Immediate Breast Reconstruction with Expander Assisted Latissimus Dorsi Flap after Skin Sparing Mastectomy

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ABSTRACT

Background and Purpose: The latissimus dorsi myocutaneous flap (LDMF) used to be the standard practice for breast reconstruction; however, with the increased use of tissue expanders and the development of the transverse rectus-abdominis myocutaneous flap for autologous tissue breast reconstruction, its use has decreased. To reassess the role of the LDMF in breast reconstruction, a prospective study was performed to evaluate women who had a skin sparing mastectomy followed by immediate reconstruction with a latissimus dorsi flap and tissue expander implant.

Patients and Methods: Twenty-five women with early breast cancer underwent immediate latissimus dorsi myocutaneous flaps with tissue expander after skin sparing mastectomy. The oncologic safety of skin sparing mastectomy, the postoperative aesthetic results and complications were evaluated.

Results: Between May 2003 and April 2005, 25 consecutive women diagnosed with breast cancer underwent skin sparing mastectomy and expander assisted immediate latissimus dorsi breast reconstruction. Their median age was 42 years, ranging from 34 to 48 years. The procedure duration ranged from 2.5 to 6 hours, with a median of 3.9 hours, however, expansion was completed by 4 months (range 1 to 8 months). Patients were discharged 7 days after surgery with a range of 5 to 15 days. The complication rate was low, manifesting with skin flap necrosis in 12%, wound infection in 4%, and port site extrusion in 4%. There was no flap loss. With the exception of seroma formation, the donor site morbidity was low (seroma 40%, hematoma 4%, back pain 8%, and limited arm movement 4%). No local recurrence was recorded. The aesthetic result of surgery was rated as excellent in 20%, good in 60%, fair in 24%, and poor in 4% of cases. The duration of post-operative follow up was 14.7 months, ranging from 6 to 24 months.

Conclusions: Skin sparing mastectomy and immediate breast reconstruction is an oncologically safe technique. The use of latissimus dorsi myocutaneous flap with tissue expansion has proved to be an effective and aesthetic method of immediate breast reconstruction after skin sparing mastectomy.

Key Words: Skin sparing mastectomy - Immediate breast reconstruction - Latissimus dorsi myocutaneous flap - Tissue expanders.

INTRODUCTION

Although breast conservation surgery is the treatment of choice in early breast cancer, approximately 30% of all patients with breast cancer have to undergo mastectomy [1]. Reconstructive surgeons focus their efforts on refining and developing techniques that optimize oncologic outcome and recreate the most natural breast mound possible [2]. As extirpative techniques have changed, so have reconstructive options and goals. Oncological breast surgery has evolved from radical mastectomy to modified radical mastectomy. Skin-sparing mastectomy (SSM) is the latest evolution in surgical management of breast cancer [3]. Although oncologically sound, the greatest asset of SSM is the tremendous advantage it provides for the reconstructive surgeon as it preserves the intact skin envelope of the breast, thereby reducing the size of the mastectomy scar [4,5]. Greater skin conservation allows the surgeon to combine resection and authentic reconstruction of the breast within its anatomical boundaries, without compromising the oncological safety of mastectomy [6]. The neo-breast can be reconstructed using prosthesis alone, the patient’s own tissues or a combination of both. The final decision of the type of reconstruction should be made by the patient herself [7], after counseling the reconstructive surgeon for the options available, and
the cosmetic results she can reasonably expect from each method, in light of her body type.

Implant based breast reconstruction provides a relatively straight-forward means of creating a new breast. In contrast to flap reconstruction, it has the advantages of simplicity, shorter operation time and hospital stay, no extra scars, and no donor sites morbidity. Moreover, it uses tissue of similar color, texture and sensation of the reconstructed site [8]. The main disadvantages of prosthetic based breast reconstruction are the continual risk of implant failure in the form of infection, rupture, extrusion, capsular contracture, inability to withstand radiotherapy, limited indications and often aesthetically inferior to autogenous flaps [8]. Immediate breast reconstruction (IBR) using autogenous tissue produces a cosmetically superior breast and favorably withstands radiation compared with other reconstructive methods [9,10]. The latissimus dorsi musculocutaneous flap has been a popular method for breast reconstruction since first described [11,12]. Initially, this flap was combined with placement of an implant. Unfortunately, high capsular contracture rates (21%-75%) were reported [13,14]. Furthermore, with the subsequent development of the transverse rectus abdominis musculocutaneous (TRAM) flap, LDMF has been relegated to a second choice. It is important to note that the published LDMF series have not consistently used an expander during the first stage of the procedure, which is regarded as the critical step in obtaining good long-term results [14,15]. Newer techniques in oncologic breast surgery, such as SSM and inframammary breast fold preservation allow the use of the LDMF to be revisited. Thus, the aim of the present study was to reassess the role of the LDMF in breast reconstruction in women with breast cancer who had a skin sparing mastectomy followed by immediate reconstruction with a latissimus dorsi flap and tissue expander implant.

PATIENTS AND METHODS

This prospective study included 25 breast cancer patients who underwent SSM and IBR procedures using LDMFs. Tissue expander and or implants were used to adjust the final volume of the reconstructed breast in all patients. This study was undertaken at National Cancer Institute (NCI), Cairo University and Damietta Cancer Institute during the period from May 2003 to April 2005. The eligibility criteria for enrolling patients into the study included: 1) Age younger than 50 years old, 2) Primary breast cancer stages I & II, 3) Patients not candidates for breast conservation surgery (large or central tumors in small breasts, multifocal/multicentric disease, an extensive in situ component and widespread lymphatic invasion). The decision to go ahead with IBR was based on comprehensive preoperative information and advice which was provided in a multidisciplinary setting. An informed consent was obtained from each patient after discussing the details of the operation as well as the possible intraoperative and postoperative sequel.

Preoperative marking: Marking was performed in the holding area while the patient was in the supine standing position. Marking the type of SSM utilized depended on the site of the lesion or lumpectomy scar in relation to the areola. Type I SSM was used for retroareolar and para-areolar lesions. Lateral extension of the incision was sometime necessary to improve exposure to the axillary tail. Type II SSM was used when the superficial tumor or previous biopsy was in proximity to the areola. Type III SSM was used when the superficial tumor or previous incision was remote from the areola. The mark-up was completed by outlining the inframammary sulcus and the extent of LD to be harvested which was based on the dimensions of the skin defect and breast pocket.

Operative technique: With the patient in the supine position, the skin incision was deepened through the superficial fascia. The breast disc was then separated from the overlying skin envelope in the subcutaneous plane taking care to preserve the infra-mammary fold. The pectoralis fascia was then separated from the pectoralis muscle, thus, mobilizing the breast. Through the same incision, an axillary dissection was carried out and the subscapular, thoraco-dorsal and serratus anterior vessels were identified. The serratus anterior branches were ligated and divided to enhance the blood supply to LD and to facilitate the subsequent flap harvest. The axillary contents were then removed en bloc with the breast disc and the attached nipple areola complex and any biopsy scar.

The patient was turned into the lateral position and the LD flap was mobilized through the previously marked transverse elliptical incision.
A layer of fat was harvested on the surface of the flap by developing a deep subcutaneous pocket underneath Scarpa's fascia, helping to compensate for any postoperative flap atrophy. The musculo-fascial attachment of LD was divided around the perimeter of this pocket, resulting in myocutaneous flap with dimensions matching that of the base of the resected breast. Dissection of the deep surface of the flap completed the mobilization and allowed rotation of the flap through the axilla into the empty breast pocket. The donor site was closed over two suction drains.

The patient was then returned to the supine position and the LD tendon was divided to allow greater flap mobility and rotation. The muscular border of the flap was then sutured to the pectoralis major (PM), the anterior rectus sheath and the serratus anterior (SA) fascia around the margins of the resection defect, forming a muscular pocket. Tissue expander was chosen according to dimension, shape and volume of the healthy breast (Mentor smooth round tissue expander with remote injection dome 550cc was the most commonly used). The expander was immersed in a solution of povidone-iodine before insertion into the intermuscular pocket. The inferior margin of the pocket was completed so that the implant became sandwiched between LD anteriorly and PM posteriorly. The procedure including repositioning and redraping was completed in approximately 3.9 hours, ranging from 2.5 to 6 hours, as shown in Table (1). With increasing experience, the procedure was shortened to about 2.5 hours. The blood loss ranged from 450 to 950ml with an average of 668ml. Blood transfusion was required in 6 patients only. The length of hospital stay ranged from 5 to 15 days, with a median of 7 and was largely dependent on the postoperative drainage. Type I SSM was performed in 8 patients (32%), while type II was undertaken in 17 patients (68%). There was no indication for type III SSM. Following discharge, the duration, and the frequency of tissue expansion was dependent on the initial degree of asymmetry, patient’s tolerance, concurrent complications and the timing of adjuvant therapy. No further procedures were required when an expandable implant was used (n=15). Whereas, in 6/10 cases in whom the classic expander was used, exchange of the expander for permanent implant was performed in 6 patients, and 4 patients refused implant insertion.

RESULTS

A total of 25 consecutive women diagnosed with breast cancer stages I or II underwent SSM and IBR during the study period. The majority of patients were premenopausal with a median age of 42 years, ranging from 34 to 48 years. The procedure was performed in 18 patients (72%) for stage I breast cancer and in 7 patients (28%) for stage II disease. Preoperative diagnosis of breast carcinoma was performed in 9 (24%) by histopathological examination of incisional or excisional biopsy, while the diagnosis of carcinoma was confirmed by frozen section examination in 16 patients (64%). The procedure including repositioning and redraping was completed in approximately 3.9 hours, ranging from 2.5 to 6 hours, as shown in Table (1). With increasing experience, the procedure was shortened to about 2.5 hours. The blood loss ranged from 450 to 950ml with an average of 668ml. Blood transfusion was required in 6 patients only. The length of hospital stay ranged from 5 to 15 days, with a median of 7 and was largely dependent on the postoperative drainage. Type I SSM was performed in 8 patients (32%), while type II was undertaken in 17 patients (68%). There was no indication for type III SSM. Following discharge, the duration, and the frequency of tissue expansion was dependent on the initial degree of asymmetry, patient’s tolerance, concurrent complications and the timing of adjuvant therapy. No further procedures were required when an expandable implant was used (n=15). Whereas, in 6/10 cases in whom the classic expander was used, exchange of the expander for permanent implant was performed in 6 patients, and 4 patients refused implant insertion.

Postoperative complications of SSM and immediate reconstruction are summarized in Table (2). Three patients (12%) developed necrosis of the overlying skin envelope. Skin necrosis was managed either by debridement, allowing healing by secondary intention (n=1) or by debridement and secondary suture after deflation of the expander and mobilization of the skin flaps (n=2). This was achieved without disturbing the underlying prosthesis in all patients, and was followed by successful re-expansion of the breast mound. No patient developed LD flap loss. One patient (4%) required expander removal for late postoperative infection 3 months after surgery, during adjuvant chemotherapy. The infection resulted in the formation of a large abscess, thus, we could not salvage the prosthesis. Extrusion of the port site from the skin was encountered in one patient (4%), in whom the prosthesis was salvaged by metal clipping of the port site and undermining the adjacent flaps to cover it. Donor site complications were encountered in 14 patients, one in the form of hematoma and partial wound dehiscence requiring frequent dressing and secondary sutures, 2 patients developed back pain, and one patient had limited arm movement. The most common complication was donor-site seroma, which developed in 10 patients (40%);
however, most of these were aspirated in the clinic, with complete resolution. All patients received adjuvant chemotherapy, while 13 patients received adjuvant irradiation to the reconstructed breast (5000Gy tumor dose in 25 fractions over 5 weeks). The interval between the date of surgery and the first session of adjuvant therapy ranged from 14 to 30 days with a median of 18 days. During the follow-up period with a median of 14.7 months (range 6 to 24 months), there was no evidence of local or distant relapse. The patients evaluated their aesthetic results as: Excellent 5, good 15, fair 4 and poor 1 (Figs. 1-2).

Table (1): Perioperative details.

<table>
<thead>
<tr>
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<th>Median (range)</th>
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<tr>
<td>Operative time (h)</td>
<td>3.9 (2.5-6)</td>
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<tr>
<td>Blood loss (ml)</td>
<td>668 (450-950)</td>
</tr>
<tr>
<td>Hospital stay (days)</td>
<td>7 (5-15)</td>
</tr>
<tr>
<td>Tissue expansion (months)</td>
<td>4 (1-8)</td>
</tr>
<tr>
<td>Follow up (months)</td>
<td>14.7 (6-24)</td>
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Table (2): Postoperative complications.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number (%)</th>
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<tbody>
<tr>
<td>Skin flap necrosis</td>
<td>3 (12%)</td>
</tr>
<tr>
<td>Infection</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Extrusion of port site</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Back pain</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Limited arm movement</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Seroma</td>
<td>10 (40%)</td>
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DISCUSSION

Breast reconstruction has become an integral part of breast cancer treatment, and it is associated with an improvement in the quality of life [1,16]. Immediate breast reconstruction progressed from a small minority to the majority of practice. In the past, reconstruction was often delayed so that the patient living for some time with a flat chest wall would be more appreciative of reconstruction. This approach is now considered unacceptable, and many women regard this attitude as evidence of lack of concern for the psychological impact of mastectomy and as a form of punishment [17]. There is considerable evidence that immediate reconstruction is safe, cost effective and provides the greatest psychological benefit for women [17,18]. The arguments against immediate reconstruction were the ability to follow for the fear to conceal recurrence and delaying adjuvant therapy. Both of these arguments were refuted by several studies [19].

The term SSM was first used by Toth and Lappert [20]. They described preoperative planning of mastectomy incisions to maximize skin preservation and to facilitate breast reconstruction. This procedure removed the breast, nipple-areola complex, previous biopsy incisions and skin overlying superficial tumors. It was adopted for patients with early breast cancer treated by total mastectomy and immediate reconstruction. Several studies have confirmed that SSM is a safe oncologic procedure which can be used for the treatment of early breast cancer. Early local recurrence and postoperative complication rates are similar to those associated with non-SSM [21,22,23].

Several studies have highlighted the cosmetic advantages of SSM in maintaining the essential esthetic elements of the breast, which are extremely difficult to recreate. Of particular importance are the inframammary fold and the
skin envelope as they allow the breast to retain natural projection, ptosis and symmetry. The location of the inframammary fold is maintained, preserving a key element of the breast mound as regards symmetry. The skin envelope is important in determining the size, shape and projection of the reconstructed breast mound. In addition, the inframammary fold and skin envelope allow ptosis to develop in the new breast, regardless of whether autologous tissue or an implant is used [3].

Reconstruction after SSM has been reported using subpectoral implant/expanders [24], or the use of myocutaneous flaps LDMF [25] and TRAM flap [26]. Both techniques facilitate immediate reconstruction of the glandular defect, but the proponents of TRAM flap procedures emphasize the benefits of autogenous reconstruction as it provides tissue most closely simulating the natural appearance and consistency of the breast, and usually avoids the need for additional volume replacement with implant or expanders. Proponents of LDMF reconstruction favor a technique which avoids the major complications of TRAM flap, including complete or partial flap loss, abdominal weakness or herniation, and fat necrosis within the reconstructed breast. This can lead to diagnostic confusion and further surgery in a proportion of cases [6]. The pedicle LDMF seems to be resurging in interest for IBR after SSM, where no skin island or only a small skin island is required [3]. It also has the advantage that the pedicle has been identified and dissected out in patients with SSM and axillary dissection, thus, it is easily and readily transposed after mobilization. The disadvantage of the LDMF is the limited volume available for reconstruction, so it is recommended to insert prosthesis to achieve sufficient volume and adequate projection [27].

In the present study, 25 women with early breast cancer underwent immediate latissimus dorsi myocutaneous flaps with tissue expander after skin sparing mastectomy. There are few studies evaluating the use of LDMF with the consistent use of tissue expanders. In 1988, McCraw and Maxwell [13] reported the results of 82 patients who underwent LDMF breast reconstruction. Many of their patients (n=37) had a radical mastectomy performed prior to reconstruction; the others had a modified radical mastectomy. No patient in the latter series had prior placement of tissue expanders, but rather permanent implants were used in all patients. Significant capsular contractures occurred in 75% of the patients in the radical mastectomy group, and 44 capsulotomies were performed. In the modified radical mastectomy group, 39% developed significant capsular contractures and a total of 40 capsulotomies were performed. The authors theorized that perhaps placing tissue expanders prior to permanent reconstruction would aid in decreasing the rate of capsular contractures. De Mey and his coworkers [28] reviewed 103 cases of LDMF breast reconstruction a year after placement of permanent implants. In the latter study, patients had no prior tissue expansion. Clinically significant capsular contractures were recorded in 27 patients (26%), 26 of whom required revision. They concluded that the use of the LDMF with an implant did not yield better results than that of simple implant reconstruction.

Argenta et al. [29] described a case report of a patient who had undergone a radical mastectomy with prior LDMF reconstruction to replace lost skin. To create an esthetically acceptable breast, the authors first used a tissue expander to allow for the placement of an adequate implant. Three years after this cosmetic reconstruction, the patient was shown to have a soft and freely movable breast. This was truly the first report demonstrating the benefit of pre-expanding the LDMF prior to placement of the permanent implant. Slavin [30] demonstrated the utility of pre-expanding the LDMF prior to transfer (n=2) and after transfer (n=8), with low complication rate and no incidence of capsular contracture. Sternberg et al. [31] retrospectively reviewed 100 consecutive patients who underwent LDMF with tissue expander breast reconstruction after mastectomy, with a mean follow-up of 34.5 months. Only 6 patients required surgery for capsular contracture. Submuscular placement of the prosthesis was associated with a lower incidence of capsular contracture [32] as is povidone-iodine washout [33,34], use of textured implant [35,36], and saline implant [35,37]. In the current study, we adopted the technique of submuscular placement of the prosthesis at the time of LDMF reconstruction. Expandable implants were used in 15 patients, and classic expanders were used in 10 cases. Four patients in the classic expander group refused permanent implant insertion after tissue.
expansion accepting minor degree of asymmetry. Only one patient (4%) developed clinically undetectable capsular contracture 7 months after implant insertion.

Irradiation of the implants has been shown to increase the rate of capsular contracture [38,39], and infection [40]. But the incidence of clinically detectable capsule formation appears to be unrelated to the use of radiotherapy after LDMF reconstruction [41], possibly because the implant lies more deeply under the muscle. Although half of our patients received postoperative radiotherapy, only one patient developed clinically undetectable contracture. Nahabedian et al. [40] found a significant association between implant infection and radiation therapy following breast reconstruction with expanders 20%, compared to 4% infection rate in our series after LDMF coverage.

In the current study, the overall complication rate was similar to other reports of SSM and breast reconstruction [24,25,42]. Skin flap necrosis (12%) and donor site seroma formation (40%) were the most common. The use of tissue expander was critical in salvaging skin necrosis, as full deflation allowed debridement and resuture of the skin edges without tension. This was followed by subsequent reinflation and expansion of the breast mound, thus, avoiding infection and exposure of the expander. It was emphasized that complete muscular coverage of the implant is a major factor in preventing flap necrosis and prosthesis loss [43]. In the latter study, only 4 patients had marginal flap necrosis out of a total of 42. The overall rate of donor site seroma formation in the present study was consistent with previously published reports [14,28,44]. However, most of seromas were aspirated in the clinic, with complete resolution. This led some authors to regard it as a common feature of the procedure, rather than a complication [6].

Patients performed subjective evaluation of overall aesthetic results. Twenty patients were satisfied with the procedure, four patients were relatively unsatisfied. The major causes of dissatisfaction were the relative morbidity, the aesthetic result in comparison to their expectation and the load of regular repeated visits especially when their homes were far from the hospital. One patient was completely unsatisfied due to the poor aesthetic outcome of her prosthesis after removal of her expander due to severe infection.

Thus, we conclude that breast reconstruction with latissimus dorsi myocutaneous flap and a tissue expander provides the surgeon with an outstanding procedure that can be recommended as a technique for IBR after SSM, with a low complication rate and high patient satisfaction.

REFERENCES
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