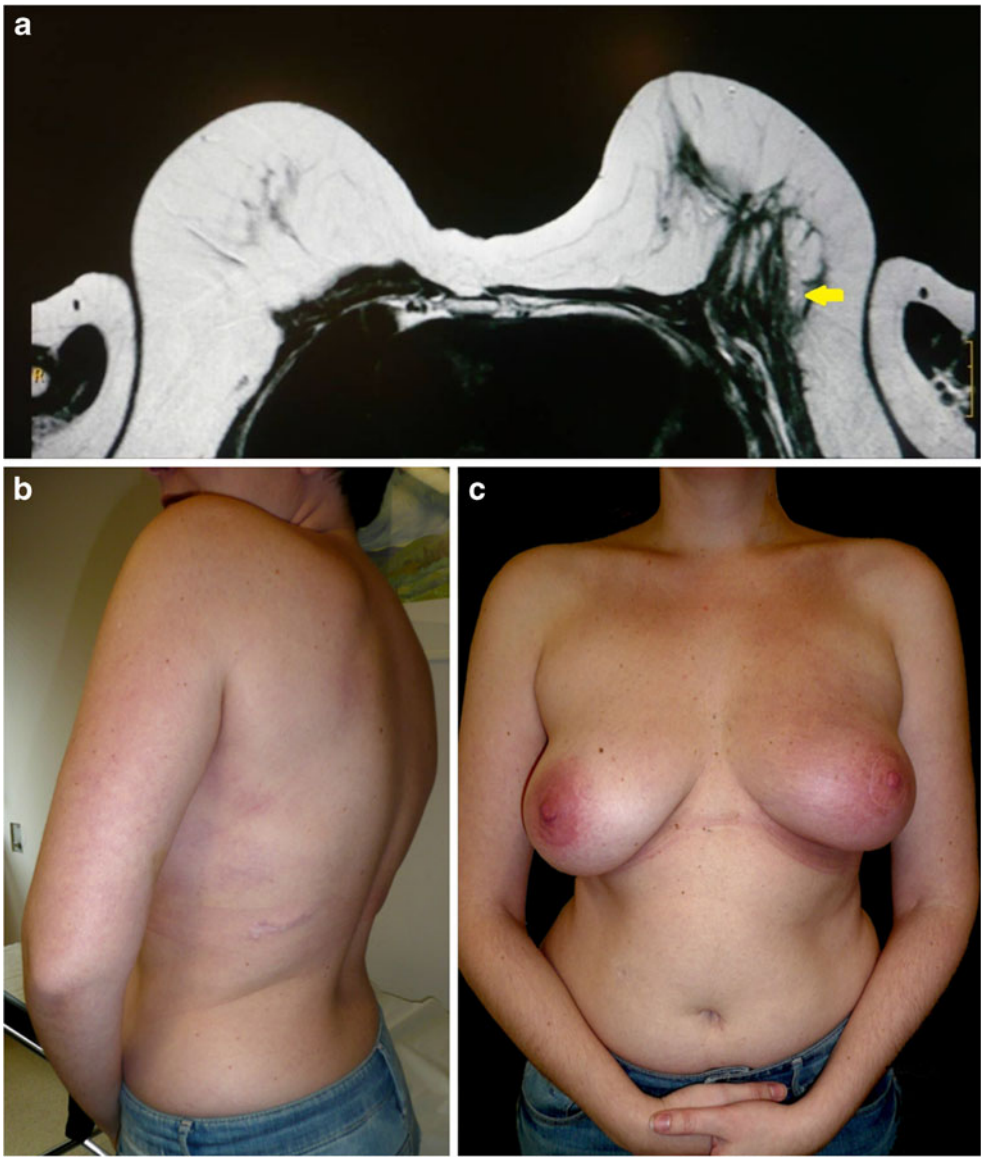

Fig. 3 Results 12 months postradiotherapy; **a** magnetic resonance detail; **b** scar detail; **c** frontal view

popularized by Bostwick [6] and Fine [10] as a technique to aid partial breast reconstruction or limb free flap reconstruction. Pomel [11] and Missana [12] report its use in total breast reconstruction after skin-preserving mastectomies.

We describe our experience with this oncoplastic technique for cancer and reconstructive surgery in the same intervention. Harvesting the latissimus dorsi muscle flap endoscopically provides autologous tissue for the bed of the oncologic resection to avoid radiotherapy tissue effects. The latissimus dorsi provides a vascularized tissue filler preserving the breast presurgical volume and shape. With adequate multidisciplinary preoperative planning, the study and evaluation of the state of the margins and lymph node involvement allows the reconstruction of a wide range of defects from simple tumorectomy to hemimastectomy, depending on the tumor–breast ratio. Nonetheless, the technique has a significant learning curve and requires familiarity with endoscopic instrumentation.

The main limitations of the technique are those inherent to breast-conserving therapy, and the impossibility of intraoperative confirmation of the margins which is essential in immediate reconstruction. In fact, it is advisable to delay reconstruction until the margins can be confirmed. Contraindications for this technique are activities such as climbing, swimming, or others in which the latissimus dorsi muscle is heavily involved.

In our experience, the use of a latissimus dorsi flap achieves excellent results for the reconstruction of defects located in the upper and outer poles in breasts of bra cup size A or B. In larger breasts, it is most effective in defects located in the upper outer quadrant or at the union of the outer quadrants. As regards morbidity, it achieves a high degree of satisfaction with body

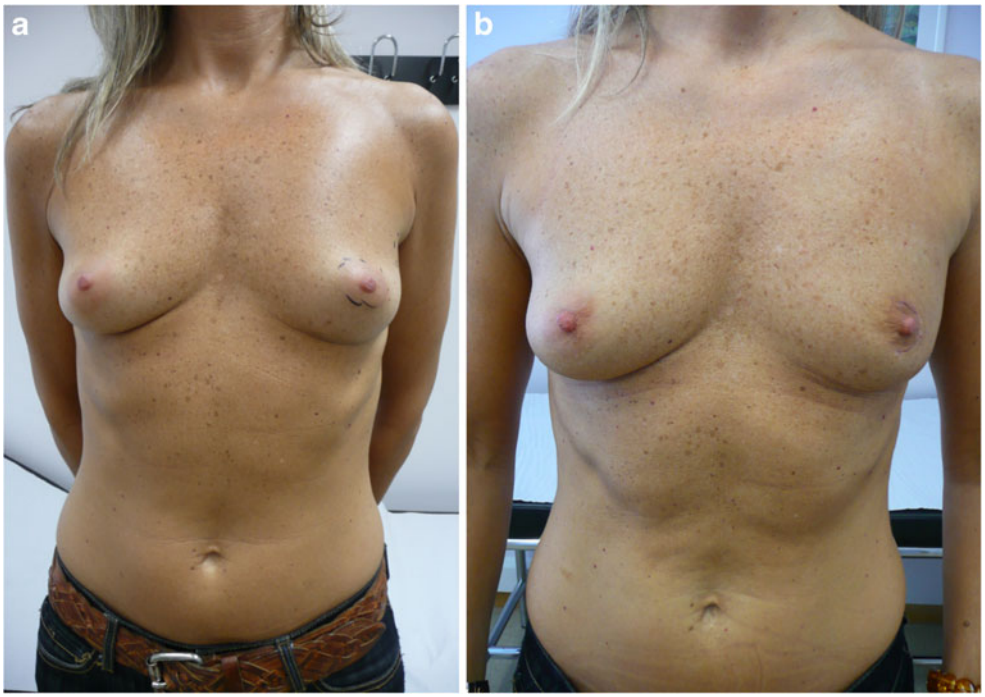

Fig. 4 Female, 42 years old with intraductal carcinoma, left breast cT2N0. **a** Presurgical view. **b** Results 6 months after surgery

image perception [13]. In two cases in our series, the axillary approach was sufficient for dissection of latissimus dorsi flap; in the others, only a mean incision of 3 cm was required, in contrast to the classical technique or pedicled perforator flaps which are associated with extensive scarring in the donor area. In our series, no scar revision or correction of dog ears in the donor area was required. The endoscopic approach achieves lower morbidity with less scarring in the donor area, lower risk of dehiscence, scar hypertrophy, or scar retraction [14, 15] and reduces the need for dressings and the time required for healing. The limitation of scars to the axillary fossa and the significant reduction in the donor area in the back is less traumatic for the patient's self-image and sexual activity. The minimal anatomical variability and the amount of tissue available for use in reconstruction also represent an advantage over fasciocutaneous perforator flaps [16]. In our institution, we use all approaches (classic latissimus dorsi, endoscopically harvested and thoracodorsal artery perforator flap) to refill partial mammary defects in the upper and outer poles of the breast. Depending on patient preferences and scar complaining, the reconstructive procedure is decided.

In order to avoid further contraction of the latissimus dorsi once in the breast, we transect the nerve pedicle under direct vision during dissection [17]. This maneuver does not affect the long-term esthetic result of the reconstruction, either according to the patient's evaluation or to the results of the magnetic resonance imaging study of the operated breast. The MRI revealed atrophy and fat degeneration of muscle, due to the effect of radiotherapy on the reconstruction and to nerve transection. To avoid this potential problem, we harvest around 30 % more muscle volume during dissection than necessary to reconstruct the defect and also recruit fat adjacent to the muscle flap.

Several methods have been described for obtaining the optical cavity: retractors, CO_2 insufflation, and the use of balloon dissectors [18–20]. In our opinion, the use of a retractor coupled to the optical light source ensures correct exposure of the operative field and helps to minimize the learning curve.

The occurrence of a seroma is a common complication of the use of latissimus dorsi muscle or musculocutaneous flap for reconstructive purposes. In our series, we observed a high percentage of seromas (48 %), similar to the rates reported in the literature [21]. All seromas were drained by needle aspiration during postoperative control. Several risk factors have been postulated for the occurrence of seroma: advanced age, body mass index, dissected cavity, or performance of lymphadenectomy in the same surgical intervention [22–24]. The use of autologous fibrin or the use of attaching stitches in the donor area has been proposed to reduce the occurrence of seroma and to shorten the duration of drainage [25–27]. In our series, we applied fibrin glue spray for the donor area (5 cm^3 of Tissucol™, Baxter International Inc.) in all cases. Clinically, we observed that seven out of ten cases that underwent axillary lymphadenectomy presented seroma, compared with two out of eight cases in which only sentinel node biopsy was performed. The mean duration of drainage in the donor site was 6 days, with a maximum of 8 days. The criteria for drainage withdrawal was 30 ml or less collected/day with a serous appearance. Though our sample was too small to establish statistically significant differences, the concomitant performance of lymphadenectomy seems to be a risk factor for the

appearance of seroma regardless of whether an endoscopic or an open technique is used.

Conclusions

The use of endoscopically harvested latissimus dorsi muscle flaps is a highly effective technique for the reconstruction of partial breast defects after oncologic surgery. It is especially indicated when the tumor is located in the upper or outer quadrants. It provides autologous tissue in the oncological resection bed anticipating to subsequent radiation therapy, providing a filling with vascularized tissue that preserves the presurgical volume and shape of the breast. The endoscopic approach is associated with lower levels of scarring than the classical technique or perforator flaps. The minimal anatomical variability and the amount of tissue available for reconstruction also represent an advantage over fasciocutaneous perforator flaps.

Conflicts of Interest None.

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