

# Patient-Reported Outcomes Are Better after Oncoplastic Breast Conservation than after Mastectomy and Autologous Reconstruction

Natalie D. Chand, MBBS, BSc,  
FRCS

Victoria Browne, MBBS

Nirmala Paramanathan, MBBS,  
FRCS

Lashan J. Peiris, MBBS, BSc,  
FRCS

Siobhan A. Laws, MBBS, DM,  
FRCS

Richard M. Rainsbury, MBBS,  
MS, FRCS

**Background:** Oncoplastic breast-conserving surgery (OBCS) avoids mastectomy for larger tumors, but patient-reported outcomes are unknown.

**Methods:** The BREAST-Q questionnaire was distributed to 333 women following therapeutic mammoplasty or latissimus dorsi (LD) miniflap since 1991 [tumor diameter, 32.5 (5–100) mm]. QScore software generated scores/100 for breast appearance, physical, emotional, and sexual wellbeing. Outcomes following therapeutic mammoplasty and LD miniflap were compared and qualitative data analyzed to identify common themes relating to satisfaction.

**Results:** One hundred fifty (45%) women responded [mammoplasty versus LD miniflap, 52% versus 42%; age, 52 (30–83) years; follow-up, 84 (4–281) months]. Eighty-nine percent rated OBCS better than mastectomy, > 80% recommending it to others. Mean outcome scores for breast appearance, physical, and emotional wellbeing were high and persisted beyond 15 years. Therapeutic mammoplasty patients were significantly more satisfied than those undergoing LD miniflap with the shape ( $P < 0.05$ ), the size ( $P < 0.005$ ), and the natural feel of the treated breast ( $P = 0.01$ ). They demonstrated similar scores for physical and emotional wellbeing and a lower score for sexual wellbeing than LD miniflap patients. More LD miniflap patients reported back/shoulder symptoms and were more likely to report upper back pain ( $P < 0.05$ ), but very few (< 5%) were concerned about donor-site appearance. Overall satisfaction with surgical outcomes was high in both OBCS groups (82% “excellent/very good”) but greatest after therapeutic mammoplasty ( $P < 0.005$ ).

**Conclusions:** Patients report long-lasting satisfaction after OBCS and outcomes that compare very favorably with those reported following mastectomy and immediate autologous reconstruction. (*Plast Reconstr Surg Glob Open* 2017;5:e1419; doi: 10.1097/GOX.0000000000001419; Published online 24 July 2017.)

## INTRODUCTION

Surgery for breast cancer has contracted from radical procedures to breast conservation, which is now standard of care for early breast cancer.<sup>1,2</sup> Breast-conserving surgery is increasingly used for larger tumors, some downsized by neo-

adjuvant treatment, but mastectomy is still indicated in about a third of patients. Data from the United Kingdom National Mastectomy and Breast Reconstruction Audit (UKNMBRA)<sup>3</sup> disclosed high overall levels of satisfaction following mastectomy and breast reconstruction, with highest levels following complex techniques. This audit collected data prospectively on > 18,000 women treated by mastectomy with or without reconstruction, using the Breast-Q to assess patient-reported outcomes (PROMs) at 3 and 18 months. Over 2,000 underwent immediate autologous reconstruction.<sup>3</sup>

Resection volume:breast volume is a key factor influencing cosmesis after breast conserving surgery, with

*From the Breast Surgery Unit, Division of Family and Clinical Support Services, Florence Portal House, Royal Hampshire County Hospital, Winchester, Hampshire, United Kingdom.*

*Received for publication January 26, 2017; accepted May 30, 2017.*

*Presented at the Association of Breast Surgeons Annual Conference, May 2016, Manchester, United Kingdom; seventh Winchester Oncoplastic Masterclass, September 2016, Winchester, United Kingdom.*

*Copyright © 2017 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.*

DOI: 10.1097/GOX.0000000000001419

**Disclosure:** *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the Wessex Cancer Research Fund.*

Supplemental digital content is available for this article. Clickable URL citations appear in the text.

patients reporting higher satisfaction following limited volume loss.<sup>4</sup> Oncoplastic breast-conserving surgery (OBCS) combines breast conservation with immediate reconstruction of the resection defect, allowing more extensive resections without compromising cosmetic outcomes or oncological safety.<sup>5–7</sup> This allows breast conservation for patients requiring extensive resections previously necessitating mastectomy. Better quality of life has been reported following oncoplastic breast conservation compared with conventional breast conserving surgery,<sup>8,9</sup> but longer term PROMs are unknown.

This unit has been performing OBCS using latissimus dorsi (LD) miniflaps and therapeutic mammoplasty for 25 and 15 years, respectively. We investigated this mature cohort of patients to establish PROMs. The UKNMBRA was used as a reference group, as most of our full reconstructions used either mixed implant/flap or implant-alone techniques, and the numbers of autologous procedures were insufficient to enable a useful comparison. The well-designed prospective UKNMBRA enjoyed a high response rate, allowing a valid comparison between our patients and a much larger group of patients undergoing immediate autologous reconstruction.

## METHODS

The BREAST-Q<sup>10</sup> is a validated, multidimensional questionnaire-based tool that assesses PROMs following breast reconstruction. It measures patient experience and quality of life using a hierarchy of questions exploring physical, psychological and sexual wellbeing, cosmetic appearance, and overall satisfaction, ranked using a simple Likert scale.

The BREAST-Q was distributed by mail to 333 women treated by either therapeutic mammoplasty or LD miniflap between September 1991 and November 2014. Patients were also asked about additional procedures undertaken, the pain, softness, and lumpiness of the treated and contralateral breast, the amount of help required with daily activities, and the overall results of surgery.

Results were analyzed using the Qscore software [Rasch Unidimensional Measurement Models Laboratory (<https://webcore.mskcc.org/breastq/scoring.html>)], giving a mean outcome score/100 for 4 domains: breast appearance, physical, emotional, and sexual wellbeing. Scores were compared with those from UKNMBRA following immediate autologous reconstruction, which utilized the same analysis methods.<sup>3</sup> Both studies used data that was not adjusted for age, performance status, level of deprivation, and health-care provider.

Responses following therapeutic mammoplasty and LD miniflap were compared using chi-square analysis for categorical responses, and the unpaired Students' *t* test for continuous data.

Free text comments were encouraged within each domain. Qualitative responses were classified into thematic domains and analyzed in keeping with Miles et al.<sup>11</sup> structure of qualitative analysis, then manually grouped by the authors using previously validated themes for patient satisfaction.<sup>12</sup>

## RESULTS

Questionnaires were sent to 333 women (112 therapeutic mammoplasties, 221 LD miniflaps). One hundred and fifty (45%) returned questionnaires [58 mammoplasties (52%); 92 LD miniflaps (42%)], median age 52 years [mammoplasty 59 (39–83); LD miniflap 49 (30–70) years;  $P < 0.0001$ ], follow-up 84 months [mammoplasty 53 (4–174); LD miniflap 112 (6–281) months;  $P < 0.0001$ ; tumor diameter 32.5 (5–100) mm].

### Patient-Reported Outcomes

Figure 1 compares the PROMs returned after OBCS with those returned after mastectomy and immediate autologous reconstruction.<sup>3</sup> The trend toward decreasing scores for question items lower down the scale confirms the validity of the Breast-Q, as outcomes are increasingly difficult to achieve moving down the list. Women undergoing therapeutic mammoplasty were significantly more satisfied than those undergoing LD miniflap with the shape of their operated breast wearing a bra ( $P < 0.05$ ), the size of their treated breast ( $P < 0.005$ ), and the natural feel of the treated breast ( $P = 0.01$ ). They were also significantly less likely to report upper back pain ( $P < 0.05$ ).

### Overall Satisfaction

When reporting overall satisfaction, most women stated that having OBCS was definitely preferable to mastectomy alone, would undergo it again, would encourage it to other women, and had no regrets about having the surgery (therapeutic mammoplasty versus LD miniflap: 91% versus 88%, 86% versus 73%, 90% versus 74%, and 88% versus 76%, respectively). Fewer felt that the surgery went exactly as planned or changed their lives for the better (therapeutic mammoplasty versus LD miniflap, 53% versus 42% and 61% versus 57%, respectively;  $P > 0.05$ ).

### Satisfaction with Flap Donor-Site Appearance

Women following LD miniflap reconstruction were questioned about satisfaction with donor-site appearance. Few women expressed concern with donor-site appearance (2–7% for all questions). Therapeutic mammoplasty does not involve a donor site, therefore patients were asked to report satisfaction with scarring, symmetry, and contralateral scars. Most reported being satisfied/very satisfied with the appearance and scarring of the treated and contralateral breast (94% and 90%, 90% and 91%, respectively).

### Functional Impairment

All OBCS patients were questioned specifically about back and shoulder function to compare the LD miniflap group with mammoplasty patients who, by avoiding LD harvest, acted as a “control.” For a range of daily activities, very few women reported back and shoulder dysfunction after LD miniflap (see figure, Supplemental Digital Content 1, which shows experience of back and shoulder functional impairment following OBCS compared with LD reconstruction with/without implant,<sup>3</sup> <http://links.lww.com/PRSGO/A485>). Although fewer women reported symptoms after mammoplasty versus LD miniflap, differences were not significant for individual question items ( $P > 0.05$ ).

Most respondents were able to carry out daily living tasks unaided with similar outcomes reported following mammoplasty versus LD mini flap ( $P > 0.05$ ) (see figure, **Supplemental Digital Content 2**, which shows proportion of OBCS patients independent with daily living activities, <http://links.lww.com/PRSGO/A486>).

**Mean Outcome Scores**

Both OBCS groups returned high aggregated mean outcome scores for breast appearance, overall satisfaction, emotional, and physical wellbeing (Fig. 2). Scores were lowest for sexual wellbeing. Cohort analysis confirmed persistence of outcomes with time, good scores being re-

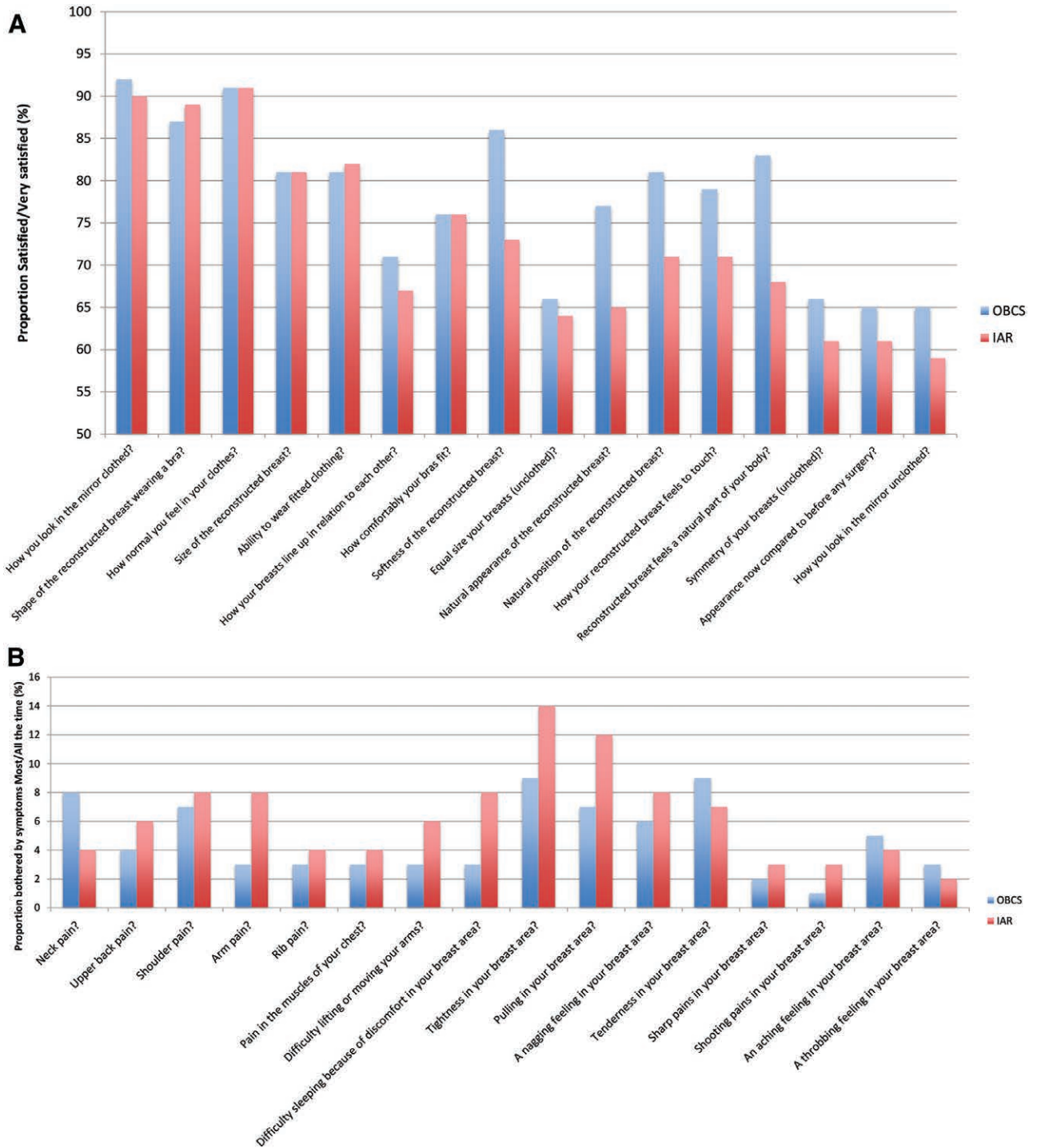
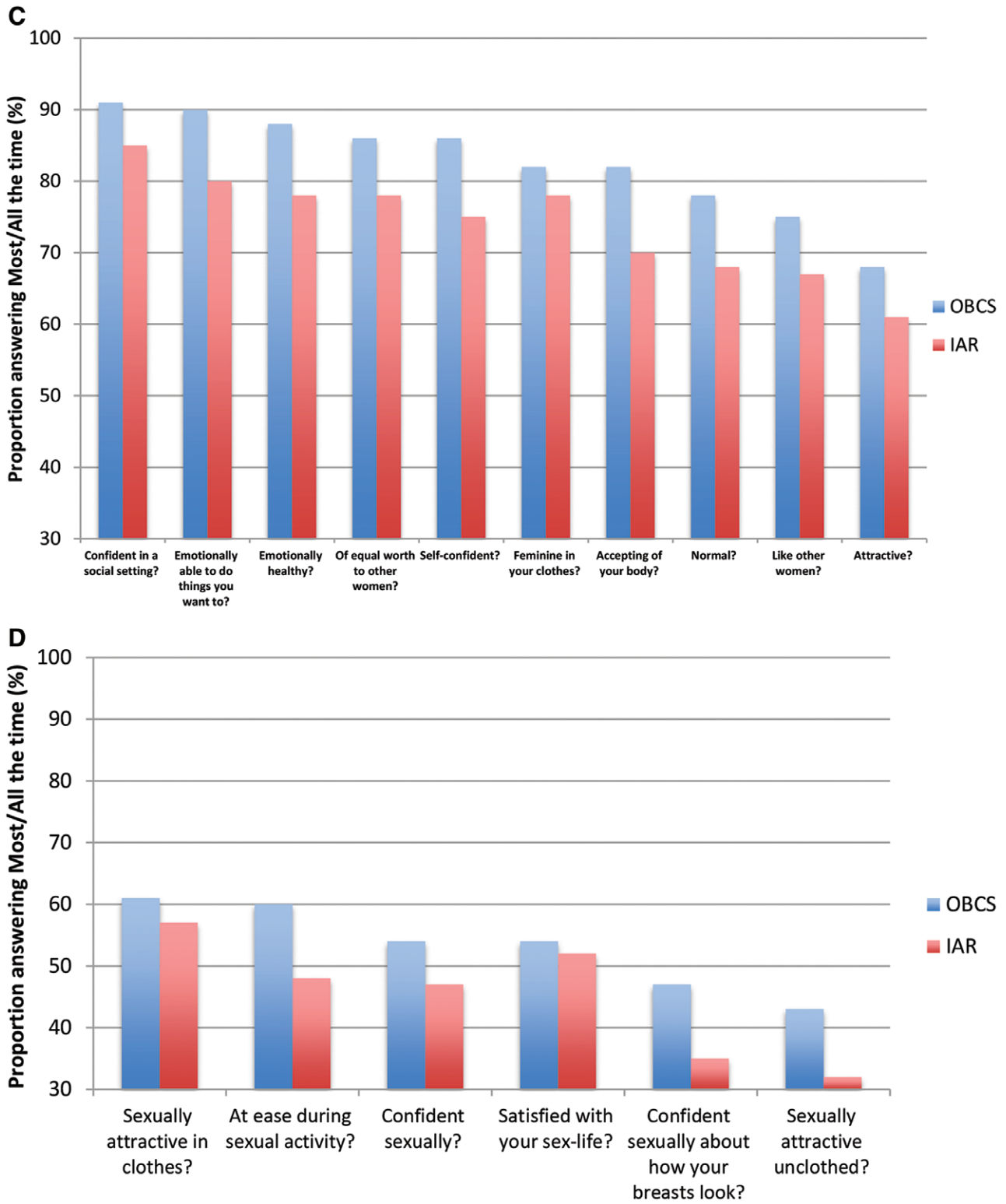


Fig. 1. Continued



**Fig. 1.** A, Satisfaction with the postoperative appearance of the breast following OBCS and immediate autologous reconstruction.<sup>3</sup> B, Physical wellbeing following OBCS and immediate autologous reconstruction.<sup>3</sup> C, Emotional wellbeing following OBCS and immediate autologous reconstruction.<sup>3</sup> D, Sexual wellbeing following OBCS and immediate autologous reconstruction.<sup>3</sup>

turned beyond 15 years (Table 1), but the generation of aggregated scores using an algorithm within the Qscore software prevented a meaningful statistical comparison.

Twenty-eight respondents (13 mammoplasty, 15 LD miniflap) were categorized as having undergone “extreme” OBCS<sup>13</sup> (tumors > 50 mm). Scores for these patients were



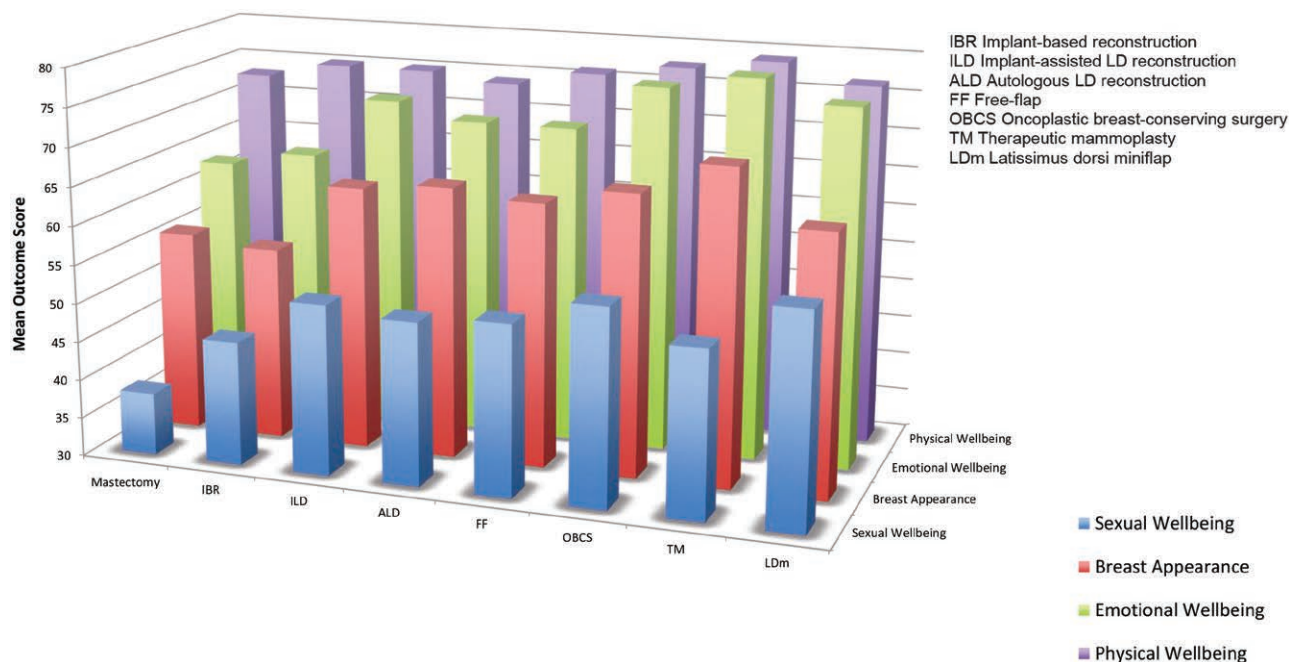


Fig. 2. Mean outcome scores following mastectomy alone, immediate reconstruction,<sup>3</sup> and OBCS.

Table 1. Mean Outcome Scores following OBCS Categorized by Length of Follow-Up

Length of Follow-Up (mo)	Breast Area Appearance	Satisfaction with Outcome	Emotional Well-Being	Physical Well-Being	Sexual Well-Being
0–60	70.2	74.7	78.3	77.7	54.1
61–120	62.7	67.4	72.5	75.8	53.5
121–180	59.6	76.0	79.1	75.4	56.9
181–280*	71.3	85.4	85.7	84.5	67.9

\*There were no patients who underwent TM within this group.

higher in most domains than the overall cohort: breast appearance 71, overall satisfaction 73, emotional wellbeing 83, physical wellbeing 79, and sexual wellbeing 59.

### Local Symptoms

Women rated the softness, pain, and lumpiness in their treated breast. Overall, most reported that the breast felt soft/normal (61%) and pain-free (60%) with no significant procedure-related differences (mammoplasty versus LD miniflap 71% versus 55% and 51% versus 66%, respectively;  $P > 0.05$ ). Women having mammoplasty were more likely to describe lumpiness versus LD miniflaps (34% versus 24%;  $P < 0.05$ ).

Twenty respondents (13%) did not receive adjuvant breast irradiation (DXT) usually as a result of patient choice and reported significantly less firmness (DXT versus no DXT, 4% versus 0%;  $P < 0.05$ ) and less breast pain and/or lumpiness (DXT versus no DXT, 2.4% versus 0% and 4% versus 0%, respectively;  $P > 0.05$ ).

### Additional Procedures

Forty-nine patients (32.7%) underwent additional surgical procedures (mammoplasty, 29.3%; LD miniflap, 34.8%; mean, 1.7 procedures/patient), most commonly nipple reconstruction (9.4%) and contralateral mammoplasty (19.5%). Donor-site or wound complications and

augmentation for asymmetry were uncommon (4.7%, 4%, and 3.3%, respectively).

### Overall Experience

Eighty-two percent described the overall experience of their operation as “excellent” or “very good” (mammoplasty, 88%; LD miniflap, 78%;  $P < 0.005$ ). Three quarters of our patients felt “very satisfied” with the OBCS options offered, a response that was independent of the type of surgery (mammoplasty, 83%; LD miniflap, 67%;  $P > 0.05$ ).

### Qualitative Data

Four hundred seventy-one free text comments were analyzed. Twelve domains were explored: communication, hospital staff, postoperative course, adjuvant treatment, adjunctive procedures, cosmetic appearance, symptoms, how natural the breast seems, clothing, relationships, confidence, and survivorship. These were each subdivided into themes to better represent the variety of comments, examples of which include information provision, radiotherapy and cosmesis, family support, and life after treatment. Factors within each theme that seemed to contribute to higher patient satisfaction were also explored (see figure, Supplemental Digital Content 3, which shows general dimensions, themes, and associated factors contributing to patient satisfaction, <http://links.lww.com/>

*PRSGO/A487*). None of the previously established themes were added or removed in the process, and representative comments were summarized (see table, **Supplemental Digital Content 4**, which displays the summary of qualitative findings and representative comments, <http://links.lww.com/PRSGO/A488>).

## DISCUSSION

OBCS involves reconstruction of the resection defect either by volume displacement or by volume replacement. It should be considered when > 10–15% breast volume loss is anticipated.<sup>4</sup> Volume displacement involves either mobilization and transposition of local dermoglandular flaps to reconstruct resection defects of 10–20% breast volume or a more extensive mammoplasty procedure for larger resections<sup>14</sup> to avoid cosmetic failure.<sup>6</sup> Many different mammoplasty techniques have been described for specific tumor locations,<sup>14</sup> using pedicle techniques evolved from breast reduction as well as secondary pedicles. Most patients choose an immediate contralateral procedure to avoid asymmetry.<sup>15</sup> Two-thirds of our patients had an inferior pedicle mammoplasty, with the remainder undergoing a superolateral or medial pedicle technique depending on the tumor site.

During volume replacement, resection defects are reconstructed using a range of local or distant pedicled or free autologous flaps.<sup>14,16</sup> This approach can restore the shape and size of the breast without the need for contralateral surgery. Options include myocutaneous, myosubcutaneous, perforator and adipose tissue flaps, lipomodelling, and implants.<sup>14,17</sup> We first described volume replacement using a myosubcutaneous LD flap, the “LD miniflap” in 1997<sup>18</sup> and have reported fewer complications and better cosmetic and functional outcomes than skin-sparing mastectomy with immediate breast reconstruction.<sup>19</sup> The myosubcutaneous miniflap is harvested via a lateral incision and is used to reconstruct defects when the overlying skin is preserved. The myocutaneous LD miniflap carries a skin island for resections removing skin, but this may lead to a color discrepancy between the donor skin paddle and native breast.<sup>14</sup>

The operation can be performed as a 1-stage procedure with intraoperative frozen section margin analysis<sup>20</sup> or as a 2-stage procedure following formal margin analysis. Selection for volume displacement or replacement is based chiefly on breast volume and predicted volume loss. A breast size > 500 cc with ptosis is a common indication for therapeutic mammoplasty, while LD miniflap is more appropriate in younger patients with smaller nonptotic breasts. In practice, decisions about the type of OBCS or mastectomy with or without total reconstruction are based on a range of clinical and oncological factors and ultimately patient choice.

### Oncological Considerations

Oncological safety is of prime concern with any emerging technique. Early reports of OBCS confirmed its oncological safety,<sup>6,21</sup> with similar rates of recurrence, disease-free and overall survival compared with standard

breast conserving surgery.<sup>5,22–24</sup> A recent meta-analysis of > 8,000 patients comparing outcomes after OBCS and standard breast conserving surgery, reported significantly lower rates of positive margins, reexcision and local recurrence, and better cosmetic outcomes.<sup>7</sup>

Losken et al.<sup>25</sup> found that therapeutic mammoplasty has no effect on the detection of local recurrence, in keeping with our experience following LD miniflap reconstruction,<sup>26</sup> as flaps remain radiolucent, with a radiolucent rim and minimal local distortion.<sup>27,28</sup> Reducing breast size by therapeutic mammoplasty may also facilitate adjuvant radiotherapy, as late radiotherapy changes are more common in larger breasts due to dose heterogeneity.<sup>29</sup> We reported favorable outcomes following irradiation of LD miniflaps, suggesting that their robust blood supply is able to withstand the ischemic changes induced by radiotherapy.<sup>30</sup>

### Overall Satisfaction following Breast-Conserving Surgery

With equivalent survival following breast-conserving surgery and mastectomy,<sup>1,2</sup> interest in factors such as patient preference, aesthetic outcome, psychosocial adjustment, and long-term quality of life become more important in determining choice of procedure.<sup>31</sup> The use of validated self-administered questionnaires is an established method to study this,<sup>32</sup> and the popular Breast-Q<sup>10</sup> has been used in almost 50 studies and with minor modifications in considerably more.<sup>33</sup>

There is little data regarding quality of life following OBCS, although several authors have demonstrated high levels of satisfaction with aesthetic outcome after therapeutic mammoplasty.<sup>34–36</sup> Patel et al.<sup>37</sup> used the Breast-Q to compare satisfaction and quality of life after immediate, staged-immediate, and delayed mammoplasty. No significant differences were reported between these 3 groups, but positive scores were returned in all domains. Santos et al.<sup>38</sup> compared cosmetic outcome following breast conserving surgery versus mammoplasty in 122 women, reporting more “excellent” aesthetic results in the mammoplasty group. The study included T1/2 tumors, preventing a direct comparison with our patients [mean tumor diameter, 32.5 (5–100) mm].

Hernanz et al.<sup>39</sup> reviewed the evidence for therapeutic mammoplasty from 10 studies, concluding clear oncological and cosmetic advantages, as well as improved quality of life in women with macromastia. Veiga et al.<sup>9</sup> compared quality of life and self-esteem after breast-conserving surgery and OBCS using volume replacement, reporting higher quality of life following OBCS using the SF-36 questionnaire.

Fewer women expressed concern with donor-site appearance (2–7% for all questions) than UKNMBRA respondents following either LD with implant (6–14%) or autologous LD reconstruction (8–15%).<sup>3</sup> More than 80% of our patients described the final results of their surgery as “excellent” or “very good,” compared with two-thirds of women after mastectomy and immediate autologous reconstruction, and a higher proportion (82%) described the overall experience of their operation as “excellent” or “very good,” compared with immediate autologous reconstruction (67%).<sup>3</sup> Both OBCS groups returned high

mean outcome scores in most domains, higher than those reported by the UKNMBRA following either mastectomy alone, or mastectomy and immediate reconstruction.<sup>3</sup>

This contrasts with other BREAST-Q data comparing mastectomy with and without reconstruction with standard breast-conserving surgery, finding lower physical and sexual wellbeing scores after breast conservation.<sup>40</sup>

Satisfaction with symmetry, breast size, and softness was higher after mammoplasty than after LD miniflap in our patients. This highlights the importance of symmetry, and the benefit of simultaneous reduction, and may reflect the longer follow-up of LD miniflap patients. LD miniflap patients were more satisfied with their scars than those choosing implant or autologous LD reconstruction.<sup>3</sup> The use of a single lateral incision in 85% of cases for tumor resection, flap harvest, and reconstruction may explain these results.<sup>16</sup>

### Physical Wellbeing and Functional Impairment

Higher levels of physical wellbeing were experienced by our patients than those reported in the UKNMBRA,<sup>3</sup> possibly reflecting the preservation of a more “natural” breast. High functional scores following therapeutic mammoplasty (although not significantly higher than following LD miniflap) may reflect donor-site avoidance and the functional improvement experienced following breast reduction.<sup>41,42</sup> The similar levels of emotional wellbeing observed after both types of OBCS suggests that anxiety about diagnosis and treatment influences emotional wellbeing more than the type of surgery.

Very few women undergoing OBCS experienced difficulties performing daily tasks, fewer than after LD reconstruction with or without implants,<sup>3</sup> and slightly less following mammoplasty than LD miniflap. Limiting muscle dissection during LD miniflap harvest may reduce disability, as our patients reported less impairment than following more extensive LD harvest.<sup>3</sup> Functional preservation is arguably even more important than good cosmesis because of the influence of disability on quality of life. Somewhat surprisingly, although pain in the treated breast was common, it had little impact on activities of daily living, satisfaction, or wellbeing scores.

### Sexual Wellbeing

Scores for sexual wellbeing following OBCS were lower than all other domains, reflecting the trend seen following immediate autologous reconstruction.<sup>3</sup> Sheppard and Ely<sup>43</sup> explored low sexual wellbeing following breast surgery using a series of in-depth interviews held with patients and spouses. They noted that women may wrongly perceive their partner to be disturbed by changes to their bodies and that despite being an important component of the breast cancer experience, sexuality and body image are not often discussed by health-care professionals.<sup>43</sup>

### Limitations

Quality of life and satisfaction may be affected by a number of factors other than those measured in this survey, including tumor stage, adjuvant treatment, and fear of recurrence. Women undergoing breast-conserving surgery, including OBCS, are more prone to worry

about ipsilateral recurrence than those undergoing mastectomy and breast reconstruction, and this may explain why others have failed to show better quality of life after breast conservation compared with mastectomy.<sup>34,44</sup> Waljee et al.<sup>45</sup> proposed that these patients may not receive the same level of counseling as mastectomy patients and are less informed about recovery and experience. This may help to explain the variety of comments we received regarding recovery, long-term symptoms, and cosmetic outcome.

A response rate of 45% is not unusual for this type of survey, but nonresponse bias cannot be ruled out. On the other hand, postal surveys confer several advantages, including limited cost, anonymity, and reproducibility.<sup>46</sup> The effect of this response rate on our results is unknown and may have been improved by a second mailing or by the use of an incentive. Other sources of potential bias included differential response rates comparing this study with the UKNMBRA<sup>3</sup> (45% versus > 80%), different methods of data collection (by treating unit versus national audit office<sup>3</sup>) and different lengths of follow-up (84 versus 18 months<sup>3</sup>), although the scores returned by patients in different time cohorts were similar.

## CONCLUSIONS

OBCS is extending opportunities for breast conservation to patients previously treated by mastectomy. This study has confirmed the patient-reported benefits of these procedures, which continue beyond a median 7-year follow-up. Patients undergoing OBCS experienced better quality of life, higher levels of satisfaction and wellbeing, better donor-site appearance and function, less impact on daily activity, and better surgical outcomes than previously published evidence of women undergoing more major procedures.

OBCS offers a valuable new alternative to mastectomy and reconstruction for patients facing a high risk of unacceptable cosmetic deformity after standard breast-conserving surgery. Additionally, it achieves 2 increasingly important goals of modern breast cancer treatment: psychological wellbeing combined with good quality of life.

*Natalie D. Chand, MBBS, BSc, FRCS*

Breast Surgery Unit  
Florence Portal House  
Royal Hampshire County Hospital  
Romsey Road  
Winchester  
Hampshire, SO22 5DG  
United Kingdom  
E-mail: ndabbas@gmail.com

## REFERENCES

- van Dongen JA, Voogd AC, Fentiman IS, et al. Long-term results of a randomized trial comparing breast-conserving therapy with mastectomy: European Organization for Research and Treatment of Cancer 10801 trial. *J Natl Cancer Inst.* 2000;92:1143–1150. Available at <http://www.ncbi.nlm.nih.gov/pubmed/10904087>. Accessed August 18, 2016.
- Jacobson JA, Danforth DN, Cowan KH, et al. Ten-year results of a comparison of conservation with mastectomy in the treatment of stage I and II breast cancer. *N Engl J Med.* 1995;332:907–911.



3. Jeevan R, Cromwell D, Browne J, van der Meulen J. National Mastectomy and Breast Reconstruction Audit; 2011. Available at <https://www.rcseng.ac.uk/surgeons/research/surgical-research/docs/national-mastectomy-and-breast-reconstruction-audit-fourth-report-2011>. Accessed August 19, 2016.
4. Cochrane RA, Valasiadou P, Wilson ARM, et al. Cosmesis and satisfaction after breast-conserving surgery correlates with the percentage of breast volume excised. *Br J Surg*. 2003;90:1505–1509.
5. Rietjens M, Urban CA, Rey PC, et al. Long-term oncological results of breast conservative treatment with oncoplastic surgery. *Breast*. 2007;16:387–395.
6. Clough KB, Lewis JS, Couturaud B, et al. Oncoplastic techniques allow extensive resections for breast-conserving therapy of breast carcinomas. *Ann Surg*. 2003;237:26–34.
7. Losken A, Dugal CS, Styblo TM, et al. A meta-analysis comparing breast conservation therapy alone to the oncoplastic technique. *Ann Plast Surg*. 2014;72:145–149.
8. Kaviani A, Sodagari N, Sheikhaei S, et al. From radical mastectomy to breast-conserving therapy and oncoplastic breast surgery: a narrative review comparing oncological result, cosmetic outcome, quality of life, and health economy. *ISRN Oncol*. 2013;2013:742462.
9. Veiga DF, Veiga-Filho J, Ribeiro LM, et al. Quality-of-life and self-esteem outcomes after oncoplastic breast-conserving surgery. *Plast Reconstr Surg*. 2010;125:811–817.
10. Pusic AL, Klassen AF, Scott AM, et al. Development of a new patient-reported outcome measure for breast surgery: the BREAST-Q. *Plast Reconstr Surg*. 2009;124:345–353.
11. Miles MB, Huberman AM, Saldana J. *Qualitative Data Analysis: A Methods Sourcebook*. 3rd ed. California: SAGE Publications; 2013.
12. Anderson R, Barbara A, Feldman S. What patients want: a content analysis of key qualities that influence patient satisfaction. *J Med Pract Manage*. 22:255–261. Available at <http://www.ncbi.nlm.nih.gov/pubmed/17494478>. Accessed August 18, 2016.
13. Silverstein MJ, Savalia N, Khan S, et al. Extreme oncoplasty: breast conservation for patients who need mastectomy. *Breast J*. 21:52–59.
14. Rainsbury RM, Clough KB, Kaufman GJ, et al. *Breast Surgery: A Companion to Specialist Surgical Practice*. In: Dixon J, ed. 5th ed. Edinburgh, Scotland: Saunders Elsevier; 2014.
15. Losken A, Hamdi M. Partial breast reconstruction: current perspectives. *Plast Reconstr Surg*. 2009;124:722–736.
16. Rusby J, Rainsbury R. Distant Volume Flaps for Conservative Surgery. In: Urban C de A, Rietjens M, eds. *Oncoplastic and Reconstructive Breast Surgery*. Milano, Italy: Springer; 2013.
17. Rainsbury RM, Clough KB, Kaufman GJ, Nos C, and Dixon JM. Oncoplastic procedures to allow breast conservation and a satisfactory cosmetic outcome. In: Dixon JM, ed. *Breast Surgery: A Companion to Specialist Surgical Practice*. 5th ed. Elsevier Saunders; 2014.
18. Raja MA, Straker VF, Rainsbury RM. Extending the role of breast-conserving surgery by immediate volume replacement. *Br J Surg*. 1997;84:101–105.
19. Gendy RK, Able JA, Rainsbury RM. Impact of skin-sparing mastectomy with immediate reconstruction and breast-sparing reconstruction with miniflaps on the outcomes of oncoplastic breast surgery. *Br J Surg*. 2003;90:433–439.
20. Rusby JE, Paramanathan N, Laws SAM, et al. Immediate latissimus dorsi miniflap volume replacement for partial mastectomy: use of intra-operative frozen sections to confirm negative margins. *Am J Surg*. 2008;196:512–518.
21. Cothier-Savey I, Otmezguine Y, Calitchi E, et al. [Value of reduction mammoplasty in the conservative treatment of breast neoplasms. Apropos of 70 cases]. *Ann Chir Plast esthétique*. 1996;41:346–353. Available at <http://www.ncbi.nlm.nih.gov/pubmed/9183883>. Accessed August 18, 2016.
22. De Lorenzi F, Hubner G, Rotmensz N, et al. Oncological results of oncoplastic breast-conserving surgery: long term follow-up of a large series at a single institution: a matched-cohort analysis. *Eur J Surg Oncol*. 2016;42:71–77.
23. Veronesi U, Cascinelli N, Mariani L, 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;347:1227–1232.
24. Fisher B, Anderson S, Bryant J, 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;347:1233–1241.
25. Losken A, Schaefer TG, Newell M, et al. The impact of partial breast reconstruction using reduction techniques on postoperative cancer surveillance. *Plast Reconstr Surg*. 2009;124:9–17.
26. Banerjee D, Paramanathan N, Summerhayes C, et al. Local recurrence following skin-sparing oncoplastic techniques: a 10-year Winchester experience. *Eur J Cancer*. 2003;1:38.
27. Tan VK, Cornford EJ, McCulley SJ, et al. Qualitative mammographic findings and outcomes of surveillance mammography after partial breast reconstruction with an autologous flap. *J Surg Oncol*. 2015;111:377–381.
28. Monticciolo DL, Ross D, Bostwick J, 3rd, et al. Autologous breast reconstruction with endoscopic latissimus dorsi musculocutaneous flaps in patients choosing breast-conserving therapy: mammographic appearance. *AJR Am J Roentgenol*. 1996;167:385–389.
29. Moody AM, Mayles WP, Bliss JM, et al. The influence of breast size on late radiation effects and association with radiotherapy dose inhomogeneity. *Radiother Oncol*. 1994;33:106–112. Available at <http://www.ncbi.nlm.nih.gov/pubmed/7708953>. Accessed August 18, 2016.
30. Laws SAM, Cheetham J, Rainsbury RM. Volume changes after latissimus dorsi “miniflap” breast reconstruction. *Breast Cancer Res Treat*. 2001;69:232.
31. Conde DM, Pinto-Neto AM, Cabello C, et al. Quality of life in Brazilian breast cancer survivors age 45-65 years: associated factors. *Breast J*. 2005;11:425–432.
32. Fehlaer F, Tribius S, Mehnert A, et al. Health-related quality of life in long term breast cancer survivors treated with breast conserving therapy: impact of age at therapy. *Breast Cancer Res Treat*. 2005;92:217–222.
33. Cohen WA, Mundy LR, Ballard TN, et al. The BREAST-Q in surgical research: a review of the literature 2009-2015. *J Plast Reconstr Aesthet Surg*. 2016;69:149–162.
34. D’Aniello C, Grimaldi L, Barbato A, et al. Cosmetic results in 242 patients treated by conservative surgery for breast cancer. *Scand J Plast Reconstr Surg Hand Surg*. 1999;33:419–422. Available at <http://www.ncbi.nlm.nih.gov/pubmed/10614751>. Accessed August 18, 2016.
35. Fitoussi A, Berry M, Fama F, et al. Oncoplastic breast surgery for cancer: analysis of 540 consecutive cases [outcomes article]. - PubMed - NCBI. *Plast Reconstr Surg*. 2010;125:454–462.
36. Spear SL, Pelletiere CV, Wolfe AJ, et al. Experience with reduction mammoplasty combined with breast conservation therapy in the treatment of breast cancer. *Plast Reconstr Surg*. 2003;111:1102–1109.
37. Patel KM, Hannan CM, Gatti ME, et al. A head-to-head comparison of quality of life and aesthetic outcomes following immediate, staged-immediate, and delayed oncoplastic reduction mammoplasty. *Plast Reconstr Surg*. 2011;127:2167–2175.
38. Santos G, Urban C, Edelweiss MI, et al. Long-term comparison of aesthetic outcomes after oncoplastic surgery and lumpectomy in breast cancer patients. *Ann Surg Oncol*. 2014;25:2500–2508.
39. Hernanz F, Regaño S, Vega A, et al. Reduction mammoplasty: an advantageous option for breast conserving surgery in large-breasted patients. *Surg Oncol*. 2010;19:e95–e102.



40. Howes BH, Watson DI, Xu C, et al. Quality of life following total mastectomy with and without reconstruction versus breast-conserving surgery for breast cancer: a case-controlled cohort study. *J Plast Reconstr Aesthet Surg*. 2016;69:1184–1191.
41. Sabino Neto M, Demattê MF, Freire M, et al. Self-esteem and functional capacity outcomes following reduction mammoplasty. *Aesthet Surg J*. 2008;28:417–420.
42. Blomqvist L, Eriksson A, Brandberg Y. Reduction mammoplasty provides long-term improvement in health status and quality of life. *Plast Reconstr Surg*. 2000;106:991–997. Available at <http://www.ncbi.nlm.nih.gov/pubmed/11039369>. Accessed August 18, 2016.
43. Sheppard LA, Ely S. Breast cancer and sexuality. *Breast J*. 2008;14:176–181.
44. Nano MT, Gill PG, Kollias J, et al. Psychological impact and cosmetic outcome of surgical breast cancer strategies. *ANZ J Surg*. 2005;75:940–947.
45. Waljee JF, Hu ES, Ubel PA, et al. Effect of esthetic outcome after breast-conserving surgery on psychosocial functioning and quality of life. *J Clin Oncol*. 2008;26:3331–3337.
46. Cartwright A. Interviews or postal questionnaires? Comparisons of data about women's experiences with maternity services. *Milbank Q*. 1988;66:172–189.