# Breast reconstruction using a latissimus dorsi flap after mastectomy

Jens B. Højvig & Christian T. Bonde


## ABSTRACT

**INTRODUCTION:** The latissimus dorsi (LD) myocutaneous flap has long been regarded as the second choice flap for autologous breast reconstruction following a mastectomy in our department. Despite uncertainty about donor-site morbidity, it is regarded as a relatively safe procedure; moreover, in contrast to our first choice, the deep inferior epigastric perforator flap, no microsurgical expertise is needed.

**METHODS:** This is a systematic review of patient files for all LD breast reconstructions performed in the 2004-2013 period, at Rigshospitalet, Copenhagen, Denmark.

**RESULTS:** A total of 135 unilateral LD breast reconstructions were performed in 126 women during the ten-year period. The median age of the women was 48.5 years, and they mainly had secondary reconstruction (90%). The average time to removal of the last drain was 6.3 days, and the average time to discharge was 6.9 days. A total of 13 patients (10%) had local complications and were re-operated within the first 30 days. We observed one flap loss and only one systemic complication; a urinary tract infection. In all, 38 patients (28%) received antibiotic treatment after the operations and 27 (20%) developed a seroma at the donor site on the back. Patients who developed seroma were four times as likely as those who did not to be readmitted for antibiotic treatment.

**CONCLUSIONS:** LD breast reconstruction remains a safe choice for autologous breast reconstruction. Prevention of donor-site seroma as well as improvement of the clinical pathway and post-operative regimen could be future focus-points for this procedure.

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**TRIAL REGISTRATION:** not relevant.


The incidence of breast cancer in Denmark has been increasing over the past decade. Although a limited decline was observed in the number of newly diagnosed cases of breast cancer in 2012, the number of new cases remains at 4,500 [1].

Mortality has decreased over the past 10-15 years, and today the five-year survival rate for women with newly diagnosed breast cancer is 83% [2]. Most patients are treated with surgery, often with *breast conserving surgery*, such as lumpectomy or oncoplastic breast surgery. Despite an increase in the utilisation of these techniques, 27% of the patients treated in 2010-2013 still required a mastectomy. Most patients will receive adjuvant chemo- and radiation therapy. In 2012, 97% of the women who were treated with mastectomy and fulfilled the criteria of the Danish Breast Cancer Cooperative Group (DBCG) received radiation therapy [3].

More than 80% of the women who undergo mastectomy are interested in reconstruction of the breast after the initial treatment [4]. Reconstruction of the breast has been shown to improve the patients' ability to overcome the psychological trauma in the wake of the primary diagnosis and treatment [5].

Patients who do not receive adjuvant radiotherapy are usually reconstructed using an implant. In contrast, patients who have received adjuvant radiotherapy will most often have an autologous reconstruction performed.

The autologous reconstruction we most commonly utilise is a deep inferior epigastric perforator or transverse rectus abdominis myocutaneous flap. This may not be possible for all patients because some do not have enough tissue and some have had previous surgery to the abdomen; in other cases the department does not have microsurgical skills or the patient does not wish to have an operation on the abdomen. In these cases, a pedicled latissimus dorsi flap with an overlying skin island (LD flap) is our most commonly used technique.

There are other alternative autologous flaps for breast reconstruction. Closely related to the LD flap is the thoracodorsal artery perforator (TDAP) flap which consists of skin and subcutaneous fat. It is raised from the same area and on the same vessels, i.e. the thoracodorsal artery and vein, as the LD flap, but does not include muscle. Other flaps, such as the transverse myocutaneous gracilis flap from the thigh or the superior gluteal artery perforator flap from the buttocks exist, but these flaps also require microsurgical expertise as opposed to the local pedicled flap options.

The aim of this single-centre study was to evaluate our peri-operative regimen for LD flap breast reconstruction based on our ten years of experience from the 2004-2013 period and to inform the reader of alternative breast reconstructive options.

**ORIGINAL ARTICLE**

Department of Plastic Surgery, Breast Surgery and Burns Treatment, Rigshospitalet, Denmark

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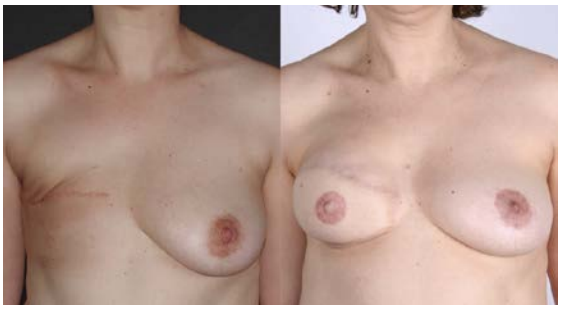


Before and after latissimus dorsi reconstruction.

## METHODS

### Surgical technique

Autologous breast reconstruction aims at recreating the sensation of a natural and soft breast that is symmetrical and of a comparable size and position as the contralateral, natural breast.

Pre-operatively, the flap is marked while the patient in a standing position (**Figure 1**), and the skin paddle is marked overlying the latissimus dorsi muscle on the patient's back. The size of the paddle relies on the surgeon's pre-operative measurements regarding the amount of skin needed to restore the breast's surface as well as the amount of skin available for a primary closure of the donor area.

During the dissection of the flap, the thoracodorsal vessels are explored first to make sure that they have not been damaged during previous surgery such as axillary lymph node dissection, as such damage will make the reconstruction impossible. The vessels are preserved throughout the procedure as opposed to the thoracodorsal nerve, which is usually transected in order to prevent involuntary muscle contractions of the breast. After dissection of the flap, it is tunnelled through the axilla and moved to the anterior side of the thorax, where it is shaped into the new breast.

In most cases, the LD flap is combined with a silicone implant, which is placed under the muscle to achieve a satisfactory volume. Sometimes it is necessary to place a tissue expander and to expand the skin to provide adequate skin coverage of the correctly sized implant.

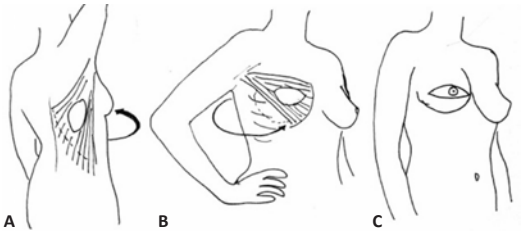
For some patients with a smaller breast, the muscle flap alone can be enough to attain a complete reconstruction. Often, a correction of the contralateral breast is needed in order to secure optimal symmetry.

The procedure can be performed primarily, following a mastectomy, or – more frequently – as a delayed procedure after completion of any planned adjuvant treatment.

After the operation, the patient is scheduled for a reconstruction of the nipple, including areolar tattooing, which is all carried out in local anaesthesia.

FIGURE 1

**A.** The flap is dissected. **B.** The patient is turned and the flap is tunnelled to its new position on the anterior side of the thorax. **C.** The reconstructed breast is shaped and sutured.




### Patients

A complete review of medical records of patients who underwent a LD flap breast reconstruction performed at Rigshospitalet between 2004 and 2013 was performed. In this period, 135 reconstructions were performed in 128 women. The median age of the operated women was 48 years (24-81 years).

*Trial registration:* not relevant.

## RESULTS

A total of seven women (5%) had bilateral breast reconstructions as staged procedures utilising this technique.

In all, ten procedures (7%) were primary reconstructions and 125 (93%) were secondary.

For 35 patients (26%), this was their second or third attempt at reconstruction following earlier attempts by another technique, e.g. expander or free flap failed (**Table 1**). The average operating time was five hours; and two suction drains were placed, one at the donor site and one at the reconstructed breast. The median time for drain removal was seven days, as was the median time to discharge.

Thirteen patients (10%) had local complications (**Table 2**), and one patient suffered a urinary tract infection. There were no deep vein thromboses. One flap was lost as a result of a clot in the donor vessel.

A total of 20% of our patients developed a seroma, which needed an average of 2.1 aspirations to resolve (range: 1-9). The patients who suffered from seromas were four times more likely than those who did not to be readmitted for antibiotic treatment (4/27 versus 4/108, p = 0.05).

In all, 126 (93%) patients had an implant placed under the flap, and 20 of these patients were expanded prior to implantation. A total of 46 of all the patients (34%) had one or more corrective procedures performed at a later date, which required a mean additional 3.9 days of hospitalisation.

In all, 109 patients had the nipple reconstructed

after an average of 45 weeks (15-174 weeks) after the breast reconstruction, and 111 patients had their nipple tattooed an average of 67 weeks (26-196 weeks) after the breast reconstruction.

The average period of outpatient follow-up was 82 weeks (2-214 weeks). The large variation in follow-up time was due to revision procedures and patients undergoing investigation/treatment for recurrent disease. The typical time period for completion of uncomplicated cases was 9-12 months.

## DISCUSSION

### Challenges in the post-operative regimen

Two types of complications dominate after breast reconstruction with an LD flap. The first is a seroma at the donor site on the back; the second is the *possible compromised shoulder function* which arises after transposition of the muscle.

A donor-site seroma is the most commonly reported complication in current literature with rates varying from 6-72% [6, 7]. In these studies, the incidence of seroma seems to depend on the timing of the reconstruction as higher rates were seen in patients who underwent primary than in patients who underwent secondary reconstructions.

The consequences of developing a donor-site seroma are additional visits to the outpatient clinic for aspiration as well as an increased risk of infection.

Several techniques were described to prevent seroma formation. A point in common for these techniques is to minimise the "pocket" created at the donor site of the latissimus dorsi muscle in the back. Fibrin glue and quilting sutures have been described as tools to prevent seroma formation [8, 9]. The results are varying; and in the future this topic should be further investigated in prospective randomised studies [10, 11].

A third tool that might be used to prevent seroma is the development of specially designed supportive garments. The garments' purpose is to apply pressure to the donor-site on the back without jeopardising the donor vessels while minimising seroma formation. The use of pressure garments for this purpose has not been thoroughly described in current literature.

The impact on shoulder function and range of motion that follows harvesting of the latissimus dorsi muscle is unclear. Although this technique was originally described more than 100 years ago and has been particularly popular throughout the past 30 years, the literature regarding these matters is inconclusive. Intuitively it seems logical that the removal of a muscle of this size must result in a significant decrease in the ability to perform the shoulder movements to which the latissimus dorsi muscle contributes, primarily adduction, extension and internal rotation.

**TABLE 1**

Data regarding the surgical procedure of latissimus dorsi reconstruction and the primary hospital submission (N = 135).

| | |
|---|---|
| *Time of operation, n (%)* | |
| 1st | 10 (7) |
| 2nd | 125 (93) |
| 2nd or 3rd attempt at reconstruction | 35 (26) |
| Radiation therapy, n (%) | 106 (79) |
| *Smoking, n (%)* | |
| Smokers | 27 (20) |
| Previous smokers | 21 (16) |
| Non-smokers | 87 (64) |
| *Contralateral surgery, n (%)* | |
| Yes | 73 (54) |
| No | 62 (46) |
| *Implants, n (%)* | |
| Yes | 126 (93) |
| Of these, after expansion | 20 (15) |
| No | 9 (7) |
| *Nervous status, n (%)* | |
| Cut | 121 (90) |
| Spared | 14 (10) |
| *Drains on LD side, n (%)* | |
| 1 | 3 (2) |
| 2 | 107 (79) |
| 3 | 25 (19) |
| Duration of surgery[a], h + min., average (range) | 5 + 7 ((2 + 54)-(8 + 10)) |
| Peroperational blood loss, ml, average (range) | 270 (0-1,000) |
| Accumulated drain production, LD-side, ml, average (range) | 964 (280-2,610) |
| *Time until, days, average (range)* | |
| Removal of last drain | 6.3 (2-11) |
| Discharge | 6.9 (2-16) |

LD = latissimus dorsi.
a) Incl. contralateral surgery, performed during the same session.

There is general consensus that the actions of synergistic muscles of the shoulder joint to a large extent compensate for the missing muscle when it comes to the mobility of the shoulder and to carrying out activities of daily living [12-14].

There are several reports of decrease of shoulder strength, but the severity of this loss varies [15]. Consequently prospective studies where the patients' shoulder strength is tested pre- and post-operatively should be performed to achieve a better understanding of the mechanical changes in the shoulder following the removal of the latissimus dorsi muscle.

### Future perspectives in latissimus dorsi reconstruction

*Improved clinical pathway*

At the moment, our patients are usually discharged on the seventh post-operative day. The benefits of fast-track regimes were originally described more than 20 years ago, and these regimes have since been introduced in a number of surgical specialities [16-18].

TABLE 2

Post-operative regimen. Overview of complications and post-operative courses (N = 135).

| | n (%) | Readmission, days |
|---|---|---|
| *Reoperation* | | |
| < 30 days | 15 [13 patients] (10) | – |
| Flap loss | 1 (< 1) | – |
| Prosthesis → expander | 1 (< 1) | – |
| Explantation | 2 (1.5) | – |
| Haematoma | 8 (6) | – |
| Wound rupture (incl. explantation) | 1 (< 1) | – |
| Haematoma observatio pro | 2 (1.5) | – |
| *Antibiotic treatment (n = 38)*[a] | | |
| Primarily: | | |
| P.o. | 2 (1.5) | – |
| IV | 18 (13) | – |
| After primary discharge: | | |
| P.o. | 10 (7) | – |
| IV[b] | 8 (6) | – |
| Explantation due to infection | 4 (3) | – |
| Readmission, patients[c] | 9 | 93 [10.3/patient] |
| *Seroma* | | – |
| Patients | 27 (20) | |
| Aspirations | 56 [2.1/patient] | – |
| *Corrections (general anaesthesia)* | | |
| Patients | 51 | 181 [4.1/patient] |
| Awaiting 1st/further corrections | 7 | – |
| *No. of corrections* | | |
| 1 | 36 (27) | – |
| 2 | 11 (8) | – |
| ≥ 3 | 4 (3) | – |

IV = intravenously; p.o. = orally.
a) Patients who were registered as having received antibiotics IV may also have received treatment p.o. before and after their procedure.
b) All patients who received antibiotics IV after primary discharge were readmitted to the hospital.
c) Patients registered as readmissions may have been readmitted more than once.

At Rigshospitalet, fast-tracking has been introduced successfully for patients undergoing breast reconstruction with abdominal flaps.

Today the length of stay is primarily dictated by the time to removal of the surgical drains from the breast and the donor site. At the moment the drains are removed according to the surgeons' instructions, most commonly when the output is < 30-50 ml/day or on the seventh post-operative day.

A recently published study shows that there is no increase in risk of complications such as seroma related to removing the drains on the third post-operative day, disregarding the amount of output, compared with waiting until the output is less than 30 ml/day [6].

By utilising the knowledge already available concerning fast-track surgery combined with optimisation of drain handling and of the surgical technique, we hope to continue improving the treatment and post-operative path.

*Alternative flap types*

As for the abdominal flaps, there has been an increased focus on perforator-based alternatives to the LD flap for breast reconstruction. The obvious alternative is the TDAP flap, which is a flap consisting of skin and subcutaneous fat only. The blood supply is based on cutaneous perforators originating from the thoracodorsal artery's descending branch with the accompanying venous drainage.

Initially, when the TDAP flaps were introduced for partial breast reconstruction, there were concerns regarding the use of the flap in combination with an implant or an expander. These concerns focused on the fragility of the vessels and the flap's ability to resist the pressure of an implant. Furthermore, there were some concerns about whether this flap would provide sufficient tissue to cover the caudal part of the implant. The technique has been improved by including a small piece of muscle to protect the perforators. Several reports on the use of the TDAP flap with an implant and few complications are therefore now available [19]. The sparing of the muscle has the further advantage that it may be used at a subsequent operation, if needed.

There are several variations of the muscle-sparing LD flap (MS-LD) where different amounts of muscle are incorporated to minimise donor-site morbidity [20].

Presently, no studies show and compare shoulder function after LD-, MS-LD- or TDAP flap reconstruction, respectively, although sparing of the muscle may be expected to cause less donor-site morbidity.

Autologous fat grafting to the muscle flap is another technique which has been used in recent years as an alternative to LD and implant-based reconstruction. The merit of this technique lies in its ability to reach the desired volume without an implant. During this procedure, fat is harvested and injected into the subcutaneous tissue and directly into the muscle part of the flap overlying the breast. The disadvantage is that it is often necessary to perform the fat-grafting procedure multiple times to obtain the desired volume, mainly due to resorption of the injected fat.

Total breast reconstruction using injection of autologous fat cells is an area under investigation that constitutes a potentially exciting future alternative. The method is not yet standard and the literature is primarily based on single case reports. We feel that there is a need for a larger series concerning the results and adverse effects of fat grafting to the breast for total breast reconstruction.

## CONCLUSIONS

Breast reconstruction using an LD flap remains an acceptable alternative to the use of abdominal tissue. In the future, the surgical technique may be improved as

can post-operative care, and our knowledge about donor-site morbidity may also be enhanced.

This information will contribute further to improving the surgeons' as well as the patients' options when facing breast reconstruction using autologous tissue.

**CORRESPONDENCE:** *Jens B.* Højvig. E-mail: jenshoejvig@gmail.com

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