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Cross Oncoplastic Breast Surgery Technique; A Good Choice for Tumors Located Far From Nipple Areola Complex

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ABSTRACT

Background: Although various Oncoplastic Breast Surgery (OBS) techniques have been introduced for various sizes of the breast and locations of tumors, surgeons are still faced with serious challenges for the tumors which have developed in special anatomic parts of the breast. A good instance of these challenges is with the tumors located far from the Nipple Areola Complex (NAC) especially in the upper inner quadrant. We aimed to assess the application of the newly introduced OBS technique (Cross Technique) for tumors in these locations.

Methods: The data of 95 patients who were suffering from breast cancer and operated with the Cross method were assessed in this prospective survey. Data was gathered regarding demographic variables, the size, location, and pathologic characteristics of tumors as well as the patients' BMI, breast circumference, and cup size. The patients were recruited to the study according to the inclusion and exclusion criteria and the study protocol which was approved by the research deputy surgery department in Tehran University of Medical Sciences. The data was then presented in a descriptive method.

Results: Ninety-five patients underwent oncoplastic breast surgery using the Cross method in a span of time from November 2015 to May 2018. The patients had a mean age of 48.2 (ranging from 25 to 70 years) as well as a wide range of breast circumferences and cup sizes (70 to 95 for the breast circumferences and A to E for the cup size). Clear surgical margins were obtained in 93 cases according to the permanent pathology reports. Complications were seen in 5 patients (2 slight hematoma and three ischemic skin flaps) all of which were managed conservatively. The most common histologic types of tumors were insitu and invasive ductal carcinoma (DCIS-IDC). The mean tumor size was 22.7 mm with a standard deviation of 9.2mm and most of the tumors were positive for estrogen receptor (ER)/progesterone receptor (PR). In the surgery of axilla, an average of six lymph nodes were excised while 22 patients were found out to have axillary lymph node involvement.

Conclusion: Not only is the Cross method is not only a reliable choice for tumors located in the upper inner quadrant (UIQ), but it can also be applied safely for the tumors in upper outer quadrant (UOQ) and upper central part of the breast, although the best application for the technique is the tumors located far from the nipple areola complex.

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Introduction

Although various treatment options have been proposed for breast cancer in recent years, surgery is still regarded as a major method for the most common cancer among women.^{1,2} Traditionally, mastectomy was the gold standard surgery method, but many



innovative approaches were proposed afterwards.³ Oncoplastic breast surgery (OBS) techniques are among the approaches that combine tumor removal procedure with a plastic surgery to reshape the breast.

OBS techniques are categorized into two different classes, corresponding to the mass of breast tissue being removed.⁴ Although various OBS techniques have been introduced for various sizes of the breast and locations of tumors, surgeons are still facing with serious challenges in certain cases.⁵ For instance, in cases with small-size breasts and tumors far from the nipple-areola complex (NAC), breast-conserving surgery can be quite challenging especially for the tumors in the upper-inner part of the breast.⁶ We have recently introduced a novel technique, called the “Cross” technique,⁷ to overcome some of the limitations of the current OBS techniques performed on tumors in the upper inner quadrant (UIQ).

The current study aimed to investigate the outcomes of the Cross technique in a larger population of breast cancer patients with tumors in the UIQ. Moreover, we have suggested the Cross technique as a suitable approach for tumors located far from NAC complex in regions other than the UIQ.

Methods

The current work is a prospective study on 95 female with individuals affected by breast cancer, who were operated using the Cross method by the main author of this article. Data was gathered regarding demographic variables, the size, location, and pathologic characteristics of tumors, patients' BMI, breast circumferences, and cup size. The protocol of the study has been approved by the research deputy of the department of surgery in Tehran University of Medical Sciences. Advantages and limitations of the planned operation (the Cross technique) were described in detail for all patients in outpatient clinic. The patients had enough time to decide whether or not to participate in this study and to be operated using the Cross technique, having been fully informed of the advantages and limitations of this novel OBS technique. Finally, the patients submitted their written informed consent were selected to be included in this study.

The inclusion criteria were as follows: 1) Breast carcinoma had to be proved by the pathology report, 2) The tumor being located far from the distance between the peripheral part of the breast and the nipple was measured and divided to three parts and only the tumors located in the far one third were included, 3) The patient had to be an applicant for the breast-conserving surgery and further oncoplastic repair, and 4) The patients also were to give their consent to be operated using the Cross technique. The exclusion criteria were; 1) having previous sessions of radiotherapy, 2) having a recurrent tumor, 3) patients with important genetic mutations like BRCA, 4) any indications for mastectomy, and 5)

patients with large breast cup sizes, who had expressed their consent to be operated using level two oncoplastic surgery (reductive type).

Surgical technique

The first step to prepare the patient for surgery was drawing the map of surgery on the breast in terms of tumor location as well as the proposed incision line in upright position. The skin incision line was drawn in a curvilinear pattern as close as possible to the areolar margin. This is in fact one of the most critical steps while using the Cross method, since an incision above the “Décolleté line” would result in a scar that is exposed by the neckline of the patient's clothing. Surgery was then started by making the incision over the curvilinear line. Afterwards, the skin and subcutaneous tissue were dissected through Cooper ligament to separate the breast tissue from the overlying skin and subcutaneous tissue. The dissection was fan-shaped and performed in the quadrant where the tumor was located. Resection of the tumor was performed by cutting the breast tissue with safe margins of 1 cm with an elliptical incision in radial direction. Then, the tumor was removed with secured margins and sent to the pathology laboratory. The frozen section assessments were used only if there were suspicious margins of tumoral involvement. Since the location of the tumor in most cases was not exactly under the skin incision, we placed metallic clips in the bed of the tumor resection to enable the radiation oncologist to accurately localize the tumor for radiation therapy. If the breast tissue defect was hard to be closed by the sutures. This maneuver helped the surgeon to do tension-free closure of the defect by facilitating the tissue flaps to slide on the pectoral plan. Then, the resection site was repaired in radial direction. As the next step of the operation, a closed suction drainage system was placed in the dissected area wherever the area of dissection was considerably large. Finally, subcutaneous tissue and skin were sutured properly with absorbable surgical sutures in circumareolar direction. The detailed methodology of the Cross technique is described in the original paper published by our team, introducing this novel approach.⁷

Statistical analysis

We analyzed the demographic data by IBM SPSS Statistics for Windows, version 22 (IBM Corp., Armonk, N.Y., USA). We verified the compliance of variables with normal distribution through probability graphics and the Shapiro-Wilk test. Data is presented as median, mean with standard deviation, or frequency.

Results

Nighty-five patients underwent oncoplastic breast surgery using the Cross method from November 2015 to May 2018. The demographic data



of patients are presented in Table 1. Patients had a mean age of 48.2 ranging from 25 to 70 years. The breast circumference and cup size were measured. The range of measurements of breast circumference was from 70 to 95 and there were 6, 46, 33, 3 and 7 patients with brassiere cup sizes of cup sizes B, C, D and E respectively.

The clear surgical margins was obtained in 93 cases according to the permanent pathology reports. Five patients showed post-op complications. One patient showed skin flap ischemia, two others had small area of skin flap necrosis and the last two cases developed with slight hematoma after the operation. None of these patients needed reoperation and their complications were fully managed conservatively. No complication was observed in the remaining 90 patients.

Table 1. Demographic features of patients.

Demographic features		Patient (n=277)
Age in years, mean \pm SD		48.2 \pm 11.6
Breast size, median (min-max)		80.0 (70-95)
Greater diameter in cm, mean \pm SD		23.8 \pm 5.1
Specimen weight, mean \pm SD		82.6 \pm 46.5
Laterality	Left	53 (55.8%)
	Right	41 (43.2%)
	Bilateral	1 (1.1%)
Tumor location	Upper outer quadrant	36 (37.9%)
	Upper inner quadrant	17 (17.9%)
	Lower outer quadrant	2 (2.1%)
	Lower inner quadrant	1 (1.1%)
	Upper central	34 (35.8%)
	True lateral	1 (1.1%)
	True medial	4 (4.2%)



Figure 1. The patient underwent oncoplastic breast surgery using the Cross technique in UOQ of the right breast after neoadjuvant chemotherapy. A and B: Before surgery (with wire localization). C and D: 20 days after surgery (before radiotherapy). E: 30 days after radiotherapy.



Figure 1 shows the breasts of a patient operated without any subsequent complications before and after the surgery and radiotherapy.

Pathologic features of the tumors are presented in table 2. The most common histologic type was insitu and invasive ductal carcinoma (DCIS-IDC). The mean tumor size was 22.7 mm with standard deviation of 9.2 mm, and most of the tumors were positive for estrogen receptor (ER)/progesterone receptor (PR). In the surgery of axilla, an average of 6 lymph nodes were excised and 22 patients were proved to have lymph node involvement

Table 2. Pathologic features of tumors.

	Features	Patients (n=95)
Tumor pathologies	IDC	29 (30.5%)
	DCIS	3 (3.2%)
	DCIS-IDC	46 (48.4%)
	ILC	4 (4.2%)
	DCIS-LCIS	39 (41.1%)
	Atypia	1 (1.1%)
	NA	10 (10.6%)
Receptor Status	ER positive	59 (62.1%)
	PR positive	56 (58.9%)
	HER2 positive	17 (17.9%)
Lymph node involvement	N0	52 (54.7%)
	N1	11 (11.6%)
	N2	10 (10.5%)
	NA	22 (23.2%)
Therapies	Neoadjuvant chemotherapy	14 (14.7%)
	Adjuvant chemotherapy	77 (81.1%)
	Adjuvant radiotherapy	91 (95.8%)
	Adjuvant hormone-therapy	61 (64.2%)
	Adjuvant target- therapy	18 (18.9%)

Discussion

We studied the outcome of a novel OBS method called the "Cross technique" in 95 patients with breast cancer. All patients enrolled in this study had tumors located in regions far from the NAC. No patients in this study experienced any kind serious complications that needed to be managed by re-surgery.

A line of studies has proved that OBS is a reliable choice in terms of survival rate and cosmetic outcomes, compared to traditional methods.^{8,9} However, the cosmetic outcome of this kind of surgery is affected by several factors, of which the most prominent is the tumor location. Various techniques have been proposed for tumors located in regions far from the NAC (UOQ, UIQ and upper central part), which are considered less favorable parts. From this point of view, Grisotti et al consider UIQ as "no man's land" where surgeries would probably lead to an NAC displacement and a visible scar.¹⁰ For instance, a study by Anderson and colleagues have demonstrated batwing mastopexy as a reproducible method.¹¹ However, Batwing method has limitations such as a risk of NAC displacement and breast deformity. The Cross method was originally described to be performed on tumors in the UIQ, causing minimum deformity in the breast.⁷ In this study, we considered the Cross method to be performed on any tumor that lies far from NAC

complex, especially in patients with small-size breasts.

A challenge to the planning of breast conserving surgeries is the resection of overlying skin of the tumor.¹² The challenge is even more serious when the tumor is near the overlying skin. Studies have shown that the application of neo-adjuvant chemotherapy can make such tumors proper candidate for breast-conserving surgeries by decreasing the size of the tumors and increasing the distance of the tumor from the skin. So, in most patients the resection of the tumor overlying skin can be safely omitted during the operation.¹³ On the other hand, the traditional point of view was that for breast conserving surgery the skin incision should usually be placed over the tumor, however, in the Cross method the skin incision can be made within a considerable distance from the tumor, explicitly below the "Décolleté line".

Furthermore, using a single incision line in the Cross technique and avoiding sophisticated surgical incisions as happens in some other oncoplastic surgery techniques like lateral oncoplasty can have major advantages such as less tissue manipulation as well as a shorter time of healing and recovery for the patients. It has been shown that up to 18% of the patients were not completely satisfied with the cosmetic results of OBS techniques.¹⁴ Multiple studies have shown that a major factor influencing patients satisfaction is the length of the scar. One of the advantages of the Cross method is that it provides a decent access to the tumor and thus leads to a single and relatively small scar.

The other important factor for patients' satisfaction is the operation on the contralateral breast. In most reductive types of oncoplastic procedures, the patient usually has to have another operation on her other breast for the sake of symmetry. Nevertheless, most of the patients do not wish to undergo other surgeries to make the other breast symmetric. Even with respect to this viewpoint, the Cross technique is a favorable procedure for petotic and large breasts (larger than C breast) specially in case of patients who do not wish to be operated for the contralateral breast.

As an oncologic measure, the reoperation for the positive margins is of utmost importance. On the other hand, requiring a second surgery is another issue that would reduce patients' satisfaction dramatically. The average rate of positive margins ranges from 20 to 40 percent after the oncoplastic surgery in different studies.^{15,16} In the present study this rate was just two percent and only two patients needed second surgery. Besides, this technique actually provides the surgeon with an excellent surgical exposure and a strong possibility to palpate and incise the breast tissue containing the tumor and its margins. Moreover, effective dissections enable surgeons to confidently perform wider resections.

As a conclusion, in the current study, we



demonstrated the outcome as well as the advantages of the newly introduced OBS method, called the Cross technique. We showed that not only is the Cross method a reliable choice for tumors located in the UIQ, but it can also be applied safely for the tumors in UOQ and upper central part of the breast while the best application of the technique is in case of the tumors located far from the nipple areola complex.

Ethical Consideration

The patient signed the informed written consent for using her photo in the article.

Conflict of Interest

The authors declare no conflict of interests.

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