ORIGINAL ARTICLE

Latissimus Dorsi Myocutaneous Extended Flap in the Reconstruction of Large Chest Wall Defects after Extensive Resections in Breast Pathology

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Received for publication: 13 February 2017; accepted for publication: 25 February 2017
Available online: 14 July 2017

KEYWORDS
Breast; Skin coverage; Breast reconstruction; Myocutaneous flap; Latissimus dorsi

Abstract  Locally advanced breast cancer remains a major problem in developing countries and it is a common presentation of this condition worldwide. In Mexico, 45% of breast cancer cases are diagnosed at locally advanced stages. Cutaneous coverage of the chest wall after extensive resection in breast cancer patients has always been a challenge for the surgical team, and latissimus dorsi flap is therefore widely used for chest wall reconstruction. With the classic technique, the size of the skin flap is usually not larger than 10 cm. For this reason, the use of latissimus dorsi extended flap has been implemented in our institution with the purpose to cover large defects of up to 40 cm. A retrospective study was carried out of all latissimus dorsi extended flap cases over a five-year period. A total of 30 patients have undergone reconstruction with a latissimus dorsi flap, out of which 15 were treated with the extended technique with tumor resections of up to 30 cm being achieved. Mean age was 42.6 years. Recorded tumor dimensions were as large as 30 cm. There was a low rate of complications requiring surgical re-intervention (6.6%) throughout an average 15.8-month follow-up. This technique is reproducible and is carried out in a single surgical procedure, and can be considered for partial or total reconstruction of large esthetic defects for purely palliative or curative purposes. The success of this technique depends on adequate patient selection and multidisciplinary treatment coordinated between breast and plastic surgeons. (creativecommons.org/licenses/by-nc-nd/4.0/).

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doi:10.24875/j.gamo.17000003
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INTRODUCTION

Breast cancer has a great impact on women’s health. It is the most common type of cancer worldwide, with more than one million new cases every year. In spite of an increased incidence, mortality related to this condition has decreased in developed countries. The probability for developing invasive cancer in women is 12.03% during their lifetime (one in every eight women). Annually, approximately 178,480 women are diagnosed with invasive breast cancer in the USA, which represents approximately 32% of all cases of cancer in women. In Mexico, this condition occupies the first place as malignancy-related cause of death since 2006, ousting cervical cancer from this position.

The American Joint Commission on Cancer (AJCC) published the latest revision of its staging system in 2016, which is based on three parameters: tumor size (T), lymph node status (N), and presence of metastasis (M). In this system, patients are clinically (c) or pathologically (p) assigned to a tumor, node and metastasis stage. In general terms, the higher the grade is, the worse the prognosis will be. Unfortunately, the most advanced stages remain a common presentation form in developing countries, and less so in developed countries. In the USA, it accounts for 5-10% of newly diagnosed carcinomas, whereas in our country, according to data of the Institute of Breast Diseases, it accounts for 45% of cases at diagnosis. This includes patients with large tumors with fixation to the chest wall or skin ulceration. It is important to consider that a percentage of these patients are young women (younger than 40 years) who are carriers of voluminous, ulcerated tumors, or with fixation to the chest wall.

In many locally advanced breast cancer cases, initial radical surgery may be indicated since skin and/or chest wall involvement can be extensive, have ulceration and bleeding, or progress on neoadjuvant treatment. It is for this reason that in some cases, extensive resections and reconstructive surgery procedures are required in order to cover vital structures and to ensure adequate wound healing. Some indications include: radionecrosis, tumors affecting the fascia, muscle and occasionally the ribs, and tumors with important bleeding. Resection and skin coverage can also improve the quality of life of patients with advanced breast cancer since it provides a palliative effect in tumors with extensive necrosis.

Chest wall reconstruction after extensive resection has always been a challenge for the surgical team. There are different techniques described for this purpose, each one indicated according to the requirements of the defect to be corrected. The selection of this technique mainly depends on the size of the wound and type of tissue. In addition, patient prognosis should always be considered in decision making. The main objective is to reestablish coverage and protection of intrathoracic structures, sometimes with an acceptable esthetical result.

The latissimus dorsi flap has been widely used for chest wall reconstruction since 1897, and was initially described by the Italian surgeon Tasini. One of the first fasciocutaneous flaps of the thoracoabdominal ipsilateral area was described by Tai, et al. in 1974, and it was irrigated by the superior epigastric artery. Subsequently, and after better understanding of the anterior and lateral abdominal wall vascular anatomy, flaps with subcostal, intercostal, or lumbar irrigation were described, and by the mid 80’s, muscle and skin-muscle flaps became the gold standard for chest wall reconstruction.

Latissimus dorsi flap is widely used in chest wall reconstruction, mainly in breast cancer patients. The thoracodorsal vessels normally provide the blood supply of the pedicle for the latissimus dorsi flap, usually allowing for a large muscle portion to be mobilized. However, the size of the skin portion is often not too large, and the skills to close the donor site dictates the size of the flap; therefore, the adjustable size of the skin is generally not larger than 10 cm in the described classic techniques. For this reason, the classic technique has been modified at the FUCAM Institute of Breast Diseases in order to obtain larger skin flaps that allow for large chest wall defects to be reconstructed after breast cancer-related resections.

MATERIAL AND METHODS

A retrospective study was carried out using the prospective database of the FUCAM Institute of Breast Diseases of all identified cases of reconstruction with latissimus dorsi extended flap from January 2011 through June 2016. Assessment on patient demographics, tumor size, and diagnosis as well as the rate and type of complications are presented. In addition, the employed surgical technique is described and analyzed.

Preoperative planning

The latissimus dorsi extended flap is intended to provide skin coverage with or without breast reconstruction criteria, without the need to demarcate a skin bridge between the dorsal region and the chest anterior wall.

The first step is the marking of the patient by the surgeon who will perform the resection together with the surgeon in charge of the reconstruction in order to identify the limits of the resection zone, which will depend on the extension of the pathology to be treated (Fig. 1 A). This marking is made using the same criteria as for conventional latissimus dorsi flap, with the anatomic variation that the lower lateral border of the defect will become the flap distant portion, since blood supply is determined by perforating arteries, the perforator vessels of which project to the anterior portion, which results in extended skin islands of up to 30 cm long at their longest axis (Fig. 1 B, C).

Surgical technique

Once the oncological resection is concluded, the defect to be reconstructed is evaluated. The patient is placed in the lateral decubitus position and final marking of the skin island is performed, where the lower lateral border of the defect will become the anterior vertex of the skin island.

The skin island dissection proceeds until the plane of the latissimus dorsi muscle fascia is reached, where the superior portion of this flap is dissected and freed in the lateral-to-medial direction towards the thoracic spine apophyses and the lateral and inferior edge of the scapula until the...
axillary portion is reached. In this way, latissimus dorsi muscle vision is obtained from above the skin island. The same is performed on the inferior border of the island, only to take the inferior edge of the *latissimus dorsi*, with a muscle extension of between 5-7 cm. Once the entire extension of the latissimus dorsi is freed, its dissection is carried out from the medial-to-lateral direction, always under observation and caution only to dissect this muscle, especially respecting deep muscle planes. The upper portion of the chest lateral flap is then freed, exposing the lateral side, which enables the lifting of the flap to be carried out without a skin pocket, a usual problem of the traditional technique (Fig. 1 D).

The dissection is continued with insertions following until the axillary edge. The emergence of the thoracodorsal artery can be observed on the posterior side of the flap, which is where the dissection concludes, with this point being taken as an axis for rotation of the entire flap. The rotation movement is carried out in the posterior-to-anterior direction for skin coverage projection (Fig. 1 E, F).

The dorsal region reconstruction is characterized by the superior flap advancement following an inferior-medial tra-
Reconstruction with latissimus dorsi myocutaneous flap

The patient is then rotated to the ventral decubitus position. Donor site closure is carried out by advancement and rotation of the superior flap in the anterior and inferior direction, trying to reduce the donor area and making the closure of the skin island territory, thus leaving a single result in continuity to the skin island, with a single drainage placed in the dorsal region and another by counter-aperture in the anterior region (Fig. 1 G, H).

RESULTS

Over a five-year period, a total of 15 patients with advanced breast cancer or malignant phyllodes tumor (Fig. 2 and 3) were treated with radical and total mastectomy, respectively, with latissimus dorsi myocutaneous extended flap reconstruction. Mean age was 42.6 years (range: 29-58) (Table 1).

Tumor dimension ranged from 5.3 to 30 cm, with a mean of 14.8 cm at the longest diameter (Table 1). Average follow-up was 15.8 months (range: 1-42) (Table 2).

The main indication for surgery was locally advanced breast cancer in 73% (11) of patients, with ductal infiltrating carcinoma being the predominant diagnosis (66%), followed by malignant phyllodes tumor (26%) and, finally, by a case of metaplastic carcinoma.

In no case was it necessary for a rib cage resection to be performed, and during follow-up, a rate of local complications of 33% (5/15 patients) was found, with two patients experiencing more than one complication, mainly partial necrosis of the flap or dehiscence of some border. No total flap loss was reported. Most complications were minor and limited, with 60% being solved in the office (Table 1), and only one patient requiring reoperation (6.6%). All patients had adequate and satisfactory chest wall coverage, with no deaths being associated with the procedure.

DISCUSSION AND CONCLUSIONS

The first reports on the prognosis of locally advanced carcinoma were described by Haagensen and Scout in 1940. Using modified radical mastectomy as single therapeutic measure, there was recurrence in 46% and five-year survival was only 6%25. In view of this experience, locally advanced carcinoma was initially classified as inoperable when there were complications such as extensive skin edema or satellite lesions, intercostal nodules, edema of the arm, supraclavicular metastasis or inflammatory cancer, ulceration, edema of the skin, fixation to pectoralis muscle, and bulky axillary adenopathy, which are poor prognosis factors and not necessarily un-resectability criteria. The role of reconstructive surgery in the treatment of locally advanced cancer is a topic of increasing interest owing to the development of innovative techniques that allow the surgeon to perform broad oncological resections, which previously would have been regarded as being unfeasible24.

<p>| Table 1. Age, tumor characteristics and complications |</p>
<table>
<thead>
<tr>
<th>Age</th>
<th>Diagnosis</th>
<th>Stage</th>
<th>Breast</th>
<th>Tumor size</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37</td>
<td>IDC</td>
<td>T3 N3 M0</td>
<td>R</td>
<td>12 x 15 cm</td>
</tr>
<tr>
<td>2</td>
<td>53</td>
<td>IDC</td>
<td>T4d N1 M0</td>
<td>L</td>
<td>12.5 cm</td>
</tr>
<tr>
<td>3</td>
<td>58</td>
<td>IDC</td>
<td>T4b N0 M0</td>
<td>R</td>
<td>16 x 12 cm</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
<td>IDC</td>
<td>T4b N2 M0</td>
<td>L</td>
<td>17 cm</td>
</tr>
<tr>
<td>5</td>
<td>37</td>
<td>IDC</td>
<td>T4d N3 M0</td>
<td>R</td>
<td>30 cm*</td>
</tr>
<tr>
<td>6</td>
<td>43</td>
<td>IDC</td>
<td>T4d N3 M1</td>
<td>L</td>
<td>13.4 cm</td>
</tr>
<tr>
<td>7</td>
<td>46</td>
<td>MP</td>
<td>—</td>
<td>L</td>
<td>23 x 20 cm</td>
</tr>
<tr>
<td>8</td>
<td>43</td>
<td>MP</td>
<td>—</td>
<td>R</td>
<td>30 x 26 cm</td>
</tr>
<tr>
<td>9</td>
<td>36</td>
<td>MP</td>
<td>—</td>
<td>R</td>
<td>24 cm</td>
</tr>
<tr>
<td>10</td>
<td>33</td>
<td>IDC</td>
<td>T4b N3 M1</td>
<td>L</td>
<td>6 x 6 cm</td>
</tr>
<tr>
<td>11</td>
<td>29</td>
<td>MPC</td>
<td>T4d N2 Mo</td>
<td>R</td>
<td>8.5 cm</td>
</tr>
<tr>
<td>12</td>
<td>44</td>
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<td>—</td>
<td>R</td>
<td>7.5 x 6.5 cm</td>
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<tr>
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<td>MP</td>
<td>—</td>
<td>L</td>
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<tr>
<td>14</td>
<td>54</td>
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<tr>
<td>15</td>
<td>37</td>
<td>IDC</td>
<td>T4b N2 M0</td>
<td>R</td>
<td>5.3 cm</td>
</tr>
</tbody>
</table>

| Table 2. Transoperative hemorrhage, surgical time and follow-up |
|---------------------|---------------------|
|                      | Mean               |
| Transoperative hemorrhage | 653 cc (100-1,700) |
| Surgical time         | 255 min (180-330)  |
| Follow-up             | 15.8 months (1-42) |
Myocutaneous, skin, or entirely muscle flaps have been shown to be acceptable alternatives for reconstruction in large defects. The selection of the technique will depend on several factors including the defect size, status of the skin (peri- or post-radiotherapy), the surgeon’s skills, and available resources (microvascular surgery, skin prostheses, vacuum system, etc.).

In general, initial surgical treatment in patients with locally advanced breast cancer is considered to be contraindicated. However, in the vast majority of our patients it is performed for palliative purposes, therefore usually being reserved to control local symptoms of advanced disease (pain, bleeding, ulceration, infection/necrosis). The latissimus dorsi extended flap has the advantage of being applicable to massive skin defects as large as 40 cm by replacing all cosmetic units of the breast regardless of the gland volume, which results in scarring free of skin bridges and without apparent physical sequel in the ranges of motion.

We are aware that a broad series of cases is required to appraise the sequels, complications, and ideal characteristics of the patients to be treated. With regard to the percentage of postsurgical complications, the vast majority was minor and limited, and probably associated either with clinical conditions or with comorbidities of our patients. In the literature we found complication rates similar to ours; for example, in 2004, Raymond carried out a 10-year review where he published a reoperation rate of 4%, associated with 16% of general complications (wound-healing delay, infections, or hematomas); on the other hand, Persichetti, et al. reports a complication rate of 22%, associated with 5% of reoperations.

This technique demands experience in the performance of myocutaneous flaps, but it is reproducible and is carried out in a single surgical intervention; it can be regarded as an excellent option in selected cases for partial or total reconstruction of chest wall large defects, for palliative or, in some cases, curative purposes. With this technique, covering resection areas of up to 40 cm is possible. We are convinced that the success of this technique depends on adequate patient selection and multidisciplinary, experienced treatment, coordinated between breast and plastic surgeons.

**DISCLOSURE OF INTEREST**

The authors have no personal or financial relationships that might inappropriately influence (bias) on their work.

**REFERENCES**


