

# Comparative study of oncoplastic *versus* non-oncoplastic breast conserving surgery in a group of 211 breast cancer patients

L. CALÌ CASSI<sup>1</sup>, G. VANNI<sup>1</sup>, G. PETRELLA<sup>1</sup>, P. ORSARIA<sup>1</sup>, C. PISTOLESE<sup>1</sup>, G. LO RUSSO<sup>2</sup>, M. INNOCENTI<sup>2</sup>, O. BUONOMO<sup>1</sup>

<sup>1</sup>General Surgery and Breast Surgery, University of Tor Vergata, Rome, Italy

<sup>2</sup>Plastic Surgery and Reconstructive Microsurgery Unit, Department of Surgery and Translational Medicine, University of Florence, Florence, Italy

**Abstract. – OBJECTIVE:** Breast conserving surgery (BCS) followed by radiotherapy is the standard of care for most patients with early breast cancers; however, the aesthetic outcomes of this procedure is not always desirable. Oncoplastic breast surgery is an innovative approach that aims at the safe and effective treatment of the cancerous lesion while achieving the best possible aesthetic outcome. The aim of this study was to evaluate and compare oncoplastic and non-oncoplastic procedures.

**PATIENTS AND METHODS:** A retrospective observational study was conducted on a group of patients who underwent oncoplastic or non-oncoplastic breast surgery at the Breast Unit of the University of Rome Tor Vergata.

**RESULTS:** Out of 211 patients, 154 (73%) underwent non-oncoplastic surgery, while 61 (27%) underwent an oncoplastic procedure. The percentage of patients requiring re-excision was twice greater for women in the non-oncoplastic group: 12.9% vs. 6.5% in the oncoplastic group. The rate of complications was higher in the oncoplastic group compared to the non-oncoplastic one (4.9% vs. 1.3%). The size of the tumor, the number of the patients receiving post-operative radiation, the interval between surgery and radiotherapy and follow-up were similar between the two groups.

**CONCLUSIONS:** Oncoplastic surgery represents a valid alternative to breast conserving surgery for patients with breast cancer, with only minimal differences in long term complications and similar results in terms of local recurrence and number of metastasis.

Key Words:

Oncoplastic breast surgery, Breast cancer, Local-recurrence, Complications.

for most patients with early breast cancer; in fact, this technique has proven to be comparable with mastectomy in terms of long-term survival in selected groups of women<sup>1,2</sup>. This surgical option consists of lumpectomy and sentinel node biopsy with or without radiotherapy and presents potential advantages over radical procedures as it is less invasive, less debilitating and more aesthetically acceptable<sup>3,4</sup>.

Despite the marked improvement represented by BCS, the aesthetic outcome is often compromised to obtain a complete excision of the cancer<sup>5</sup> and poor cosmetic results have been reported in 25-30% of patients<sup>6,7</sup>. Two of the main factors that impact on the aesthetic result are tumor-to-breast volume and tumor location. A volume excision of 10% is usually considered an aesthetically acceptable limit for BCS; however, due to the relative tissue paucity, medially reduction of more than 5% can lead to bad aesthetic results, whereas it is possible to remove up to the 15% of the breast volume laterally with a positive outcome<sup>8</sup>.

Apart from the aesthetic factor, BCS presents some limitations as it cannot be performed in some specific conditions, such as tumor larger than 5 cm, skin or pectoral muscle involvement, multicentric cancers, anticipated poor cosmetic outcome (for example due to unfavorable tumor-to-breast size ratio), and unsuitable radiation therapy<sup>9</sup>. In addition, mastectomy is traditionally preferred in patients at higher risk of local recurrence<sup>10</sup>.

Although breast cancer remains the most common cancer among women in the Western population, survival rates have consistently increased over the last decades, mainly thanks to the spreading of screening campaigns, combined with improvements in radiotherapy, hormone therapy and chemotherapy<sup>11</sup>. In addition, thanks to the availability of neo-adjuvant chemotherapy, many

## Introduction

Nowadays breast conserving surgery (BCS) followed by radiotherapy is the standard of care

patients that would have otherwise required a mastectomy are now eligible for BCS<sup>12</sup>. As a result, the importance of cosmesis has substantially increased, and patients' expectations and demands have become higher.

Oncoplastic breast surgery (OBS) is an innovative approach developed in the last decades that combines BCS with concomitant breast reconstruction. The aim of this technique is to obtain a safe and complete removal of the cancerous lesion while achieving the best possible aesthetic outcome<sup>13,14</sup>. OBS consists of large lumpectomy and remodeling techniques such as breast-reshaping by therapeutic reduction mammoplasty or volume replacement by local glandular flaps or regional/distant flaps. A broad range of surgical procedures of different complexity characterizes OBS, which frequently includes contra-lateral surgery to achieve breast symmetrisation, especially in the case of very large breasts<sup>15,16</sup>. Moreover, thanks to the reshaping of the whole breast, OBS allows wider excision of the tumor, thus giving the possibility of conservative surgery to patients previously considered not suitable to BCS, such as those with large tumor size, unfavorable tumor to breast ratio, central and lower pole tumor location or multifocal disease<sup>17</sup>.

Although OBS presents a number of advantages over BCS, there are still some concerns regarding this technique; these are mainly due to the lack of evidence on the long-term safety of the procedure and to the limited availability of studies that directly compare OBS and BCS<sup>16,18-20</sup>.

The aim of this study was to compare oncoplastic and non-oncoplastic breast conserving surgery, focusing especially on the need for re-excision, local recurrence and post-surgery complications.

## Patients and Methods

This was a retrospective, observational, cohort study conducted on a group of patients treated for breast cancer between 1<sup>st</sup> January 2012 and 30<sup>th</sup> December 2014 at the breast unit of the University of Rome Tor Vergata. Eligible patients were 18 years of age or older, female, and had been treated with lumpectomy, either oncoplastic or non-oncoplastic. Patients were stratified in two groups depending on the type of treatment received. Oncoplastic surgery included therapeutic mammoplasty and adjacent tissue transfer following lumpectomy, and comprised in some cases a bilateral procedure. Therapeutic mammoplasty was performed in the case of

hypertrophy of the breast (macromastia and gigantomastia) and included superior, medial, or inferior pedicle mammoplasty.

Each patient was followed by a surgical team composed of an oncological and a plastic surgeon. In the case of a bilateral procedure, one or two residents were also present to perform surgery on both sides at the same time. The choice of the most appropriate procedure for each patient was made by the oncological and the plastic surgeon depending on breast and tumor size, and patient's general condition and was also discussed with the patient.

Patient's data were collected from patients' medical records, from the initial diagnosis to the last visit and included: demographics (age and body mass index [BMI]), size of the tumor, tumor margin status, patients requiring re-excision, patients receiving post-operative radiotherapy, interval between surgery and radiotherapy, complications and length of follow-up. Both immediate (infection, non-healing wounds, wound dehiscence, nipple necrosis, hematomas, and seromas) and long-term (skin retraction and fat necrosis) complications were considered in the analysis. Complications were evaluated both by the plastic surgeon and an oncological surgeon

## Statistical Analysis

All data were analyzed by descriptive statistics. Primary analyses were conducted to compare patients based on breast conserving surgery type (i.e. non-oncoplastic vs. oncoplastic). Differences between the two groups were assessed by Chi-square test. A p-value <0.05 was considered statistically significant. Statistical analysis was performed using SPSS software for Windows.

## Results

A total of 211 patients were included in the study. Four patients underwent bilateral lumpectomy because of bilateral cancer. Non-oncoplastic surgery was performed on 154 (73%) patients while 61 (27%) underwent an oncoplastic procedure; after lumpectomy patients were treated with post-operative radiation whenever necessary. Data related to patients' demographics, tumor details and follow-up are summarized in Table I.

None of the patients presented with multicentric tumor and the median size of the lesion was not statistically different between the two groups: 1.4±0.9 vs. 1.3±0.7 (range 0.01-4;) for mammoplasty and oncoplastic surgery, respectively. The

**Table I.** Patients' demographics, tumor details and follow-up after non-oncoplastic vs oncoplastic breast surgery.

	Non-oncoplastic group			Oncoplastic group			p-value
	No.	Result	Range	No.	Result	Range	
Age (years)	154	63.2±12.1	29-88	61	54.7±12.6	26-80	0.052
Body Mass Index (BMI)	154	32.6±8.9	18.1-67.2	61	30.1±7.3	17.6-51.9	0.437
Patients requiring re-excision	154	20 (12.9%)	-	61	4 (6.5%)	-	<0.05
Size of tumor (cm)	154	1.4±0.9	0.1-5.0	61	1.3±0.7	0.01 -4.0	0.395
Patients receiving post-operative radiotherapy	154	117 (76%)	-	61	45 (73.8%)	-	0.496
Interval between surgery and radiotherapy (months)	94	4.2±2.9	1-12	37	5.1±3.1	1-11	0.320
Follow-up (months)	154	43.3±21.1	190-107	61	44.8±16.0	17-101	0.681
Local recurrence	154	1 (0.6%)	-	61	0	-	N.A.
Complications	-	2 (1.3%)	-	61	3 (4.9%)	-	0.128

Data are reported as mean ± standard deviation or as number of observations (percentage).

percentage of patients requiring re-excision was twice greater for women in the non-oncoplastic group: 12.9% vs. 6.5% in the oncoplastic group and the difference was statistically significant ( $p < 0.05$ ). However, the number of patients receiving post-operative radiation, the interval between surgery and radiotherapy and follow-up were similar between the two groups and the statistical analysis did not show any significant difference.

Median follow-up was 43.3±21.1 months in the non-oncoplastic group and 44.8±16.0 months in the oncoplastic group. Only one patient (0.6%) experienced local recurrence after non-oncoplastic surgery, while no one recurred after the oncoplastic procedure. The rate of complications was slightly higher in the oncoplastic group, where three patients (4.9%) reported complications after surgery, while in the non-oncoplastic group complications were observed only in 2 patients (1.3%). The main complications reported by patients were hematoma (80%), non-healing wound (60%), infection (20%) and wound dehiscence (20%). Patients received the following treatments in case of seroma formation: elasto-compressive medications, suction drain, possible US-guided external drainage of collected serum. There was no difference in the post-operative treatment received by patients in the two groups. No long-term complications were registered in our study.

## Discussion

Oncoplastic surgery seems to offer similar results to BCS in terms of safety and oncological outcome, while extending the indication for con-

servative surgery to patients otherwise addressed to mastectomy. Nonetheless this procedure still presents some limitations, and a more clear understanding of its characteristics compared to BCS is still needed.

### Re-excision

The main advantage of oncoplastic techniques seems to be the possibility to perform wider excisions without compromising the aesthetic outcomes, while possibly reducing the risk of positive margins. In our study only 4 patients required re-excision after oncoplastic surgery (6.5%) while reoperation was performed on 20 women (12.9%) in the non-oncoplastic group.

These results are in line with literature data on oncoplastic surgery that reported a number of patients requiring re-excision after lumpectomy ranging from 8% to 20%<sup>16,21-23</sup>.

Of note, in a study by Kaur et al<sup>18</sup>, it was reported that after oncoplastic surgery 83.4% of the patients presented negative margins, compared to 56.7% in case of quadrantectomy; although re-excision rates were not reported in this study, we can assume that these were smaller in the oncoplastic group.

Despite the decreased need for reoperation after OBS, it is important to note that re-excision procedures in case of positive margins might be compromised in oncoplastic surgery due to the extensive parenchymal re-shaping and the possibility that some margins might be widely apart<sup>24</sup>.

### Radiation Therapy

Patients receiving post-operative radiotherapy might suffer from moderate to severe adverse

reactions such as mastitis, vasculitis, breast parenchyma fibrosis and chronic pain<sup>25</sup>. In particular, these side effects seem to be directly related to the amount of breast tissue irradiated. The use of reduction mammoplasty might, therefore, help decrease the risk of additional side effects and increase the homogeneity of treatment by a reduction in breast volume<sup>25</sup>. In addition, considering that some shrinkage might occur after radiotherapy, the bilateral approach used in OBS might help reduce breast asymmetry and maintain a good aesthetic outcome<sup>26</sup>.

Our data show little difference in the number of patients requiring post-operative radiotherapy after non-oncoplastic or oncoplastic treatment. Most importantly there was no marked difference in the interval between surgery and radiotherapy in the two groups, thus suggesting that OBS does not prolong the time to radiation.

### **Local Recurrence**

In our study we reported only 1 local recurrence in the non-oncoplastic group, while no local recurrences were seen in patients treated with OBS. Our results are in line with those previously reported in other studies on OBS<sup>27,28</sup> and are fully comparable to a study by Tenofsky et al on 140 women who underwent either non-oncoplastic or oncoplastic treatment reporting 1 and 0 recurrences, respectively<sup>29</sup>. Overall these results suggest that long-term survival of patients after oncoplastic treatment is comparable to that achieved after BCS.

### **Complications**

The immediate and long-term complications of oncoplastic surgery have been investigated in a few studies. One of the most common complications registered after oncoplastic surgery has been fat necrosis, whose rates ranged from 8% to 27.3%<sup>22,27-28,30</sup>.

Early surgical complication rates have also been investigated in different studies with percentages ranging from 30% to 13.3%<sup>16,21-22,30-31</sup>. In particular, the presence of hematoma reported in 3.3% of the cases by Meratoja et al<sup>30</sup> and in 2.2% by Clough et al<sup>16</sup> is of crucial importance as wound healing problems can cause a delay in the oncological treatment.

In our study the complication rates were slightly higher in the oncoplastic group (4.9%) compared with the non-oncoplastic group (1.3%). In particular patients in the oncoplastic group experienced more

often hematoma and non-healing wound. However, the difference between the two groups was not statistically significant ( $p=0.128$ ). These results are in line with those reported by Tenofsky et al<sup>29</sup> where patients experienced more complications after oncoplastic surgery compared to the standard non-oncoplastic treatment; in particular, patients reported a higher rate of fat necrosis (25.9% vs. 9.5%) and more non-healing wounds.

McCulley and Macmillian<sup>22</sup> also observed a higher percentage of fat necrosis following OBS compared to BCS; however, the overall complications rate was not significantly different between the two groups. Of note, in our study no long-term complication was reported in the two groups.

### **Conclusions**

Oncoplastic surgery can represent a valid alternative to BCS for patients with breast cancer. This new approach presents some advantages over BCS as it warrants a better aesthetic outcome while offering similar results in terms of oncological outcome and safety.

The results of this study suggest that there are only minimal differences in the long-term complications between standard breast conservation therapy and oncoplastic treatment. In addition, OBS seems to give similar results in terms of local recurrence, it does not impact on time to radiotherapy after surgery and reduces the need for repeated surgery.

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### **Conflicts of interest**

The authors declare no conflicts of interest.

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