

The effect of breast reconstruction surgery on body image among women after mastectomy: a meta-analysis

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Abstract The purpose of this study was to analyze the available evidence concerning the effects of breast reconstruction (BR) on body image of women with breast cancer. BR is a potential intervention to improve the body image of women with breast cancer. Conflicting research findings about the effects of breast reconstructive surgery on body image compared to breast conservative surgery (BCS) or mastectomy exist. A meta-analysis of studies found in MEDLINE, CINAHL, PsychINFO, PubMed as well as PQDT (dissertation and theses), and other unpublished literature resources from 1970 to 2010 were searched. Comparable studies that examined the difference of body image between breast cancer women receiving mastectomy plus BR and those with BCS were included. A clear definition about the domains of body image including body stigma, body concern, and transparency were identified. Mean effect sizes were calculated. Twelve studies were included in the meta-analysis. Women with BR and BCS were no different on the body concern domain of body image. However, women with BR had a significantly worse score on body stigma domain of body image than women receiving BCS. Women with BR had a better body image score than women with mastectomy. Women who are satisfied with their body

shape may still perceive deficiencies because of the stigma of mastectomy and affect on body image. Consistent application of valid and reliable measures of body image specific to breast cancer women is needed.

Keywords Body image · Breast cancer · Breast reconstruction · Mastectomy · Systematic review · Meta-analysis

Introduction

Evidence has shown that mastectomy and breast conservative surgery (BCS) combined with radiotherapy yield similar survival rates for patients in the early stages of breast cancer [1]. Women with breast cancer make treatment decisions according to their preference. However, under some circumstances, such as having a large tumor comparable to the size of the breast, multiple primary tumors, or a high risk of subsequent new or recurrent tumors, only a mastectomy is recommended [2].

The psychological ramifications of a mastectomy can be substantial as women face distress and disfigurement caused by the loss of their breast. Breast reconstruction (BR) has offered an alternative to women requiring a mastectomy and was more commonly available from 1970s to 1980s. In the late 1990s, surgical techniques were refined, including the use of autologous BR. Procedures such as the transverse rectus abdominis myocutaneous flap, deep inferior epigastric artery perforator flap, and latissimus dorsi flap have led to better cosmetic results than non-autologous BR using silicon or saline breast implants. Women may also select to undergo nipple reconstruction. Visually satisfying breast tissue in size, shape, color, and skin texture that matches, as nearly as

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possible, the original or the remaining breast is considered surgically optimal.

Breasts are often emphasized by society as a symbol of femininity or sexuality. Women seek BR in order to be more attractive and whole [3–5]. It is generally believed that BR can improve women's quality of life and well-being. However, ambivalent findings about the effects of BR on body image compared to BCS were found. Studies have shown that BCS results in a more acceptable body image [6–8]. However, others have found no significant difference in body image scores between the two groups [9–11]. Yet when the measurement of body image has focused on cosmetic evaluation, the majority of women have reported significant satisfaction with cosmetic results from BR compared to BCS [12, 13]. Several qualitative studies also demonstrated that most women express a high satisfaction with their reconstructed breasts by regaining a sense of normalcy [5, 14]. However, women have reported that the reconstructed breasts look or feel unnatural and lack sensation [5, 14–16]. The discrepancy of body image between women with BR and BCS might be explained by their feelings of finding themselves with a new breast and the scale used for measuring body image.

Women's quality of life after breast cancer surgery is influenced by body image. The instrument used to measure body image varied. One systematic review evaluating measures on quality of life in women with breast surgery found that most of these questionnaires had not undergone any formal development or psychometric evaluation. Only three breast cancer body image questionnaires were qualified [17], and one instrument identified clear domains of body image for breast cancer women which validated formally [18]. The impact of BR on women's body image remains limited by the domains of measurement which the researcher selected.

One meta-analysis examined the psychosocial outcomes of BCS versus modified radical mastectomy (MRM) and reported consistent psychological advantages for BCS. The effect size (ES) of the body/self-image was 0.56, larger than other psychosocial variables such as social adjustment, cancer-related fears and concerns [19]. However, the analysis included women with BR in the MRM group. The inclusion of BR limits the understanding of the real effect of BCS when compared to women receiving MRM plus BR. Moyer [19] argued that level of disfigurement in patients treated with MRM may moderate the effects of BCS on psychosocial outcomes including body image. Given the importance of understanding how the body image change is perceived by women with BR, this review aims to determine whether the body image of women with BR differed from women with BCS and any effect of measurement instrument.

Methods

Search strategy

Electronic databases, including PubMed, MEDLINE, PsychINFO, ProQuest, and sociological and dissertation abstracts in English were searched to identify relevant studies. Reference sections of published empirical papers identified were also reviewed. Published and unpublished investigations from 1970 to 2010 were retrieved. Keywords, titles, and abstracts were searched. The search term "body image" or "quality of life," in combination with "breast cancer" and "breast reconstruction" were used. After the searches were completed, reference list from identified studies was examined to find additional studies.

Selection criteria

The studies selected for this meta-analysis involved the comparison of body image of women who had undergone different types of surgery including BCS (procedures that spare the breast also called local excision, wide excision, and lumpectomy) and BR (procedures that replace the breast, including saline or silicon gel-filled implant or autogenous tissue techniques). Inclusion of potential studies in the meta-analysis included: (a) published in English; (b) measurement of body image in women with breast cancer; and (c) one of the groups required BR compared to BCS or both BCS and MRM. Exclusion criteria were studies focused on reconstruction in women receiving prophylactic MRM and without separate women receiving MRM and reconstruction. Studies without sufficient data to calculate Cohen's *d* were also excluded.

Data extraction and quality assessment

Descriptions of methodology and substantive variables of each study were coded including publication type, author background, sampling method, sample size, research design, data collection and time frame, statistics, and instruments used to measure body image. Variables previously identified as influencing the differences in body image outcome between groups included the women's age, cancer stage, marital status, education, adjuvant therapies, menopause status, time period since surgery, and the type of reconstruction surgery. Data about measurements of body image including statistics value and items were extracted and coded in the original form reported by the authors.

Inter-rater reliability was conducted on data extracted from the papers. Fifty percent of the papers were randomly selected and independently extracted by the investigator and a researcher with experience in meta-analysis.

Agreement between the two raters was 95 % after discussion. The concepts of the items in body image scale were first categorized by the author SYF. These were further examined by a native English speaking nursing professor for comparison.

The evidence-based library and information practice critical appraisal checklist evaluating population, data collection, study design and results was used to assess the methodological quality of each selected study [20]. Two authors assessed these studies independently. Consensus was achieved by 95 %, and the overall validity was over 75 % which meant we could safely conclude that these studies were valid.

Statistical analysis

Because the majority of the selected studies were groups comparison and mean, standard deviation or p value between groups were provided. ES estimation was calculated using Cohen's d by Comprehensive Meta-Analysis software. In a small proportion of studies, significant findings were reported but with no value provided and $p < 0.05$ was assumed [21]. One ES was formulated by calculating mean value when more than one ES was provided in the papers [8–10, 13, 22–24]. A positive ES indicated that body image of BR group was better than MRM or BCS groups.

To detect publication bias, the calculation of Begg's test as well as the funnel plot was assessed. The ES of outcome variables was pooled using fixed-effect or random-effect model based on heterogeneity test, which was calculated by the inverse variance method. The heterogeneity of studies was examined by the χ^2 of Q statistic [21]. With a non-significant heterogeneity, a fixed-effect model was used to identify the pooled ES, while random-effect model was used for heterogeneity [25]. Subgroup analysis was then performed according to the domain of body image.

Results

Search results

The PubMed search identified 234 articles. Only 17 articles met the criteria of our study. These 17 articles were also identified in MEDLINE. One dissertation was identified from ProQuest [26]. One additional article [27] was retrieved from the review [28]. As a result, 19 studies met the stated criteria for review and 12 studies were suitable for the meta-analysis. The total sample size for the 12 meta-analysis studies was 3,776, ranging from 37 to 1,957 per study.

In seven studies excluded from the meta-analysis, three did not provide significant value [27, 29, 30] and four used non-parametric to report their results [31–34]. Authors were contacted with the provided email address for requesting additional information needed for meta-analysis, however, no response was received.

Study characteristics

The initial review process generated 12 studies eligible for inclusion (Table 1). Three studies compared BCS and BR groups and eight studies compared BCS, MRM groups, and BR. The remaining one study compared four different groups. This study separated the reconstruction group into immediate and delay groups in terms of timing of receiving BR with MRM. The majority of studies (7/12) did not report the timing of reconstruction or combined the immediate and delay BR women into the same group. Five studies recruited immediate BR group to compare with BCS and MRM groups (Table 1).

A wide variety of body image measurements were used. Six studies used validated instruments [7, 8, 10, 13, 23] and the others developed their own measurement [6, 9, 11, 12, 22, 24]. Body image after breast cancer questionnaire (BIBCQ) is a breast surgery-specific instrument for assessing the long-term impact of breast cancer on body image and had been validated in an oncologic breast surgery population [18]. BIBCQ included six domains of body image which were vulnerability, body stigma, limitations, body concerns, transparency, and arm concerns [18]. Based on the domain of BIBCQ, each instrument of the 12 studies for meta-analysis was evaluated. Among all 12 studies, 9 included body stigma, 7 included body concern, 5 included transparency, however, none included vulnerability, limitations and arm concerns. Additionally, 3 studies only measured a single domain of body image, while 7 studies measured 2 and 2 studies measured 3 domains (Table 1).

Comparison of body image between BR and BCS groups

Twelve studies included in the meta-analysis were published between 1989 and 2007. Four were published before 2000 (Table 1). No publication bias was observed among studies using Begg's p value ($p = 0.09$), and the funnel plot was inspected and found to be symmetrical.

The 12 studies surveyed 3,776 women to compare body image between BR and BCS groups (Table 2). Four of 12 studies reported positive ES (d) ranging from 0.009 to 0.130, with 8 of 12 studies reporting ES from -0.089 to -0.778 . The forest plot shows the standardized difference in means and 95 % CI of each study and the pooled outcome of random-effects model (Fig. 1). The test for

Table 1 Summary of studies included in the review comparing body image between women receiving BR, BCS, and MRM

| Author(s) | Years | Design and number | Reconstruction group | Follow time after diagnosis | Measurement tool | Domains of body image | Body image findings |
|-----------------------|-------|---------------------------------------------|----------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Nicholson et al. [13] | 2007 | BCS: 41 BR: 80 MRM: 46 | IR + DR | Not provided | Derriford Appearance Scale (DAS-59) | Body stigma Transparency | NS |
| Dian et al. [12] | 2007 | BCS: 64 BR: 70 | IR + DR | Not provided | Self-designed questionnaire | Body concern | BR > BCS |
| Parker et al. [23] | 2007 | BCS: 104 BR: 109 MRM: 45 | IR | Baseline: before surgery Follow: 1, 6, 12, 24 months after surgery | Multidimensional Body-Self-Relations Questionnaire (MBSRQ) | Body concern | NS |
| Nano et al. [11] | 2005 | BCS: 109 BR: 123 MRM: 78 | IR + DR | Mean >2 years (some <1 years) | Self-designed questionnaire | Body stigma Body concern Transparency | BCS > MRM BR > MRM BCS versus BR: NS |
| Cocquyt et al. [9] | 2003 | BCS: 21 BR: 21 | IR | >2 years | Self-designed questionnaire | Body concern Body stigma | Body concern: BCS > BR Body stigma: NS |
| Arora et al. [6] | 2001 | BCS: 49 BR: 33 MRM: 21 | IR | <2 years (baseline: 23 days, follow: 5 months) | Self-designed questionnaire | Body stigma Transparency | Follow: 5 months BCS > MRM BCS > BR |
| Rowland et al. [7] | 2000 | BCS: 443/676 BR: 151/176 MRM: 269/242 | IR + DR | >2 years (1–5 years) | Cancer Rehabilitation Evaluation System (CARES) | Body stigma Transparency | BCS > BR BR versus MRM: NS |
| Yurek et al. [8] | 2000 | BCS: 53 BR: 25 MRM: 44 | IR + DR | <2 years (36 days) | Body Impact of Treatment Scale (BITS) Body satisfaction | Body stigma Transparency Body concern Body concern | BCS > MRM; BCS > BR BR versus MRM: NS BCS > MRM; BR > MRM BCS versus BR: NS |
| Front [26] | 1999 | BCS: 162 BR: 46 MRM: 122 | IR + DR | <2 years | Body Image and Sexuality Scale (BISS) | Body stigma Body concern | BCS > BR BR versus MRM: NS BCS versus MRM: NS |
| Noguchi et al. [24] | 1993 | BCS: 42 BR: 48 | IR | >2 years | Self-designed questionnaire | Body stigma Transparency | BCS > BR |
| Mock [10] | 1993 | BCS: 90 IR: 58 DR: 47 MRM: 62 | IR DR | <2 years | Polivy Body Image Scale Body Image Visual Analogue Scale (BIVAS) | Body concern Body concern | NS BCS > IR; BCS > MRM |
| Wellisch et al. [22] | 1989 | BCS: 22 BR: 15 MRM: 13 | IR + DR | >1 years <3 years | Self-designed questionnaire | Body stigma Body concern Transparency | BCS > BR BCS > MRM |

BCS breast-conserving surgery, MRM mastectomy, BR mastectomy with BR, IR immediate reconstruction, DR delayed reconstruction, NS no significant

heterogeneity was significant ($Q = 47.690$, $p < 0.0001$), indicating that the variation in the effects represented systematic differences among the studies. The Z test for overall ES was significantly negative revealing that body image of the BCS group was better than BR group with $ES = -0.212$ (95 % CI: -0.407 , -0.017).

Studies were categorized into different groups depending on the domains of body image. There was no significant difference in body concern domain between BR and BCS groups (Fig. 2). However, significant difference in body stigma domain was found in BCS group as compared to BR group ($ES = -0.258$, 95 % CI: -0.515 , -0.001) (Fig. 3), which revealing that BR group experienced much more body stigma than BCS group.

Comparison of body image between BR and MRM

Figure 4 showed the results from seven studies of 2,359 women and compared the body image scale scores between the BR and MRM groups. Seven studies reported a positive ES ranging from 0.083 to 0.285. The heterogeneity test was non-significant ($Q = 3.878$, $p = 0.794$), indicating that variations in the effects were not due to systematic differences among the studies. The combined ES (0.122, 95 % CI: 0.024, 0.220) revealed that body image of BR group was better than MRM group. In order to understand whether different domains of body image have different effect, subgroup analysis was conducted. There was significant difference in body concern domain between BR and MRM groups ($ES = 0.238$, 95 % CI: 0.034, 0.441) (Fig. 5). However, no significant difference in body stigma

domain was found in MRM group as compared to BR group, which revealed that BR group experienced similar body stigma to MRM groups (Fig. 6).

Discussion

Results of this study indicated that women with BCS had a significantly better overall body image than women with BR. The subgroup analysis of the domain of body image revealed that even the BR group had a similar body concern to BCS group, women with BR experienced more body stigma than women with BCS.

The BCS group had significant higher body image score than the BR group. Although the ES estimates were considered to be heterogeneous, indicating variations between studies due to systematic error by categorizing the studies on body image domains, the benefits of BCS on body stigma but not on body concern were revealed. Body concern is related to satisfaction with body shape and appearance [18]. Women with the shape of their breast rebuilt from BR would not be concerned by clothing, this finding was anticipated. However, the body stigma domain of body image emphasizes the loss of body integrity when a breast is removed. Women who were satisfied with their body shape may still perceive themselves as deficient after BR. As a result, body image problems occur despite satisfaction with shape and appearance.

On the contrary, women receiving BR had a better body image than women receiving MRM. The subgroup analysis of the domain of body image indicated that BR group only had a better body concern but not in body stigma domain. The result indicated that BR might be able to recreate physical appearance but is unable to resolve women's perception of feeling abnormal or different from others after a MRM.

Breast cancer is synonymous with disfigurement since removing women's breasts is considered to be a standard treatment for women with breast cancer [35]. Cultural stereotypes about female appearance complicate the procedure of MRM as the treatment disrupts social interactions and women perceived themselves as repulsive, ugly, or unattractive [36]. The disease of breast cancer leading to a MRM has been stigmatized.

According to Feather et al. [37] study, a woman strives toward wholeness by using a prosthesis or reconstruction surgery. Using a prosthesis or accepting reconstruction which cover the flawed defected body is one strategy women use to cope with the stigma of losing a breast [37]. However, in this study, non-significant effect on the body stigma between BR and MRM and significant negative effect on body stigma between BR than BCS indicate that using a prosthesis or surgical reconstruction may not be an

Table 2 ESs of body image on BR comparing BCS ($n = 3,776$)

| Authors | Sample size (BR/BCS) | ES | p^a value |
|-----------------------|----------------------|--------|-------------|
| Arora et al. [6] | 33/49 | -0.778 | 0.001 |
| Rowland et al. [7] | 327/1119 | -0.588 | <.0001 |
| Noguchi et al. [24] | 48/42 | -0.402 | 0.060 |
| Front [26] | 46/162 | -0.329 | 0.050 |
| Yurek et al. [8] | 25/53 | -0.321 | 0.188 |
| Wellisch et al. [22] | 15/22 | -0.264 | 0.432 |
| Mock [10] | 105/90 | -0.095 | 0.508 |
| Nano et al. [11] | 123/109 | -0.089 | 0.499 |
| Cocquyt et al. [9] | 21/21 | 0.009 | 0.977 |
| Parker et al. [23] | 109/104 | 0.066 | 0.629 |
| Dian et al. [12] | 70/64 | 0.104 | 0.548 |
| Nicholson et al. [13] | 80/41 | 0.130 | 0.499 |
| Random | | -0.212 | 0.033 |

Positive ES indicates preference of BR and negative ES indicates preference of BCS

Heterogeneity test: $Q = 47.690$, $p < 0.0001$

^a Z test

Fig. 1 Systematic review of combined dimensions of body image in studies comparing BR and BCS

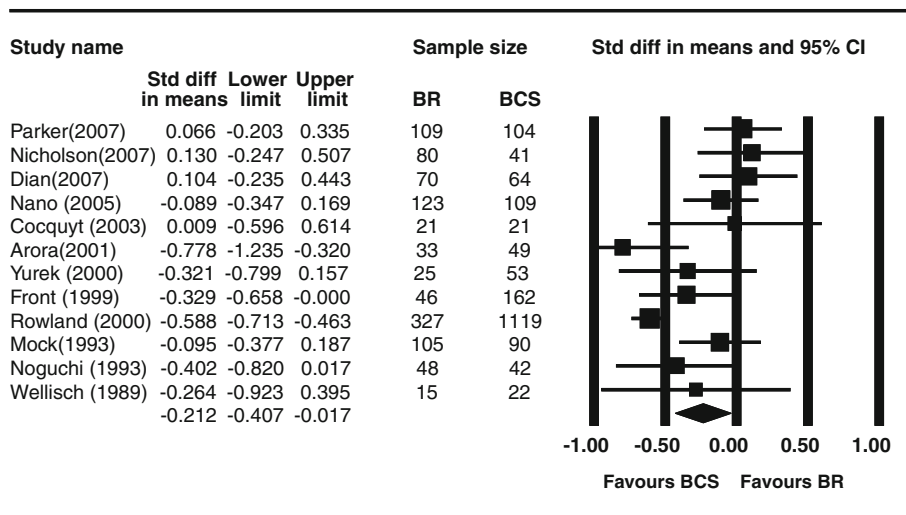


Fig. 2 Systematic review of body concern of body image in studies comparing BR and BCS

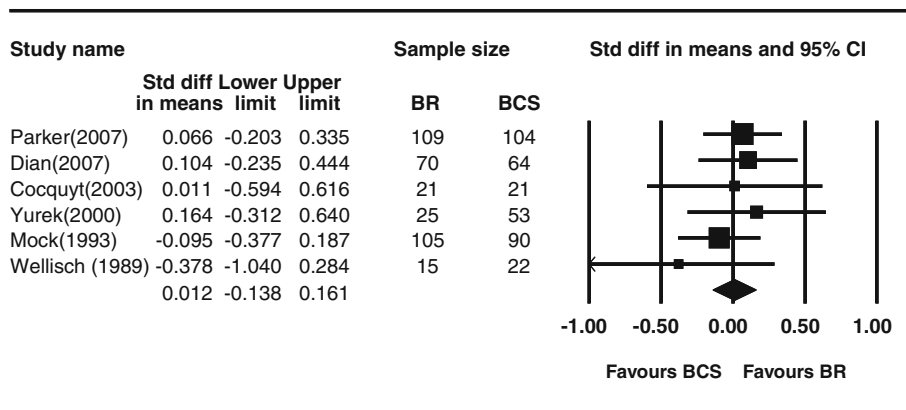
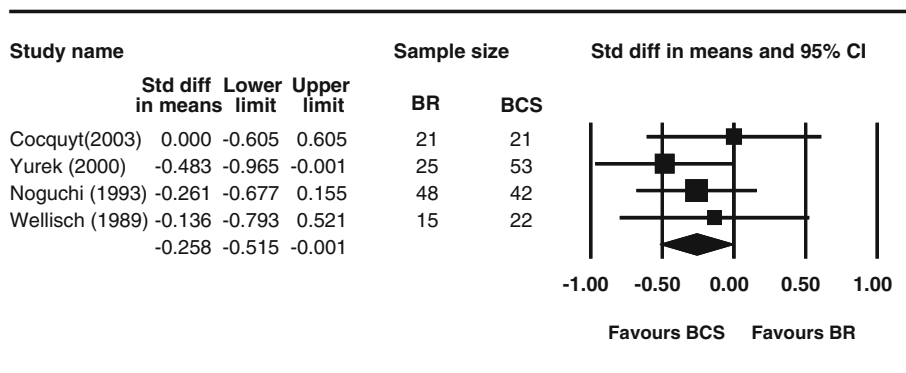


Fig. 3 Systematic review of body stigma of body image in studies comparing BR and BCS



effective strategy for women to deal with their perception of a flawed and stigmatized body. Women view their new breasts as foreign objects and unnatural after BR [5, 15, 38] and experienced a “struggling to accept” [38]. The findings support Kasper [16] opinion that social and cultural antecedents, which regarded women’s breasts as symbols of

femininity, sexuality, and important to physical appearance, create difficulty for women faced with breast cancer.

Body image is a complex concept which encompasses more than physical attributes and describes overall wholeness, functionality, and ability to relate to others [39]. The review of the literature revealed the lack of a consistent scale

Fig. 4 Systematic review of combined dimensions of body image in studies comparing BR and MRM

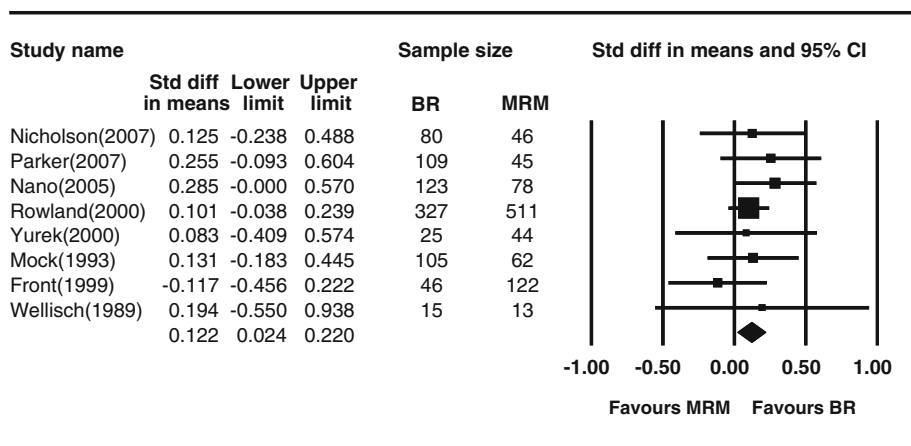


Fig. 5 Systematic review of body concern of body image in studies comparing BR and MRM

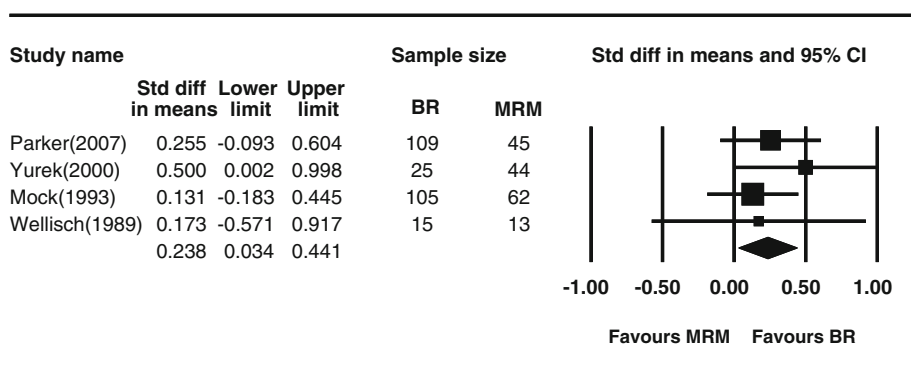
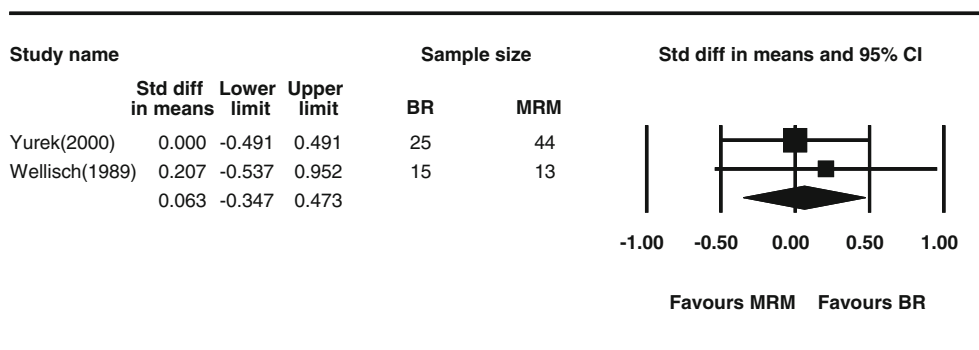


Fig. 6 Systematic review of body stigma of body image in studies comparing BR and MRM



to measure body image in women with breast cancer. Some studies measured satisfaction of body image from the overall perception of the body, such as Polivy Body Image Scale [10, 40] and Body Satisfaction Scale [8]. Some investigators devised their own instruments [9, 33]. Additionally, some measures are disease specific rather than surgery specific [17]. The inconsistent use of scales across the studies identified may have influenced the ability of difference-detection between different breast cancer surgeries. If the effect of BR on body image in women with breast cancer is to be

understood, it is critical to evaluate the domains of body image and measure them appropriately.

Limitation

The studies comparing BR and BCS included a wide range of variables such as tumor size, tumor stage, adjuvant therapies, BMI, and incision or tumor location might influence the results. Studies revealed that receiving BR

right after MRM would not improve psychosocial well-being compared to delayed BR [14, 41]. Additionally, significant improvements in psychosocial adjustment including body image during long-term follow-up have been reported [23]. Factors such as the timing of post-surgical assessment and the grouping of immediate and delayed reconstruction women may contribute to variability in ES.

The lack of standardization of measurement of body image among breast cancer women makes comparison among studies difficult. As body image problems can encompass more than physical attributes and describes overall wholeness, functionality, and ability to relate to others [39]. Since the authors concerned different domains of women's body image, the outcomes polled from all different instruments increase the heterogeneity. Analyzing different domains extracted from each study might inform specific issues of body image. However, some studies did not provide separate scores for each item for the body image scale they used. Calculation of ES according to the domain may be limited by studies providing only total scores of body image scales.

Conclusion

Women who are satisfied with their body shape may still perceive deficiencies because of the stigma of MRM and effect on body image. These findings have implications for health care professionals. Even receiving BR, women need to express their feelings related to body image. Offering accurate and realistic information on the outcomes of BR is important for women during decision making. Researchers must identify the domain of body image that is most relevant for patients. Consistent application of valid and reliable measures of body image specific to breast cancer women is needed.

Conflict of interest We have no affiliation with or financial involvement in any organization with a financial interest in the subject matter or materials discussed in the manuscript.

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