

Oncoplastic breast-conserving surgery in breast cancer treatment

Systematic review of the literature



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BACKGROUND: Oncoplastic breast-conserving surgery (OPBS) is a rapidly emerging field. Various oncoplastic techniques have been proposed and are increasingly adopted to facilitate breast conservation and preserve breast aesthetics. This systematic review seeks to assess the oncological and cosmetic outcomes of OPBS.

MATERIALS AND METHODS: A systematic review of the literature was conducted using specific inclusion and exclusion criteria, for articles published up to July 31th, 2015. Relevant studies were identified using computerized bibliographic searches of MEDLINE database. The keywords that were used in various combinations were: "Oncoplastic surgery", "oncological results", "cosmetic results", "cosmesis", "immediate reconstruction" and "breast conserving surgery".

RESULTS: A total of 106 articles were identified for potential inclusion and reviewed in detail. No randomized controlled trials were identified. This study was initially designed to identify and review after a strict selection process, published articles with the highest level of evidence on OPBS. Systematic reviews and metaanalyses were not included in this systematic review for methodological reasons. Ten prospective studies fulfilled strict inclusion criteria and were included. Local relapse using OPBS did not exceed 7%. Tumor free margins were retrieved in 86% of cases. Good cosmetic results were obtained in 86% of patients. Most studies showed significant weaknesses, including absence of robust design and methodological limitations, influencing negatively generalizability.

CONCLUSIONS: This systematic review proves that current evidence supporting efficacy of OPBS is based on poorly designed and underpowered studies. Further studies and particularly RCTs, are required to assess oncological safety and cosmetic results of OPBS, reporting evidence on long-term oncological results, cosmetic outcomes and survival rates of patients treated with this technique.

KEY WORDS: Oncoplastic surgery, Oncological results, Cosmetic results, Cosmesis, Immediate reconstruction, Breast conserving surgery

Introduction

Early breast cancer treatment has been changed in recent years. A consistent number of clinical studies have compared the efficacy of mastectomy to BCS followed by radiotherapy and observed that disease-free and overall

survival are equivalent^{1,2}. Not all patients fulfill eligibility criteria of BCS, although, the adoption of such an approach implies high rates of patient satisfaction³. Initial attempts adopting BCS concentrated on removing the tumor with an adequate margin and little attention was paid to the long-term cosmetic results. Consequence of that were prominent unaesthetic scars and significant excision defects which resulted in severe asymmetry. In fact, approximately 10% to 30% of patients submitted to BCS are not satisfied with their cosmetic results⁴.

Breast conserving surgery is difficult to obtain for certain unfavorable tumor locations and for significant volumes of resection required for adequate oncologic treat-

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ABBREVIATION

OPBS	– oncoplastic breast-conserving treatment;
BCS	– breast conserving surgery;
BCT	– breast conserving treatment, RCTs
	– randomized control trials;
DCIS	– ductal carcinoma in situ.

ment, because, in these cases cosmetic results are unlikely. Although, with the introduction of plastic surgical mastopexy techniques, numerous authors began to publish encouraging results in allowing larger and more adequate resections, but concealing the defects of excision using various volume displacement techniques of plastic surgery ⁵⁻⁸.

Oncoplastic surgery is a relatively recent and increasingly used approach for breast cancer treatment. The term oncoplastic surgery was introduced by Audretsch et al. in 1998, to describe a combination of a plastic surgical procedure with breast conserving treatment ⁹ that allows, wide excisions and prevents breast deformities by immediate reconstruction of large resection defects.

Oncoplastic procedures represent a useful alternative for resection of 20% to 40% of the breast, which is a range that delimits, the group of patients who are normally treated by mastectomy ¹⁰. The evidence from published literature could help clinicians and patients understand both oncological and cosmetic outcomes, and issues of morbidity and quality of life, thus allowing informed decisions on the most appropriate surgical technique for the treatment of each specific breast cancer case.

The primary objectives of this systematic review were to assess the oncological and cosmetic outcomes of OPBS. The secondary objectives were to Assess Morbidity, Quality Of Life And Applied Algorithms.

Indications and Basic principles of OPBS

Oncoplastic breast conserving surgery, is a relatively new technique in breast cancer treatment, based in four key principles: Firstly, appropriate oncologic surgery to permit radical excision of the tumor. Then, partial reconstruction to correct wide excision defects and immediate reconstruction with the full range of available techniques, seem necessary to justify the better cosmesis which should be offered with this approach. Last principle of OPBS, also regards cosmesis and embraces correction of asymmetry relative to the contralateral breast ^{11,12}.

Oncoplastic surgery is based on 2 different approaches: a) Volume replacement procedures, which substantially combine resection with immediate reconstruction of the defect by using autologous tissue such as: local fasciocutaneous flaps and latissimus dorsi miniflaps ¹³⁻¹⁷. b) volume-displacement procedures, which combine resec-

tion with a variety of different breast-reduction and -reshaping techniques, according to the location of the tumor ¹⁸. The last approach, determines a net loss of breast volume and frequently requires a contralateral procedure to achieve symmetry.

Oncoplastic treatments may allow better aesthetic outcomes for breast cancer patients together with a wider resection, there are although, a few data from the oncologic point of view, regarding its impact on local recurrences, distant metastases and overall survival ¹⁹.

Whilst tumor size, or more precisely tumor to breast volume, is a key indication for OPBS, tumor location is an equally important consideration. Although, the application of aesthetic techniques for therapeutic purposes should never compromise the main objective of breast cancer surgery which is obtain clear margins with good local disease control ²⁰. Although, it is essential to remember that there are limitations related to the breast cancer patient, to whom this procedure can be offered. In fact, patients with very small breasts who would be left with very little tissue after a very wide excision, are not good candidates for such an approach ⁶.

Materials and Methods

A search for relevant articles regarding application of OPBS in breast cancer treatment, was conducted using the MEDLINE database. The articles were published between 2000 and July 31th 2015. A comprehensive search was performed using the following search terms: “Oncoplastic surgery”, “oncological results”, “cosmetic results”, “cosmesis”, “immediate reconstruction” and “breast conserving surgery”. Various combinations of the keywords and related terms were used to increase sensitivity. Abstracts from all articles were obtained and those with relevant data on OPBS were reviewed. A second level manual search included the bibliography of these articles. The search was limited to English-written studies published between 2000 and July 31th 2015, involving women with breast cancer undergoing immediate reconstruction after BCS. Systematic reviews or metaanalyses were not included for methodological reasons. A manual cross-reference search of the bibliographies of relevant articles was conducted to identify studies not found through the computerized search. The studies included were classified into levels of evidence according to the Oxford Centre for Evidence-Based Medicine Levels of Evidence ²¹.

The search was limited to articles published in English between 2000 and July 31th 2015 and involving women with breast cancer undergoing immediate reconstruction after breast-conserving surgery. A manual cross-reference search of the bibliographies of relevant articles was conducted to identify studies not found through the computerized search. Randomized controlled clinical trials (RCTs), prospective observational or comparative

Table I - Literature diagram.

Search Terms	
"Oncoplastic surgery", "oncological results", "cosmetic results", "cosmesis", "immediate reconstruction" and "breast conserving surgery".	
Computerized bibliographic searches	
Medline	
Inclusion and Exclusion Criteria of the study	
Inclusion Criteria	Exclusion Criteria
a) OPBS	a) Non-English publications
b) Breast cancer cases	b) Published before 2000
c) Oncological results	c) Benign breast disease
d) Cosmetic results	d) Reconstruction after mastectomy
e) RCTs	e) Delayed reconstruction
f) Prospective studies	f) Studies including benign breast disease or comparative studies between OPBS for cancer and benign breast pathology
g) Studies including more than 25 cases	g) Systematic reviews and meta-analysis
2264 abstracts failed to meet criteria	
First screening	
106 articles identified for potential inclusion	
Second screening	
95 articles failed to meet strict inclusion criteria	
11 articles reviewed and scored	

studies with an oncoplastic operated patient group greater than 25 individuals, were considered to be potentially included. Articles describing appropriate and recognized OPBS techniques were also assessed for potential inclusion. No other restrictions were applied on selection. Inclusion and exclusion criteria of this systematic review are reported in Table I. All articles which failed to meet strict inclusion criteria were not included in this systematic review.

Results

Literature search

Titles and abstracts of 2370 citations were identified from the MEDLINE search engine. After appraisal of the inclusion criteria, 106 articles were identified for potential inclusion and reviewed in detail. A total of 95 articles were excluded, leaving 11 articles to form the basis of this systematic review.

OPBS METHODOLOGICAL CHARACTERISTICS

Study Design

No RCTs were identified during the selection process (Table I). As Veiga et al^{25,26} used the same study population in articles from 2010 and 2011, we considered both articles as one study. Of these 11 studies, 7 were

prospective observational studies and 4 were prospective comparative studies. Three studies compared OPBS with BCT, and 1 study compared OPBS with reduction mammoplasty for Macromastia. All the trials were single-center studies.

Study population and follow up

All studies recruited patients from a single clinical institution and tended to toward small sample sizes. Four of the studies included less than 100 patients in the OPBS group, and none of the remaining 7 studies exceeded 200 patients. A total of 712 patients were treated using OPBS techniques in these prospectively monitored studies and the predominant histotype was invasive ductal carcinoma. Mean or median follow-up ranged from 1 to 74 months.

ONCOLOGICAL RESULTS FOLLOWING OPBS

Local relapse & margin involvement

Some authors suggest that in term of local recurrences, OPBS can be considered as safe as mastectomy in tumors less than 2 cm and probably safer than the BCS, in tumors of more than 2 cm. The authors explain this by the better control of tumor margins⁴⁶. For the assessment of local recurrence rate, a significant follow-up period is necessary. To evaluate local relapse after OPBS, a

follow-up period of minimum two years was considered sufficient. In this systematic review, only seven studies reported data on local recurrence, with a mean follow-up period ranging from 1 month to 74 months. Four of these studies assessed local relapse with mean and median follow-up periods of more than 2 years^{6,19,27-28}. In these studies is suggested that when mean or median follow-up exceeds 2 years permits local relapse retrieval at rates ranging from 0%-7%. In these studies, there is a wide range in the described follow-up periods. In fact, it begins to be reported from 10 months and arrives to 108 months of follow-up. Only one of the included studies²⁸, highlighted the significance of counting out mastectomies from local relapse rate measurements. This is another factor that shows some of the methodological limitations of the current published literature.

Considering margin involvement rates using OPBS, it should be recorded that the accepted definition of tumor-free margins is a distance of a minimum 1 mm from the exterior tumor border. Obtaining distances which exceed 1mm, local recurrence rates are not furtherly reduced, despite the rationale of OPBS which is obtainment of wider excisions²⁹⁻³¹.

Each review article which evaluates oncological results of OPBS, should also take into account potential bias and restrictions of analyzed studies.

In this review, the margin involvement outcomes of six prospective studies were compared^{6,19,28,32-34}. In these prospective studies, authors described close margins with various definitions. This fact, indicates in part the non homogeneous reportance which still affects OPBS. In the major part of these studies, close margins were considered when a distance of 1-mm or 2-mm was obtained between the cut edge of the sample and the external border of the tumor. The use of OPBS resulted in tumor-free margins in 85.5% of cases (assessed as mean value). Close margins were retrieved in 8% of cases whereas, positive margins in 5% of cases, resulting in mastectomy in 5% to 16% of all cases. Undoubtedly, when mastectomy rates arrive up to 16% of cases in some studies, it should not be considered as appropriate selection of "eligible cases for OPBS". This inadequate selection of patients to whom OPBS should proposed, clearly affects negatively mastectomy rate. Specimen weight range in these studies was wide, arriving at 950 gr in some studies.

COSMETIC RESULTS FOLLOWING OPBS

The second endpoint of this systematic review was to assess the cosmetic results of OPBS. Great discordancy was observed among the considered studies in the methods used cosmetic assessment following OPBS. Reported data are not "homogeneous" in the methods used and only 4 from the included studies, assessed the cosmetic outcomes of OPBS. Nevertheless, one of them did not

refer the method of cosmetic evaluation used. Validated methods, internationally accepted as confirmed tool for cosmetic evaluation, do not exist^{6,27,35,36}. In fact, some authors assessed the method of cosmetic outcome evaluation, but did not report their findings giving numerical values²⁶. Considered together, these four studies describe favorable aesthetic results following OPBS, in the major part of patients. In fact, 86.5% of patients had good cosmetic results^{6,27,35,36}.

Discussion

Oncoplastic surgery combines appropriate oncologic surgery with reconstructive techniques³⁷. Considering the importance of good cosmesis after breast cancer surgery, surgeons should try to obtain a favourable: tumour/breast volume ratio. In fact, there is published literature which demonstrates that tumour excisions that exceed 15% of breast volume, correlate with aesthetically unpleasant results and lower patient satisfaction³⁸.

Recently, breast and plastic surgeons have adapted and utilised well-established aesthetic mammoplasty techniques to enhance standard BCS. Nowadays, the standard BCS seems to be located at one end of the spectrum of what is now defined OPBS³⁹⁻⁴¹. A significant variety of oncoplastic techniques have been proposed to fulfil different patient and tumour requirements but essentially, the basic principle should be obtain adequate oncological surgery (therapeutic volume reduction) and then, an appropriate breast tissue re-arrangement (volume displacement) to correct the defect^{42,43}. Breast surgeon should always propose an OPBS approach to the most appropriate cases. Breast cancer patients could benefit from OPBS, under the following conditions: Firstly, cases with unfavorable tumor - to - breast ratio. Then, patients in which a large defect is anticipated; Last condition is represented by these cases who request contralateral symmetrizing procedure such as mastopexy⁷.

CRITICAL APPRAISAL OF PUBLISHED LITERATURE REGARDING OPBS

Primary goal of this systematic review was to assess oncological and cosmetic outcomes of OPBS, including studies which offer high level of evidence. In fact, considering the absence of RCTs (level 1 evidence), 11 studies reporting level 2 evidence, 33 studies level 3, and 9 studies level 4 evidence were initially found. After the first screening, only level 2 studies were selected and assessed, because they had the highest level of evidence from all the initially included. In fact, only eleven articles regarding OPBS in breast cancer treatment met the inclusion criteria. These articles were reviewed in detail. As consequence, after the first screening process, all level 3

TABLE II - Specific data of assessed studies & oncological results (chronological order of publication)

Study	Design	Groups & No. of pts	Mean/ Median FU in months	BM	MI	Recurrence
Clough 2003	PO	1 group: OPBS n=101 pts	46 (median)	6,00% (6/101 pts)	Free: 90 (89%) Focal: 4 (4%) Extensive 3 (3%) Unknown 4 (4%)	5 year LR rate: 9.4%
Kaur 2005	PC	2 groups: OPBS n=30 pts, vs quadrantectomy n=30 pts	Less than 24 months	NR	1 st group: Free 25 (83%) Close 4 (13%) Positive 1 (3%) 2 nd group: Free 17 (57%) Close 10 (33%) Positive 1 (3%) Unknown 2 (7%)	None
Rietjens 2007	PO	1 group: OPBS n=148 pts	74 (median)	5 M contralateral breast (due to breast cancer during FU)	Negative: 135 (91%) Close 5 (3%) Focally involved with DCIS: 8 (5%) 2 reoperations	3,00%
Giacalone 2007	PC	2 groups: OPBS n=31 pts vs quadrantectomy n=43 pts	NR	NR	1 st group: Free 24 (77%) Close 4 (13%) Positive 3 (10%) 2 nd group: Free 29 (67%) Close 7 (16.5%) Positive 7 (16.5%)	NR
Rusby 2008	PO	1 grp: OPBS n=110 pts	41.1 (median)	6 mastectomies (in 115 pts) 1 for close margins and 5 for positive margins	115 pts for frozen section: Free 107 (93%) Close 3 (3%) - 2 reexcisions and 1 mastectomy Positive 5 (5%) - all mastectomies	1%
Veiga 2010	PC	2 groups: OPBS n=45 pts vs BCT n=42 pts	6 and 12 months	NR	NR	1 st group: 2% LR 2 nd group: NR
Veiga 2011	PC	2 groups: OPBS n=45 pts vs BCT n=42 pts	6 and 12 months	NR	NR	1 st group: 1% LR 2 nd group: NR
Meretoja 2010	PO	1 group: OPBS n=90 pts	26 (Median)	16,00% (11/90 pts)	High level of inadequate margins in 11 pts (16%), treated with mastectomy	No LR or DR
Chan 2010	PC	1 group: OPBS n=162 pts	1-3 months	NR	NR	NR
Bong 2010	PO	1 group: OPBS n=167 pts	NR	7,00% (11/167 pts)	Close or involved: 37 (22.2%) Reexcision: 17 (10%) Plan to reoperate: 3 (2%)	NR
Yang 2011	PO	1 group: OPBS n=58 pts	21 (mean)	NR	NR	No LR

(n=33) and level 4 (n=9) studies were excluded and finally only level 2 evidence studies were included (n=11). This systematic review demonstrates that incomplete reporting of oncological information is a significant problem in all published studies of OPBS and that there is clearly a need for the development of standards of reporting to permit construction of evidence-based algorithms which will strictly define in which cases OPBS should be proposed and considered. It should be referred that one of the major limitations

of the published literature in regards to OPBS, is the lack of RCTs. In fact, during selection process for this systematic review no RCTs were identified. All the trials which are herein assessed, are single-center studies. Two different prospective studies^{25,26}, used the same patients' population. For the purposes of this systematic review both articles will be assessed as one study. As consequence, will be finally considered 10 studies; 3 were prospective comparative and 7 prospective observational. All studies derived from single clinical institutions.

A total number of 712 patients were included in this systematic review. Mean follow-up was different in the assessed studies, although, did not exceed 6 years.

Despite the variety of published literature on OPBS (in quality and quantity), in this systematic review no RCTs were found. Available evidence for OPBS is based only on a relatively small number of prospective observational and prospective comparative studies of different quality, which were critically assessed and analyzed in this systematic review. All included studies assessed breast cancer cases. In all studies was offered immediate breast reconstruction following BCS.

Methodological differences between these studies made the direct comparisons of results difficult. Despite the extensive literature published in recent years for OPBS, only one of the prospective studies which were assessed in this systematic review presented integrated data and employed good methodology for assessment of oncological and cosmetic results ⁶. An explanation for the incomplete reporting might be related to the fact that OPBS is a relatively new approach.

Despite the fact that randomized controlled trials (RCTs) provide clinicians with the best available evidence for the effects of interventions, there is still much room for improvement in the quality of reporting and adherence to the Consolidated Standards of Reporting Trials (CONSORT) recommendations ^{22,23}. In fact published evidence, in regards to OPBS lacks RCTs and contains various studies with different design, methodologically underpowered which conceal part of their results, as correctly observed in a recent review ²⁴ which also assesses prospective trials. Although, on the contrary from the review of Haloua et al. ²⁴ with which some of the prospective studies considered are common, herein are assessed studies which include only breast cancer cases and not benign breast disease. Furthermore, inclusion and exclusion criteria, methodology of screening, and selection process are unique in this review.

It should be mentioned that this is the first systematic review on OPBS, which proposes an original methodology for eligible studies' screening and selection according to their evidence level. This methodology permitted inclusion of high level of evidence studies and the conclusions that are reported herein are evidence-based, safer and probably, easier to generalize. For the aims of this systematic review were finally selected the studies with the highest evidence level, considering although, the fact that systematic reviews and meta-analyses were not included in the selection process for methodological reasons.

ASSESSMENT OF THE ONCOLOGICAL OUTCOMES OF OPBS

Theoretically, there are oncologic advantages to be gained using OPBS, since this method, has been shown to result in larger resective specimens than with BCS alone ³². It should be recorded to that point that using OPBS,

TABLE II - *Cosmetic results*

Study	Cosmetic outcomes
Clough	Acceptable results 88% at 2y, 82% at 5y Neoadjuvant RT vs Adjuvant RT: Worse results for neoadjuvant RT (42.9% vs 12.7%)
Veiga	Better scores for the OPBS group compared with the BCT group
Meretoja	Acceptable results 84% of the time
Chan	Surgeons: Nearly similar: 41%, Slightly different: 45%, Clearly different: 14%, Distorted: 1% Patients: Nearly similar: 40%, Slightly different: 45%, Clearly different: 14%, Distorted 1%
Yang	Surgeon: Excellent: 31%, Good: 52%, Fair: 15%, Bad: 2% Patient: Excellent: 38%, Good: 45%, Fair: 15%, Bad: 2%

tumor-free margins were found in 85.5% of cases. On the contrary, close margins were retrieved in 8% of cases and positive margins were found in 5% of cases, having as consequence the implementation of mastectomy in 5% to 16% of all cases. On the contrary from its principles, the large specimens excised in the analyzed studies did not guarantee the achievement of tumor-free surgical margins. In fact, the mean specimen weight among considered studies was 552.5 g. The oncological results of the assessed studies, are comparable with the results of various single-center studies. The single largest retrospective study evaluating oncological and cosmetic outcomes of 540 patients over a period of 20 years ⁴⁴, reported comparable outcomes with this systematic review. This retrospective study found tumor-involved margins in 5% of cases, focal involvement in 14% of cases and clear margins in the vast majority of an 81% of cases. Forty patients received an additional boost of radiotherapy (7% of cases), an overall 9% required mastectomy and 2% of cases required reexcision. To that point, it should be observed that in spite of the fact that OBPS allows wider margins, margin involvement is up to 22% of the cases. This percentage seems very disappointing, especially considering that clear margins in OBPS are a prerequisite for direct reconstruction.

The prospective studies considered in this systematic review show a local recurrence rate which varies from 0% to 7%. The follow-up varied considerably, ranging from 10 to 108 months. The selected studies described survival rates between 92% and 99%.

Comparing this systematic review with the retrospective study of Fitoussi et al ⁴⁴, local recurrence rate was 7% (higher in comparison with this review). In this study the 5-year survival rate was 93% and the overall disease-free survival rate 88% after OBPS with additional treatment. This fact can be explained comparing the 5 years of follow-up in the retrospective study of Fitoussi et al., with the approximately 2 years follow-up in the consid-



Fig. 1: The pyramid of “Evidence Based Medicine” (EBM). In the pyramid diagram, the least clinically relevant are located at the bottom and the most clinically relevant at the top. (Source: <http://library.downstate.edu/EBM2/2100.htm>).

ered studies in this systematic review.

Whereas, Chakravorty et al.⁴⁵ in their retrospective study, compared OPBS with the standard BCS and assessed oncological outcomes with BCS and reconstruction⁴⁵. The authors observed a re-excision rate of 2.7% and local recurrence rate of 2.7% and although the follow-up was limited to 28 months, a projected 6-year local recurrence rate was 4.3% in OPBS group. Despite a larger tumor size and higher grade in the OPBS group, the local recurrence rates were similar in both groups, with and without reconstruction.

ASSESSMENT OF COSMETIC RESULTS AFTER OPBS:

In the assessment of cosmetic results after OPBS, a crucial issue is the “ideal” time to evaluate cosmesis. Some authors argue that the most appropriate time to assess cosmetic outcomes is at least 2 years postoperatively, due to the long-term effects of radiation⁴⁷. In the published literature, various methods of cosmetic assessment have been proposed; Panel evaluation, breast retraction and patient self-evaluation are the most frequently adopted. The last one, is fundamental because the substructure experience of the patient is central to assessment of quality of life. However, it should be referred that patients consistently mention higher scores than professionals^{48,49}.

A truly objective method is the measuring changes in breast symmetry with breast retraction assessment. In general, a combination of cosmetic assessment methods will produce the most reliable results.

In this systematic review, cosmetic outcomes were reported in only 4 of 10 prospective studies; these studies reported good cosmetic outcomes in 84% to 89% of patients. Only one although, of these four studies showed appropriate evaluation of cosmetic results, using an independent panel format and a follow-up time of at least 2 years⁶.

The same cosmetic evaluation method as Clough et al.⁶ was used in a retrospective study by Fitoussi et al.⁴⁴. Authors in this retrospective study⁴⁴, used a panel made up of a surgeon, a nurse, and a layman, using a 5-point scale from excellent to poor. The cosmetic outcome in this retrospective study was satisfactory in 98% of patients at 12 months, and in 90% of patients at 5 years after surgery. Although there is a large disparity in follow-up periods and cosmetic evaluation methods between the prospective studies described here, the cosmetic outcomes after OPBS seem encouraging, compared with the 60% to 80% rate of acceptable cosmetic results generally achieved with standard BCT.

These studies also differed with regard to the timing of contralateral symmetrization. It should be mentioned to that point that Fitoussi et al.⁴⁴, performed symmetrization 6 months after lumpectomy following neoadjuvant treatment, as they suspected an unpredictable effect of radiotherapy on the breast and a fluctuation of body weight during chemotherapy, although these effects were not objectified in the study.

Conclusions

The field of OPBS has greatly evolved over the last years. OPBS is based on a rationale of obtainment of wider resection margins, which could improve oncological outcomes, since achieving good aesthetic results with the operated breast. This systematic review assessed only prospective studies including breast cancer cases. The large specimen volumes, obtained with OPBS, did not guarantee tumor free surgical margins. It should be highlighted that OPBS offers a non significant improvement of clear margins (when compared to BCT)^{29-31,50}.

Applied algorithms which define patient's inclusion and exclusion criteria for OPBS are quite different among breast units. For that reason, breast surgeon has an important role in patient's decision making. Proper patient selection and careful planning are of great importance to achieve an acceptable result.

Single centre experiences have to be published to spread medical knowledge on OPBS, proving that this modality of breast-conserving treatment has not to be confined only in dedicated centers of breast surgery but also in medium flow hospitals⁵³. In a recent paper of Rassu et al.⁵³, the authors confirm, presenting five different cases treated by OPBS, that OPBS for breast cancer is a fundamental part of BCT also in a suburban hospital. Today in fact, the breast surgeon must be “a vertical sur-

geon", as claimed by the authors in order to treat cancer completely, interfaced with a multidisciplinary team, to ensure a personalized treatment for each patient⁵³. Also in this case series patients' satisfaction was high after OPBS, as claimed also by other articles.

In a recent update on breast cancer surgical treatment, Franceschini et al.⁵⁴ prove that oncoplastic breast-conserving surgery procedures are less technically demanding and time-consuming than major reconstructive procedures and surgeons experienced in routine breast surgery can easily incorporate them in their practice with a relatively short learning curve. This last issue is of extreme importance, considering the pressing need for modern breast surgeons to learn and incorporate in their practice oncoplastic techniques of breast-conserving surgery and offer such techniques, when indicated, in their breast cancer patients. These procedures are generally performed in a single surgical approach and the patient leaves the operating theater without major asymmetry or deformity⁵⁴.

Unfortunately, evidence on OPBS is limited by the lack of RCTs, comparing OPBS with BCS. Undoubtedly, RCTs could help obtain results of valuable evidence. It should be stated although, randomization has various limitations when there is a clear preference of the surgeon or the patient for one approach compared to another^{51,52}. This systematic review clearly demonstrated that further studies from different institutions are needed. Systematic reviews and meta-analyses offer the highest level of evidence. Well designed RCTs are necessary, to compare oncological and cosmetic results of BCS and OPBS. High level of evidence is still needed to obtain more generalizable results regarding oncological and cosmetic outcomes of this procedure.

Riassunto

Il trattamento chirurgico del carcinoma della mammella ha subito profondi cambiamenti negli ultimi anni. Vari studi hanno dimostrato l'equivalenza in termini di risultati oncologici tra mastectomia e chirurgia conservativa della mammella seguita da radioterapia. La chirurgia conservativa della mammella offre nella maggior parte dei casi risultati favorevoli dal un punto di vista estetico. Ciononostante, in un 10-30% dei casi, i risultati estetici sono deludenti.

In questi casi, la chirurgia oncoplastica della mammella che coniuga tecniche di chirurgia oncologica con quelle proprie della chirurgia plastica ha permesso di superare il conflitto tra estensione della resezione tumorale e risultato estetico finale. Varie tecniche di chirurgia oncoplastica sono state proposte e sono sempre più adottate per facilitare la conservazione e preservare l'estetica della mammella.

Questa revisione sistematica si propone di valutare i risultati oncologici e cosmetici di chirurgia oncoplastica con-

servativa della mammella. Questo lavoro è stata condotto usando dei criteri ben definiti di inclusione ed esclusione, per gli articoli pubblicati fino al 31 luglio 2015. Un totale di 106 articoli sono stati identificati per potenziale inclusione ed esaminati in dettaglio. Dopo una selezione adeguata, 11 articoli hanno formato la base di questo lavoro. Questo studio è stato inizialmente progettato per identificare e poi revisionare dopo un processo di selezione rigoroso, gli articoli pubblicati con il più alto livello di evidenza su chirurgia oncoplastica della mammella. Revisioni sistematiche e metanalisi, non sono stati inclusi per ragioni metodologiche.

I risultati di questo lavoro dimostrano che le ricadute locali adoperando la chirurgia oncoplastica non superano il 7%. Margini liberi sono stati recuperati nel 86% dei casi. Buoni risultati cosmetici sono stati ottenuti in 86% dei casi. Ciononostante, si deve riferire che la maggior parte degli studi pubblicati hanno mostrato delle debolezze significative, tra cui l'assenza di un disegno robusto e limiti metodologici, che influenzano negativamente la generalizzabilità dei risultati.

Le attuali evidenze a sostegno dell'efficacia di chirurgia oncoplastica si basano su studi mal progettati e metodologicamente indeboliti. Ulteriori studi e in particolare studi randomizzati controllati, sono tenuti a valutare la sicurezza oncologica e i risultati estetici di chirurgia oncoplastica della mammella, riportando elementi sui risultati oncologici a lungo termine, i risultati estetici e tassi di sopravvivenza delle pazienti trattate con questa tecnica.

References

1. Veronesi U, Cascinelli N, Mariani L, Greco M, Saccozzi R, Luini A, et al.: *Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer*. N Engl J Med, 2002; 347:1227-235.
2. Fisher B, Anderson S, Bryant J, Margolese RG, Deutsch M, Fisher ER, et al.: *Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer*. N Engl J Med, 2002; 347:1233-241.
3. Al-Ghazal SK, Fallowfield L, Blamey RW: *Patient evaluation of cosmetic outcome after conserving surgery for treatment of primary breast cancer*. Eur J Surg Oncol, 1999; 25:344-46.
4. Blondeel P, Hijjawi J, Depypere H, Roche N and Van Landuyt K: *Shaping the breast in aesthetic and reconstructive breast surgery: An easy three step principle. Part III e reconstruction following breast conservative treatment*. Plast Reconstr Surg, 2009; 124:28-38.
5. Anderson BO, Masetti R, Silverstein MJ: *Oncoplastic approaches to partial mastectomy: An overview of volume-displacement techniques*. Lancet Oncol, 2005; 6:145-57.
6. Clough KB, Lewis JS, Couturaud B, Fitoussi A, Nos C, Falco MC: *Oncoplastic techniques allow extensive resections for breast-conserving therapy of breast carcinomas*. Ann Surg, 2003; 237:26-34.
7. Huemer GM, Schrenk P, Moser F, Wagner E, Wayand W: *Oncoplastic techniques allow breast-conserving treatment in centrally*

located breast cancers. *Plast Reconstr Surg*, 2007; 120:390-98.

8. Association of Breast Surgery at BASO; Association of Breast Surgery at BAPRAS; Training Interface Group in Breast Surgery, Baildam A, Bishop H, Boland G, et al.: *Oncoplastic breast surgery: A guide to good practice*. *Eur J Surg Oncol*, 2007; 33 (Suppl 1): S1-23.

9. Audretsch W, Rezai M, Kolotas C, Zamboglou N, Schnabel T, Bojar H: *Tumor-specific immediate reconstruction in breast cancer patients*. *Perspect Plast Surg*, 1998; 11: 71-100. DOI: 10.1055/s-2008-1080243

10. Rainsbury RM: *Training and skills for breast surgeons in the new millennium*. *ANZ J Surg*, 2003; 73: 511-16.

11. Baildam AD: *Oncoplastic surgery of the breast*. *Br J Surg*, 2002; 89: 532-33.

12. Rew DA: *Towards a scientific basis for oncoplastic breast surgery*. *Eur J Surg Oncol*, 2003; 29:105-06.

13. Noguchi M, Saito Y, Mizukami Y, Nonomura A, Ohta N, Koyasaki N, et al.: *Breast deformity, its correction and assessment of breast-conserving surgery*. *Breast Cancer Res Treat*, 1991; 18:111-18.

14. Raja MA, Straker VF, Rainsbury RM: *Extending the role of breast-conserving surgery by immediate volume replacement*. *Br J Surg*, 1997; 84:101-05.

15. Rainsbury RM, Paramanathan N: *Recent progress with breast conserving volume replacement using latissimus dorsi mini flaps in UK patients*. *Breast Cancer*, 1998; 5:139-47.

16. Dixon JM, Venizelos B, Chan P: *Latissimus dorsi mini flap: A new technique for extending breast conservation*. *Breast*, 2002; 11: 58-65.

17. Clough KB, Kroll SS, Audretsch W: *An approach to the repair of partial mastectomy defects*. *Plast Reconstr Surg*, 1999; 104:409-20.

18. Nos C, Fitoussi A, Bourgeois D, Fourquet A, Salmon RJ, Klough KB: *Conservative treatment of lower pole breast cancers by bilateral mammoplasty and radiotherapy*. *Eur J Surg Oncol*, 1998; 24: 508-14.

19. Rietjens M, Urban CA, Rey PC, Mazzarol G, Maisonneuve P, Garusi C, et al.: *Long-term oncological results of breast conservative treatment with oncoplastic surgery*. *Breast*, 2007; 16: 387-95.

20. Morrow M: *Minimally invasive surgery for breast cancer*. *BMJ*, 2009; 19: 338:b557.

21. Oxford Centre for Evidence-based Medicine e levels of evidence [last accessed 1st April 2013], <http://www.cebm.net/index.aspx?o=1025>; March 2009.

22. The CONSORT (Consolidated Standards of Reporting Trials) Group. <http://www.consort-statement.org/> [last accessed 1st April 2013].

23. Adie S, Harris IA, Naylor JM, Mittal R: *CONSORT compliance in surgical randomized trials: are we there yet? A systematic review*. *Ann Surg*, 2013; 258:872-78.

24. Haloua MH, Krekel NM, Winters HA, et al.: *A systematic review of oncoplastic breast-conserving surgery: current weaknesses and future prospects*. *Ann Surg*, 2013; 257:609-20.

25. Veiga DF, Veiga-Filho J, Ribeiro LM, Archangelo I Jr, Baldino

PF, Caetano LV, et al.: *Quality-of-life and self-esteem outcomes after oncoplastic breast-conserving surgery*. *Plast Reconstr Surg*, 2010; 125:811-17.

26. Veiga DF, Veiga-Filho J, Ribeiro LM, Archangelo-Junior I, Mendes DA, Andrade VO, et al.: *Evaluations of aesthetic outcomes of oncoplastic surgery by surgeons of different gender and specialty: A prospective controlled study*. *Breast*, 2011; 20:407-12.

27. Meretoja TJ, Svarvar C, Jahkola TA: *Outcome of oncoplastic breast surgery in 90 prospective patients*. *Am J Surg*, 2010; 200: 224-28.

28. Rusby JE, Paramanathan N, Laws SA, Rainsbury RM: *Immediate latissimus dorsi mini flap volume replacement for partial mastectomy: Use of intra-operative frozen sections to confirm negative margins* *Am J Surg*, 2008; 196:512-18.

29. Kaufmann M, Morrow M, von Minckwitz G, et al.: *Locoregional treatment of primary breast cancer: consensus recommendations from an International Expert Panel*. *Cancer*, 2010; 116:1184-191.

30. Meric F, Mirza NQ, Vlastos G, et al.: *Positive surgical margins and ipsilateral breast tumor recurrence predict disease-specific survival after breastconserving therapy*. *Cancer*, 2003; 97:926-33.

31. Singletary SE: *Surgical margins in patients with early-stage breast cancer treated with breast conservation therapy*. *Am J Surg*, 2002; 184:383-93.

32. Giacalone PL, Roger P, Dubon O, El Gareh N, Rihaoui S, Taourel P, et al.: *Comparative study of the accuracy of breast resection in oncoplastic surgery and quadrantectomy in breast cancer*. *Ann Surg Oncol*, 2007; 14: 605-14.

33. Kaur N, Petit JY, Rietjens M, Maffini F, Luini A, Gatti G, et al.: *Comparative study of surgical margins in oncoplastic surgery and quadrantectomy in breast cancer*. *Ann Surg Oncol*, 2005; 12: 539-45.

34. Bong J, Parker J, Clapper R, et al.: *Clinical series of oncoplastic mastopexy to optimize cosmesis of large-volume resections for breast conservation*. *Ann Surg Oncol*, 2010; 17:3247-251.

35. Chan SWW, Cheung PSY, Lam SH: *Cosmetic outcome and percentage of breast volume excision in oncoplastic breast conserving surgery*. *World J Surg*, 2010; 34:1447-452.

36. Yang JD, Bae SG, Chung HY, et al.: *The usefulness of oncoplastic volumedisplacement techniques in the superiorly located breast cancers for Korean patients with small to moderate-sized breasts*. *Ann Plast Surg*, 2011; 67:474-80.

37. Gabka CJ, Bohmert H: *Future prospects for reconstructive surgery in breast cancer*. *Semin Surg Oncol*, 1996; 12:67-75.

38. Cochrane RA, Valasiadou P, Wilson AR, Al-Ghazal SK, Macmillan RD: *Cosmesis and satisfaction after breast-conserving surgery correlates with the percentage of breast volume excised*. *Br J Surg*, 2003; 90:1505-509.

39. Spear SL, Pelletiere CV, Wolfe A, Tsangaris TN, Pennanen MF: *Experience with reduction mammoplasty combined with breast conservation therapy in the treatment of breast cancer*. *Plast Reconstr Surg*, 2003; 111: 1102-109.

40. McCulley SJ, Macmillan RD: *Planning and the use of therapeutic mammoplasty e Nottingham approach*. *Br J Plast Surg*, 2005; 58: 889-901.

41. McCulley SJ, Macmillan RD: *Therapeutic mammoplasty e analysis of 50 consecutive cases*. Br J Plast Surg, 2005; 58:902-07.
42. Clough KB, Kaufman GJ, Nos C, Buccimazza I, Sarfati IM: *Improving breast cancer surgery: A classification and quadrant per quadrant atlas for oncoplastic surgery*. Ann Surg Oncol, 2010; 17: 1375-391.
43. Galimberti V, Zurrida S, Zanini V, Callegari M, Veronesi P, Catania S, et al.: *Central small size breast cancer; how to overcome the problem of nipple and areola involvement*. Eur J Cancer, 1993; 29A: 1093-96.
44. Fitoussi AD, Berry MG, Fama F, et al.: *Oncoplastic breast surgery for cancer: Analysis of 540 consecutive cases [outcomes article]*. Plast Reconstr Surg, 2010; 125:454-62.
45. Chakravorty A, Shrestha AK, Sanmugalingam N, Rapisarda F, Roche N, Querci Della Rovere G, et al.: *How safe is oncoplastic breast conservation? Comparative analysis with standard breast conserving surgery*. Eur J Surg Oncol, 2012; 38:395-98.
46. Asgiersson KS, Rasheed T, McCulley SJ, Macmillan RD: *Oncological and cosmetic outcomes of oncoplastic breast conserving surgery*. Eur J Surg Oncol, 2005; 31:817-23.
47. Vrieling C, Collette L, Fourquet A, et al.: *The influence of patient, tumor and treatment factors on the cosmetic results after breast-conserving therapy in the EORTC "boost vs. no boost" trial*. Radiother Oncol, 2000; 55:219-32.
48. Sacchini V, Luini A, Tana S, et al.: *Quantitative and qualitative cosmetic evaluation after conservative treatment for breast cancer*. Eur J Cancer, 1991; 27:1395-400.
49. Vrieling C, Collette L, Bartelink E, et al.: *Validation of the methods of cosmetic assessment after breast-conserving therapy in the EORTC "boost versus no boost" trial. EORTC Radiotherapy and Breast Cancer Cooperative Groups. European Organization for Research and Treatment of Cancer*. Int J Radiat Oncol Biol Phys, 1999; 45:667-76.
50. Park CC, Mitsumori M, Nixon A, et al.: *Outcome at 8 years after breast-conserving surgery and radiation therapy for invasive breast cancer: Influence of margin status and systemic therapy on local recurrence*. J Clin Oncol, 2000; 18:1668-675.
51. Pusic A, Thompson TA, Kerrigan CL, et al.: *Surgical options for the early-stage breast cancer: Factors associated with patient choice and postoperative quality of life*. Plast Reconstr Surg, 1999; 104:1325-333.
52. McCarthy CM, Collins ED, Pusic AL: *Where do we find the best evidence?* Plast Reconstr Surg, 2008; 122:1942-947.
53. Rattu PC, Serventi A, Giaminardi E, et al.: *Oncoplastic reshaping in breast-conserving surgery in a peripheral hospital. The Novi Ligure "San Giacomo" hospital experience*. Ann Ital Chir, 2013; 84:389-94.
54. Franceschini G., Sanchez AM, Di Leone A, et al.: *Update on the surgical management of breast cancer*. Ann Ital Chir, 2015; 86:89-99.