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A population-based audit of surgical practice and outcomes of oncoplastic breast conservations in Scotland – An analysis of 589 patients

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ABSTRACT

Introduction: Current evidence for oncoplastic breast conservation (OBC) is based on single institutional series. Therefore, we carried out a population-based audit of OBC practice and outcomes in Scotland.

Methods: A predefined database of patients treated with OBC was completed retrospectively in all breast units practicing OBC in Scotland.

Results: 589 patients were included from 11 units. Patients were diagnosed between September 2005 and March 2017. High volume units performed a mean of 19.3 OBCs per year vs. low volume units who did 11.1 ($p = 0.012$). 23 different surgical techniques were used. High volume units offered a wider range of techniques (8–14) than low volume units (3–6) ($p = 0.004$). OBC was carried out as a joint operation involving a breast and a plastic surgeon in 389 patients. Immediate contralateral symmetrisation rate was significantly higher when OBC was performed as a joint operation (70.7% vs. not joint operations: 29.8%; $p < 0.001$). The incomplete excision rate was 10.4% and was significantly higher after surgery for invasive lobular carcinoma (18.9%; $p = 0.0292$), but was significantly lower after neoadjuvant chemotherapy (3%; $p = 0.031$). 9.2% of patients developed major complications requiring hospital admission. Overall the complication rate was significantly lower after neoadjuvant chemotherapy ($p = 0.035$). The 5 year local recurrence rate was 2.7%, which was higher after OBC for DCIS (8.3%) than invasive ductal cancer (1.6%; $p = 0.026$). 5-year disease-free survival was 91.7%, overall survival was 93.8%, and cancer-specific survival was 96.1%.

Conclusion: This study demonstrated that measured outcomes of OBC in a population-based multi-centre setting can be comparable to the outcomes of large volume single centre series.

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Introduction

Oncoplastic breast conserving surgery has become an integral part of breast cancer surgical treatment over the last two decades [1]. The evidence for oncoplastic breast conservation (OBC) is limited and prospective randomized controlled trials are unlikely ever to be undertaken given the complex ethical implications [2].

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Current evidence is largely based on single-institution retrospective series [3–15]. Systematic literature reviews, meta-analyses and reviews further strengthen the evidence base but numbers in many series are small [2,16–24]. The majority of data reflect the practice of high-volume, mainly tertiary referral centres with few data outside of such units. There is only a single study underway to delineate OBC practice prospectively in a multi-unit level [25]. Due to the lack of robust data outside of the previously mentioned larger units, the published outcomes of OBC do not mirror the results of the majority of patients who are treated outside of these centres. OBC is a rapidly developing field in breast cancer surgery, so it is vital to gain “real-life” data.

Oncoplastic breast conserving surgery practice has been studied in each breast unit from a geographically well-defined area in order to get “real-life” experience in OBC practice and outcomes. In Scotland, all patients treated with oncoplastic breast conservation were analysed with regards to indications, oncoplastic surgical techniques, incomplete excision rate, complication rate, (neo) adjuvant treatment and recurrence rate.

Methods

A predefined database was filled in retrospectively from all breast units who practise oncoplastic breast conservation in Scotland. The following characteristics were collected: age, date of diagnosis and surgery, presentation, oncoplastic surgical technique, immediate contralateral symmetrisation, tumour type, invasive tumour size, whole tumour size, grade, ER and HER-2 expression, lymph node status, multifocality, excision margins, neoadjuvant systemic treatment, adjuvant chemo-, radio-, hormonal, and anti-HER-2 treatment, postoperative complication, date and site of recurrence, date and cause of death, date of last follow-up, presence of plastic surgeon at the operation. Units were asked to enter patients treated with OBC consecutively. Patients who needed completion mastectomy or who had distant metastasis at presentation were excluded.

Oncoplastic technique was determined by the ratio of tumour size to breast size, tumour location, and patients' anatomy and preferences. This was decided subjectively by oncoplastic breast surgeons, or breast and plastic surgeons together. Only patients who underwent significant volume excision followed by volume displacement accompanied by adequate skin envelope reduction, or true volume replacement were included (level II oncoplastic techniques as defined by Clough et al.) [26]. Patients treated with simple reshaping such as dual plane mobilization without skin envelope reduction were not included in the study.

Units were classified as high and low volume units based on the number of OBC done per year. A high volume unit was defined as one which reported at least 100 patients having OBC over two consecutive years.

Joint operations were defined as OBC carried out by a breast (general) and a plastic surgeon together. When a breast surgeon operated together with another breast surgeon, a breast surgical trainee or an oncoplastic fellow, this did not count as a joint procedure.

Incomplete margins were determined by local guidelines of the time. Since 2016, a 1 mm clear margin was considered to be satisfactory for invasive and *in-situ* disease, while 1 or 2 mm clear margin was required previously in some of the Units in Scotland [27]. Overall survival was defined as the time from the date of surgery to the date of death due to any cause, while cancer specific survival is defined as death due to breast cancer. Disease-free survival (DFS) was defined as the time from the date of surgery to the date of the first relapse or the date of death due to any cause. DFS events were defined as any ipsilateral or contralateral breast recurrence

(invasive or non-invasive), regional or distant metastases. Patients who were alive or diseased were censored at the time of last follow-up.

Complications were classified as major or minor. A major complication was considered when readmission or prolonged hospital admission was required for subsequent treatments, that were mainly further surgery for complications and/or intravenous antibiotic administration. All other subsequent treatment not requiring inpatient care was classified as a minor complication.

Chi-square and Mann-Whitney U tests were used for comparison of categorical variables. For comparison between case-load of units or case numbers of time periods ANOVA test was used. For correlation between the case load of units and the number of oncoplastic techniques offered Spearman's rho test was used. A *P*-value equal to or less than 0.05 was considered statistically significant.

Results

589 patients were included in the analysis. The median age was 56 years [range 21–86]. Almost two-thirds of the patients were from the symptomatic service (273 (62.7%); one third from breast screening: 159 (36.5%), and the remainder from follow-up or family history clinics between September 2005 and March 2017. The number of patients treated with OBC in a unit ranged between 4 and 145 (Table 1). 11 of 17 units practising oncoplastic breast conservation contributed to the study. The 6 remaining units are relatively small units and they do not practise OBC. Of these, high volume units performed a mean of 19.3 cases per year [17.3–26.5] vs. low volume units doing 11.1 cases per year [7.7–14.4] ($p = 0.012$) (Table 2). Between 2005 and 2010 the number of patients treated with OBC in Scotland increased yearly. In 2005–2010 a mean of 20 patients per year [5–42] were treated with OBC. This trend plateaued after 2011 when no further increase was observed (2011–2016: mean of 76 patients per year [51–121] ($p = 0.002$)).

23 different oncoplastic surgical techniques were used (Table 3). The number of oncoplastic techniques performed in a unit was associated with case-load: high volume units used a wider range of surgical techniques (8–14 different oncoplastic techniques per unit) compared to low volume units (3–6 different techniques) ($p = 0.004$) (Table 4). Oncoplastic reduction techniques (volume displacement) were used in 515 patients (91.3%), compared to volume replacement oncoplastic technique in 49 patients (8.7%) (Table 3). Immediate symmetrisation was carried out in 336 patients (57%). The immediate symmetrisation rate in patients treated with oncoplastic reduction mammoplasty was 61.7% (327 of 530 patients). The joint operation rate was 66.3% (389 patients).

Table 1

Number of patients treated with oncoplastic breast conservation during the indicated time periods in the various units.

Units	Number of patients	Time period
Western General Hospital Edinburgh	145	April 2005–August 2015
Victoria Infirmary Glasgow	144	September 2005–March 2017
Ninewells Hospital Dundee	111	January 2013–October 2016
Western Infirmary Glasgow	78	July 2005–October 2016
University Hospital Crosshouse	36	June 2005–December 2015
Aberdeen Royal Infirmary	31	January 2014–May 2016
Forth Valley Royal Hospital	13	September 2014–November 2015
Stobhill Hospital Glasgow	12	March 2006–March 2014
Glasgow Royal Infirmary	9	July 2005–April 2010
Wishaw General Hospital	6	August 2015–December 2015
Royal Alexandra Hospital Paisley	4	August 2015–October 2015

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