

Case Series

Burow's triangle advancement flap: a reliable oncoplastic surgery for upper/upper inner quadrant breast cancer

Mohamed Ebrahim El Dahshan*, Ayman Abdulhameid Elnemr

Department of Surgery, Faculty of Medicine, Tanta University Hospital, Tanta, Egypt

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*Correspondence:

Dr. Mohamed Ebrahim El Dahshan,
E-mail: Dr.eldahshan85@gmail.com

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ABSTRACT

The oncologic outcome of breast-conserving surgery (BCS) is equivalent to mastectomy, when free margins are achieved and adjuvant radiotherapy of the operated breast is applied. Oncoplastic breast conserving techniques combine two aspects: oncological safety with a resection of the tumor with free margins and optimal aesthetic aspects. The modified Burow's triangle advancement flap for upper/upper Inner quadrant breast cancer is a safe and effective technique to manage tumors at this complex location. It provides adequate oncological margins, good cosmetic results, and contralateral symmetry, with complication rates similar to those of standard conservative surgery.

Keywords: Breast conserving, Oncoplastic, Oncologic, Conservative surgery

INTRODUCTION

The most common cancer among women worldwide is breast cancer, which causes 14% of all cancer-related deaths.^{1,2} Major treatment progress has been achieved over the past 30 years, leading to improved survival.^{3,4}

Oncoplastic breast surgery (OBS) was a term originally coined in 1980s to reflect the integration of chemotherapy and radiotherapy planning with conservative forms of breast surgery for more advanced disease. Its aim was to achieve better aesthetic and quality of life outcomes compared to traditional approaches with less morbidity.⁵

OBS expands the indications and possibilities of BCS by allowing for a wider cancer resection than lumpectomy would typically entail and an opportunity to improve breast contour and aesthetic outcomes while avoiding mastectomy and its consequences.⁶

The oncologic outcome of BCS is equivalent to mastectomy, when free margins are achieved and adjuvant radiotherapy of the operated breast is applied.⁷⁻¹¹

Oncoplastic breast conserving techniques combine two aspects: oncological safety with a resection of the tumor with free margins and optimal aesthetic aspects.¹²⁻¹⁴

BCS including axillary treatment and radiotherapy has become the standard of care for most breast cancer patients, reaching long-term survival rates similar to those of radical mastectomy.¹⁵⁻¹⁶

However, in many cases, the cosmetic results are unsatisfactory given the percentage of breast volume to be resected or its location, leading to severe breast deformities, skin retraction, nipple-areola complex (NAC) distortion or deviation, and secondary contralateral breast asymmetry.¹¹⁻¹⁷

Even with many oncoplastic techniques, some patients will still need a total mastectomy to obtain satisfactory cosmetic or adequate oncological results.¹⁸

Tumors located at the superior edge of the upper quadrant or at the upper inner quadrant usually replace the whole breast thickness, compromising the anterior margin and

making it difficult to preserve the skin. Tumors at these locations are a challenge for conservative surgery, whenever necessary to respect the entire breast thickness, as it might produce secondary glandular deformity, high risk of positive tumor margins, and upper NAC deviation.¹⁹

We present a modified triangular advancement flap for breast cancer to reserve the breast in difficult cases.

The present study aimed to assess the reliability and safety of Burow's triangular advancement flap. This technique, usually described for the correction of facial defects, can be applied to the breast so as to preserve it in difficult cases, with minimal effect on breast volume and mostly without need of contralateral breast symmetrization.²⁰⁻²⁶

CASE SERIES

This prospective study was conducted on ten patients who underwent BCS followed by immediate reconstruction employing Burow's triangle advancement flap were operated on in the surgical oncology unit at department of general surgery. Then completed adjuvant therapy in the medical oncology department, faculty of medicine; Tanta university hospital, from January 2019 to December 2021.

Inclusion criteria for this study were as follows: (1) breast cancer patients who were candidates for BCS, (2) tumor size of no more than 5 cm in transverse diameter in a small-to-moderate-sized breast, and (3) the tumors were located in the upper/upper inner quadrant.

All ten patients were diagnosed with breast cancer and managed by a multidisciplinary breast cancer team. They were submitted to conventional preoperative examinations and had a previous percutaneous biopsy, with histological and immunohistochemical (IHC) analysis for hormone receptor status, HER2, and Ki67. Clinical evaluation was performed to determine the location of the tumor in the breast, distance to the skin, possible multicentricity, and potential axillary involvement.

Imaging studies included mammogram, ultrasound, computed tomography (CT) scan, and bone scan to identify local and distant involvement. The indication for primary conservative surgery was based on the tumor/breast ratio and IHC results. Patients with cT3 tumors received neoadjuvant chemotherapy. Other factors were taken into account for surgical planning, such as previous breast surgery that could hinder adequate local blood supply for advancement glandular flaps. Associated risk factors for local complications, such as diabetes, active smoking, and obesity, were recorded. Furthermore, contralateral breast shape was considered when evaluating the need for symmetrization surgery.

Burow triangle flap technique was applied to the ten patients

Surgical technique

Skin markings were made on patients in a standing position right before surgery. The inframammary fold, sternal midline, breast boundaries, and tumor location were marked. The nipple position was not changed. A curved line with inferior concavity was drawn from the mid-axillary line with the arm abducted 90° extending medially parallel to the clavicle, 1-2 cm above the tumor location in the breast. Next, a triangle was drawn with the upper base in this line. The base width depended on the tumor size and should have at least 1 cm of macroscopic safe surgical margins. The triangle vertex was drawn long down in relation to the lateral margin of the tumor toward the NAC in order to achieve posterior orderly and harmonic breast rotation without deformity of central breast projection. At the axillary region, a small upside-down triangle (Burow's triangle) was drawn to enable access to the axilla for either sentinel lymph node biopsy or axillary dissection, which later allowed skin compensation when the rotation advancement dermoglandular flap was done (Figure 1).

Under general anesthesia, a triangular incision was performed with resection of the main triangle; including the whole breast thickness, the tumor, its overlaid skin and the pectoral fascia. Histologic tumor margins were assessed by a pathologist intra-operatively. Free margins were defined as no tumor cells at the inked margin of the specimen for invasive carcinoma and a 2 mm margin for ductal carcinoma *in situ*.



Figure 1: Skin marking of Burow triangle advancement flap.

Tumor bed was marked with vascular clips. A simultaneous axillary dissection was carried out through the small triangular resection drawn before. The curved line incision was completed between both triangles straight to the pectoralis major muscle. Afterward, this lateral dermoglandular flap was raised from the muscle just enough to allow its advancement toward the medial border of the main triangle resected before.

Accurate hemostasis was performed, 2 tube non suction drains were placed on the breast and axilla. The advancement flap was closed in 2 layers with 2-0 interrupted absorbable Vicryl® sutures. Skin was closed using 4/0 prolene sutures or skin staplers (Figure 2). Wounds were dressed with gauze. Patients were discharged the day after surgery. Drains were removed 2-7 days after surgery.



Figure 2: Closure of wound using skin stapler or prolene sutures.

Postoperative assessment

Weekly clinical examinations were performed until the final histopathology was received. Oncological treatments were completed according to national protocols, with chemotherapy, radiotherapy, biological treatment, and hormonal therapy if needed.

Cosmetic evaluation

Cosmetic outcomes were assessed using photographic documentation of each patient taken preoperatively and 2-12 months post-surgery and radiotherapy. Cosmetic outcome was measured by both physician and patient evaluation according to modified Harvard-Harris cosmetic scale (Table 1).

The mean patient age at diagnosis was 52.6 years (range 37-72), the median age was 51 years. The mean body mass index (BMI) was 25.2 (range 19-32). All patients were symptomatic at diagnosis (palpable mass).

Histological reports showed invasive ductal carcinoma in all patients. At diagnosis, three patients had stage I cancer (case 2, 5 and 8), and seven patients had stage II. The mean initial clinical tumor size was 2.77 cm (range 1.5-4.2 cm). Two patients received neoadjuvant chemotherapy (case 7, 10), one with pathological complete response (case 10), and the other patient with pathological partial response (case 7). No patient required contralateral breast symmetrization.

The mean pathological tumor size was 2.10 cm (range 0.7-3.4). The mean resected specimen weight was 63.2 gm (range 47-82 gm). All patients had adequate histological margins on final pathologic reports, and none required re-excision surgery before adjuvant radiotherapy.

Table 1: Modified Harvard-Harris cosmetic scale.

Poor	Fair	Good	Excellent
When compared with baseline image, there is marked change in the appearance of the breast involving more than one-quarter of the breast tissue. The skin change sare very obvious. There is severe scarring and thickening of the breast. In retrospect, mastectomy would have been a better option	When compared with baseline image, there is moderate deformity with obvious difference in the size and shape of breast. This change involves one quarter or less of the breast. There is moderate thickening or scar tissue of the skin and the breast and obvious color changes	When compared with the baseline image, there is mild asymmetry or slight difference in the size or shape of the breast Mild reddening or darkening of the breast. The thickening or scar tissue with in the breast causes only a mild change in the shape	When compared with the baseline image, there is minimal or no difference in size or shape or consistency of the breast. There may be mild thickening or scar tissue with in the breast or skin, but not enough to change the appearance

According to the Harris scale, the cosmetic result was considered excellent in 30% of cases (case 2, 5 and 8), good in 40% (case 3, 6, 7 and 10), fair in 20% (case 1, 9), and poor in 10% (case 4). No major complications were reported. Two patients had minor wound dehiscence, requiring only outpatient management (case 7, 10).

Median follow-up was 11 months (range 2-26 months). To date, no patient or distant metastasis. Among these patients, no deaths have been reported (Table 2).

Table 2: Characteristics of patients who underwent breast surgery with modified Burow's triangle technique, (n=10).

Variables	N
Median age (In year, range)	51 (37-72)
Mean initial tumor size (cm, range)	2.77 (1.5-4.2)
Mean pathological size (cm, range)	2.1 (0.7-3.4)
Mean excised breast volume (gm, range)	63.2 (47-82)
Mean BMI (kg/m ² range)	25.2 (19-32)
Histological type (core biopsy)	
Invasive ductal carcinoma	10
Invasive lobular carcinoma	0
Stage at diagnosis	
Stage 0 (<i>in situ</i>)	0
Stage I	3
Stage II	7
Stage III	0
Stage IV	0
Median follow-up (range, months)	11 (2-26)
Local recurrence	0
Distant metastasis	0

DISCUSSION

Oncoplastic surgery increases the indication for BCS in case of large tumors or tumors at difficult locations of the breast, making it possible to obtain better cosmetic results and adequate surgical margins.^{11,18,27,28}

Tumors located at the upper quadrants can be excised and repaired by different oncoplastic techniques, including glandular reshaping or undermining, inferior pedicle mammoplasty, round-block, racket resection, batwing technique, among others.^{27,29-32} The main issues of all these techniques are repositioning the areola at the center of the new breast and avoiding a filling defect due to insufficient tissue after reshaping.

However, in some areas, repairing partial mastectomy defects is extremely difficult, like in the site known as "no man's land" which refers to tumors located closer than 16 cm from the sternal notch and/or less than 7 cm from the sternal midline.³³

Tumors in this area usually leave a significant filling defect, especially if the skin section must be excised. The

solution comes with volume replacement techniques, such as the latissimus dorsi flap and the more recently described immediate fat grafting, which shows promising results.^{34,35}

The application of Burow's triangle advancement flap first described in the early 19th century for facial defects to the breast has become a fast and straightforward technique, allowing resecting the whole thickness of the affected breast quadrant, including its skin, and partial breast reconstruction with a volume displacement approach involving lateral dermoglandular rotation and advancement flap.³⁶⁻³⁸ Burow's triangle corresponds to a compensatory excision of redundant tissue at the proximal edge of any advancement flap in order to improve cosmesis and avoid standing cones.²²

The size of the Burow's triangle can be reduced by extending the length of the flap, especially useful when resecting breast tumors at the "no man's land area" and when access to the axilla is necessary. The advantages of this flap include a wide, well-vascularized pedicle and the

ability to place the compensatory triangle relatively far from the oncological defect, allowing good access to the axilla.²²⁻²⁶

If the flap is judiciously planned, the breast shape can be preserved without major NAC displacement. Operative time does not increase significantly from a standard BCS. Since symmetrization surgery is not required, a second surgical team is not needed. The complication rate is low.

In our cohort, only two partial wound dehiscence was described, requiring outpatient treatment. A disadvantage of this technique is the large scar, sometimes in a visible area; however, the cosmetic result was excellent or good in most patients according to the Harris scale (70%).

No patient required conversion to total mastectomy. This could be explained by the adequate preoperative breast assessment with images, the careful management of margins during surgery, and the concept that oncoplastic techniques are associated with lower incidence of positive margins and secondary reoperations.^{1,10,39}

By applying Burow's triangle advancement flap we can avoid converting these surgeries to total mastectomy and posterior breast reconstruction, reducing the high postoperative complication rate associated with breast reconstruction and posterior radiotherapy.⁴⁰

This technique allows performing wider excisions and therefore, obtaining adequate surgical margins. The local breast recurrence rate should be as low or even lower than that of conventional partial mastectomy.^{1,10}

In our study, to date, none of them has had any local recurrence or distant metastasis showing the safety of this technique.⁴¹

CONCLUSION

Local breast advancement flaps are an essential part of partial breast reconstruction tools, with which every breast surgeon should be familiar. The Burow's triangle advancement flap offers significant benefits, such as a straightforward and fast coverage of upper inner surgical breast defects. This flap allows an excellent matching of skin color, texture, thickness, shape, volume, and sensibility regarding the original breast and very close similarity to the contralateral one, often avoiding the need for a symmetrization surgery. The compensatory triangle can be hidden in the axillary region. Its main disadvantage is the evident geometrical scar outside the esthetic landmarks of the breast, which must be understood and accepted by the patient. Fortunately, most of the time, the scars partially fade after radiotherapy. Modified Burow's triangle advancement flap is a technique that can be safely used in breast surgery, with adequate oncological and cosmetic outcomes, avoiding total mastectomy and giving more patients the opportunity to have a BCS.

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