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Patient-reported Outcomes of Breast Reconstruction after Mastectomy: a Systematic Review

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Breast reconstruction is commonly utilized after mastectomy for breast cancer and is generally felt to improve women's quality of life and well-being.¹ However, most studies that have evaluated breast reconstruction have focused on outcomes that may not be relevant to patients or that are of interest primarily to surgeons (such as fat necrosis, symmetry without clothing),^{2–4} and many studies have not compared outcomes of breast reconstruction to outcomes of mastectomy only. In addition, recent findings of large geographic variations in rates of breast reconstruction have called into question the appropriateness of who gets breast reconstruction.^{5–8} Thus, our understanding of the impact of breast reconstruction on women's lives remains somewhat limited. The purpose of this systematic review is to evaluate studies examining patient-reported outcomes of breast reconstruction after mastectomy for breast cancer, compared to mastectomy only.

METHODS

Search and Selection Processes

The process of identifying articles is summarized in Figure 1. Sources included Medline (using PubMed), PsycINFO, CINAHL, and the Cochrane Library. The query for these databases was: (quality of life OR outcomes OR results OR benefits OR satisfaction) AND (breast reconstruction OR breast implant OR TRAM OR latissimus dorsi) AND breast cancer. Article references were hand-searched. Experts in the field were queried. The latest search date was July 15, 2007.

We included articles published in English after 1980, since this marked the beginning of modern reconstructive surgical techniques. We included articles whose study population consisted of women undergoing mastectomy for breast cancer. Thus, studies of women without

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breast cancer (such as women undergoing prophylactic mastectomy) and studies of men were excluded.

Only studies that compared outcomes of mastectomy with reconstruction to outcomes of mastectomy without reconstruction were included. Thus, studies that assessed outcomes of reconstruction with no comparison group were excluded. We required outcomes to be patient-reported, including clinical and psychosocial outcomes. Studies measuring only length of stay, complication rates, cancer recurrence, survival, or physician assessment of appearance were excluded.

Data Extraction

Two authors (CS and CL) independently assessed studies for eligibility. The authors were blinded to each other during that process and then reconvened to compare findings. Discrepancies in inclusion/exclusion were reviewed by the two authors. Next, the two authors independently assessed studies for outcome measures, study design, and analytic methods. The authors were again blinded to each other during that process and then reconvened to compare findings. Discrepancies were reviewed and resolved.

We identified data on patient-reported outcomes, such as quality of life and body image. We made note of use of validated outcome measures, study population, type of reconstruction, time period from diagnosis of breast cancer, and measurement of baseline psychosocial characteristics. Because we were interested in identifying studies that assessed the appropriateness of surgery, we noted whether a study measured patients' preferences relevant to breast reconstruction, such as concern about the duration of surgery or concern about appearance. Data were arranged in evidence tables (summarized in Tables 1 and 2), which were used to draw conclusions. Table 1 includes data on breast conservation because many studies were designed primarily to compare breast conservation to mastectomy. Because of the diversity of outcomes and scales used, a meta-analysis of findings was not considered appropriate.

RESULTS

Search Results

The PubMed search identified 1000 articles. We excluded 229 articles that were not in English, not about women, or were published before 1980. We excluded 739 articles that were not about breast reconstruction after mastectomy, did not assess a patient-reported outcome, or did not compare outcomes of mastectomy with reconstruction to mastectomy only.

The PsycINFO search identified eighteen articles, of which five had not been identified by the PubMed search. Two of the five were not in English^{9, 10}, one was a dissertation that we could not obtain¹¹, and one was not about breast cancer¹². The remaining article was included in the review.¹³ The CINAHL search identified forty-four articles, of which six had not been identified by the PubMed or PsycINFO searches. Four of the six were not in English,^{14–17} and two were not about outcomes of post-mastectomy reconstruction^{18, 19}. The Cochrane Collection search identified no articles. Searching of references and consultation with experts in the field identified no new articles.

The remaining 33 articles from the electronic searches were reviewed in detail. Two were excluded because they were about breast reconstruction after prophylactic mastectomy, not after mastectomy for breast cancer.^{20, 21} Two used the same data as other studies that met inclusion criteria.^{22, 23} One study was excluded because it did not describe its methods or results.²⁴ Thus, twenty-eight studies were included for review.

Study Characteristics

Outcomes—The most common outcomes are listed in Table 2 and include: quality of life (eleven studies)^{23, 25–34}, body image (fifteen studies)^{23, 25–27, 30, 32, 34–42}, and sexuality (twelve studies)^{23, 25, 30, 33, 35, 38–44}. Most studies used validated scales, but few studies used the same scales, and thirteen used additional non-validated (“ad hoc”) questions.

Study population—Most studies drew their sample from one clinical institution (fifteen studies) or from five or fewer institutions (eight studies). Sample size in those studies ranged from 49 to 757 subjects. Three studies used population-based samples. Sample sizes in those studies ranged from 1357 to 1957, with the largest study including all women with early-stage breast cancer in Los Angeles and the District of Columbia.²³

Type of reconstruction—Most studies included both immediate and delayed reconstruction. Six studies included immediate reconstruction only,^{39, 41, 43, 45–47} and three included delayed reconstruction only^{31, 44, 48}. Most studies included both autologous and implant reconstruction or did not specify the type.

Time period—The time period under study was most commonly one to five years after diagnosis, but it ranged from two weeks to five years post-diagnosis. Ten studies assessed subjects within one year of diagnosis.^{25, 28–30, 36, 38, 43, 45, 49, 50}

Study design—The most common study design was a cross-sectional survey (twenty-one studies) administered after treatment. Seven studies were prospective cohort studies.^{28–31, 36, 43, 49} One cohort study surveyed women before treatment and at 1, 3, 6, 12, 18, and 24 months postoperatively.²⁸ This study measured psychosocial characteristics prior to surgery and therefore could determine whether or not women undergoing reconstruction differed at baseline from other women. Three retrospective studies asked women to recall their behavior and feelings prior to surgery.^{27, 35, 38} No study measured a patient’s preferences or values in order to assess whether the chosen option (reconstruction or no reconstruction) was best for her.

Analysis—Nine of the twenty-eight studies used multivariate analysis to adjust for confounding.^{23, 25, 26, 28, 30, 38, 42, 45, 50} Two studies did not report their method of analysis.^{37, 40} The remaining seventeen studies used univariate or bivariate analysis. Many studies were designed to detect differences in outcomes between mastectomy and breast conservation therapy.^{25, 28, 29, 32, 50} Such differences tend to be larger than differences in outcomes between mastectomy with reconstruction and mastectomy only.

Study Findings

Study findings are summarized in Table 2. Overall, the majority of measurements of quality of life, body image, and sexuality did not find significant differences between mastectomy with reconstruction and mastectomy only. In this section, we review the findings for quality of life, body image, and sexuality, presenting aggregate results and then examining the higher-quality studies in greater detail. Cohort studies, population-based studies, and studies that used multivariate adjustment were considered higher-quality.

Quality of Life—Most of the studies of quality of life (seven of eleven), including all of the higher-quality studies, did not find statistically significant differences in quality of life between women who had reconstruction and women who had mastectomy only.^{23, 25, 29, 30, 32, 42, 50} Three studies reported better quality of life among women who had mastectomy with reconstruction compared to women who had mastectomy only^{27, 31, 33}, and one study of

younger women reported poorer quality of life among those who had mastectomy with reconstruction compared to those who had mastectomy only.²⁸

The two largest and higher-quality studies found no significant differences in quality of life between mastectomy with reconstruction and mastectomy only. The population-based study of study of survivors in Los Angeles and the District of Columbia measured quality of life using the Short Form 36 Health Survey (SF-36), and found that the mean score for physical functioning was 84.4 (out of 100) for reconstruction and 75.8 for mastectomy only ($p=0.120$).²³ Scores for emotional well-being were 73.5 (out of 100) for reconstruction, and 76.2 for mastectomy only ($p=0.907$). Another large cross-sectional, population-based study measured quality of life of survivors in Los Angeles and Detroit, using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Cancer (EORTC QLQ-C30) and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Breast Cancer (EORTC QLQ BR-23).²⁵ They found that on average, women who had reconstruction had the lowest quality of life scores in all dimensions, although the differences were not statistically significant or not clinically meaningful. The mean physical function score was 76 (out of 100) for reconstruction and 78 for mastectomy only. The mean emotional function score was 64 (out of 100) for reconstruction and 72 for mastectomy only.

Four studies measured quality of life prior to and after mastectomy.^{28, 30, 31, 36} The highest-quality of these studies measured quality of life in 97 women before treatment and at 1, 3, 6, 12, 18, and 24 months postoperatively, using the Functional Assessment of Cancer Therapy – Breast (FACT-B), the Mishel Uncertainty in Illness Scale, and the Profile of Mood States (POMS).²⁸ Preoperative quality of life for women who chose reconstruction was no different from preoperative quality of life for women who chose mastectomy only, on any of the three scales. At 1, 12, and 18 months postoperative, however, women who had reconstruction had poorer physical well-being, emotional well-being, and functional well-being on the FACT-B and greater mood disturbance on the POMS than women who had mastectomy only. Postoperative uncertainty in illness was similar between groups. All postoperative outcomes were adjusted for preoperative levels.

Of note, four of the studies that did not find a difference in quality of life between mastectomy and reconstruction also found no difference in quality of life between breast conservation and mastectomy (with or without reconstruction), raising the possibility that their measures lacked adequate sensitivity.^{23, 25, 28, 29} Three out of four of those studies did, however, use measures that are disease-specific and have been shown to discriminate between treatments and respond to change^{51, 52} – the EORTC QLQ-BR23 in one study²⁵ and the FACT-B in two studies^{28, 29}. Neither of these instruments was designed specifically to measure the effects of surgery.

Body Image: Nine of the sixteen studies that evaluated body image found no significant differences between women who had reconstruction and women who had mastectomy only.^{23, 26, 30, 35–38, 40, 42} Seven studies reported better body image in women who had reconstruction.^{25, 27, 34, 39, 41, 43, 53}

Each of the three higher-quality studies of body image found no difference in body image between reconstruction and mastectomy only. The study of 1,957 women in Los Angeles and District of Columbia measured body image using the Cancer Rehabilitation Evaluation System (CARES).²³ Mean body image scores were 1.24 (range 0 to 4, higher score indicating worse state) for reconstruction and 1.37 for mastectomy only and were not statistically different. The study of 1,357 women in Los Angeles and Detroit used the EORTC QLQ BR-23 to measure body image.²⁵ Mean body image scores were 69 (out of 100) for reconstruction and 74 for mastectomy only and were not statistically different. A cohort study of 103 women in England also used the EORTC QLQ BR-23 and found that body image at baseline (shortly after surgery)

and at six and twelve months after surgery were no different for reconstruction and mastectomy only.²⁹ Mean baseline body image scores were 78.28 (out of 100) for reconstruction and 76.66 for mastectomy. Mean six month body image scores, adjusted for baseline body image, were 74.60 for reconstruction and 77.45 for mastectomy only. Mean twelve month body image scores, adjusted for baseline body image, were 73.55 for reconstruction and 75.88 for mastectomy only. None of these differences was statistically significant.

Sexuality and sexual functioning: Seven of the twelve studies that measured sexuality or sexual functioning found no difference between women who had reconstruction and women who had mastectomy only.^{25, 30, 35, 41–44} Three studies found improved sexual outcomes with reconstruction,^{33, 39, 40} and two studies found poorer sexual outcomes with reconstruction.^{23, 38}

The three higher-quality studies of sexuality found equivalent or poorer outcomes with reconstruction. The study of 1,957 women in Los Angeles and District of Columbia found that sexuality and sexual functioning, as measured by the CARES and the Watts Sexual Function Questionnaire, were similar between women who had reconstruction and women who had mastectomy only (specific data not reported).²³ There was a trend on the CARES for women who had mastectomy only to be less interested in sex ($p=0.04$), but sexual function and overall sexual summary scores were no different. Women who had reconstruction reported more frequently that breast cancer had had a negative impact on their sex lives (45.4%) than women who had mastectomy only (41.3%), but this difference was not statistically significant. The study of 1,357 women in Los Angeles and Detroit measured sexuality and sexual functioning using the EORTC QLQ BR-23.²⁵ The mean sexual functioning score was 22 (out of 100) for reconstruction and 14 for mastectomy only. The difference was not considered clinically meaningful. The cohort study of 103 women in England also used the EORTC QLQ BR-23 to measure sexual function.²⁹ Women undergoing reconstruction had better sexual function shortly after surgery (33.13 out of 100) than women undergoing mastectomy only (14.28, $p<0.05$), but equivalent sexual function later (29.30 at six months and 38.44 at twelve months for reconstruction and 23.60 at six months and 22.38 at twelve months for mastectomy only).

Two studies reported a statistically non-significant trend toward better sexual outcomes in women who had reconstruction. Avis' study of younger women found a trend toward improved sexuality but no difference in sexual functioning. Missing 90 days of work or usual activities had a greater impact on sexual outcomes than the type of surgery.⁴² Wellisch found a trend toward better sexual functioning (frequency of sex, frequency of appearing naked, importance of sex) in women who had reconstruction.³⁵

DISCUSSION

The available literature suggests that patient-reported outcomes of breast reconstruction after mastectomy for breast cancer are similar to outcomes of mastectomy without reconstruction. All of the higher-quality studies in this review found equivalent or poorer quality of life, body image, or sexual outcomes in women who had mastectomy with reconstruction, compared to women who had mastectomy only.^{23, 25, 28, 29} The highest-quality cohort study found that postoperative quality of life was poorer for women who had reconstruction, adjusted for preoperative quality of life. These higher-quality studies formed a small minority of the studies in this review, however. The rest of the studies in this review were limited by issues with study design and methodology, particularly selection bias, sensitivity of measures, power, and appropriateness of decisions.

Selection bias

Women who choose breast reconstruction may differ from women who do not, in terms of their preoperative quality of life, body image, or sexuality. If women who choose reconstruction start out with poorer quality of life, body image, or sexuality prior to surgery, then equivalent postoperative outcomes in the two groups may actually reflect improvements from baseline after reconstruction. On the other hand, if women who choose reconstruction have better baseline quality of life, body image, or sexuality, then equivalent postoperative outcomes would suggest that reconstruction causes some impairment. Without knowing the preoperative characteristics of women in both groups, however, it is difficult to know the effects of reconstruction.

Like many studies of surgery, most studies of breast reconstruction, including all but one that met this review's criteria, are observational studies. Observational studies, which measure outcomes after treatment, often have problems with bias if they do not take into account how patient groups differ. The ideal approach to reducing selection bias would be to randomize patients. In the case of breast reconstruction, treatment choice depends largely on a patient's personal preferences. Thus, only patients who are completely undecided could ethically qualify for such randomization, making such a trial difficult to perform.

A more feasible approach to reducing bias in studies of breast reconstruction is to measure, prior to treatment, the outcomes of interest or characteristics that affect those outcomes. Of the five studies in this review that measured preoperative characteristics, two did not find differences in preoperative quality of life, body image, or sexual function.^{31, 36} One study was a randomized controlled trial.⁴³ One study found poorer preoperative sexual function among women who chose mastectomy³⁰ and another found poorer preoperative mood state in women who chose reconstruction.²⁸ Three studies asked women to recall their behaviors and feelings prior to surgery and found little difference between women who had reconstruction and women who did not.^{27, 35, 38} Such a retrospective approach, however, is subject to recall bias.

Although measuring characteristics before and after treatment would be ideal, another method to reduce bias in observational studies is multivariate analysis. Techniques such as multivariate linear regression and logistic regression can help to identify the effects of reconstruction by adjusting for other variables that may confound the relationship between those who receive reconstruction and the outcomes of interest. Most studies in this review did not conduct multivariate analysis.

Sensitivity of measures

The measures in many of the studies in this review may not have had adequate sensitivity to detect meaningful differences in outcomes. The majority of studies that measured quality of life used generic instruments which may not be able to discriminate between outcomes of reconstruction and mastectomy only.⁵⁴ Of note, the five studies that did use breast cancer-specific instruments which have been validated in breast cancer patients and shown to be responsive to change,^{51, 52} found equivalent or poorer outcomes with reconstruction.^{25, 28–30, 53} Of the studies that measured body image, only one used a disease-specific measure.²⁵ Given the potential salience of the breast for women's body image, studies of body image outcomes after breast surgery ought to use measures that have been developed or at least validated in women who have undergone breast surgery.⁵⁵ For example, the EORTC QLQ BR-23 has been developed and tested in breast cancer survivors,⁵¹ and the BREAST-Q[®] has been developed and tested in breast reconstruction patients.⁵⁶ Of the studies that measured sexual function or sexuality, only two used breast cancer-specific measures. It is unclear how well such measures could detect changes in sexual function or sexuality due to breast reconstruction. Overall, the vast majority of the measures used by studies in this review are

generic instruments that have not been developed or tested in women who have undergone breast surgery.

Power

Two studies of body image^{35, 42} and one study that measured sexual function³⁵ found statistically non-significant trends toward better outcomes with reconstruction, raising the possibility that studies did not have enough power to detect differences. Many studies were designed to compare mastectomy to breast conservation therapy. Because those differences are generally larger than the difference between reconstruction and no reconstruction, these studies may have been too small to detect the smaller, but clinically meaningful, differences between reconstruction and mastectomy only.

Appropriateness of decisions

No study took into account whether or not a woman's decision to undergo reconstruction was an appropriate decision for her, considering what is most important to her. For example, if some of the women who had reconstruction would actually have preferred mastectomy only, then the studies in this review may have underestimated the benefits of reconstruction for women who would prefer that option. Similarly, if some of the women who had mastectomy without reconstruction would have preferred to undergo reconstruction, then these studies did not measure the benefit they would have received from reconstruction. We know that breast cancer patients do not always receive the treatments that they truly prefer and value because of problems with access to care, poor communication between patients and providers, or poor understanding^{8, 50, 57, 58}. Future studies ought to provide an opportunity to measure whether or not the treatment received was consistent with personal preferences.

Other limitations

The generalizability of the findings from these studies is somewhat limited because most studies examined a single institution or a few institutions. Many factors can affect a woman's satisfaction with reconstruction, including individual surgeon ability, complication rates, use of radiation, or even convenience of hospital services. To the extent that these factors vary by institutions, these studies' conclusions may not apply to all women undergoing reconstruction. In addition, study populations tended to be from academic centers and urban settings. The applicability of their findings to women in general is uncertain.

The ideal time to measure outcomes of mastectomy and reconstruction for breast cancer is also unclear. On the one hand, women deciding about mastectomy with or without reconstruction may be interested in the nature of the early recovery period. The finding that missed time from usual activities in the early postoperative period strongly affected psychosocial outcomes supports this possibility.²⁸ On the other hand, because breast reconstruction generally involves more surgery and a longer recovery than mastectomy only, studies of early outcomes may be less likely to find a benefit to reconstruction than studies of later outcomes. Finally, differences in quality of life outcomes between groups of women with breast cancer seem to diminish over time^{22, 23}, so longer-term studies may provide the most realistic picture of the quality of cancer survivorship. We did not identify good comparisons of patient outcomes based on the timing of reconstruction.

The ideal approach to studying outcomes of breast reconstruction would be a prospective cohort study that includes women undergoing mastectomy and women undergoing mastectomy with reconstruction. The study would have a population-based sample large enough to detect differences in outcomes between the two groups. It would measure patient psychosocial characteristics and key outcomes at baseline prior to surgery, as well as patients' preferences about issues that influence decisions about reconstruction. The appropriateness of the decision

to undergo reconstruction (or not) would be calculated and incorporated into the evaluation of outcomes. Patient-reported outcomes would be evaluated using measures with adequate sensitivity to detect changes due to surgery and changes over time and multivariate analysis would be used to adjust for potential confounders.

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Abbreviations

CARES

Cancer Rehabilitation Evaluation System

EORTC QLQ-C30

European Organization for Research and Treatment of Cancer Quality of Life Questionnaire - Cancer

EORTC QLQ BR-23

European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Breast Cancer

FACT-B

Functional Assessment of Cancer Therapy – Breast

POMS

Profile of Mood States

SF-36

Short Form 36 Health Survey

TRAM

Transverse rectus abdominus myocutaneous flap

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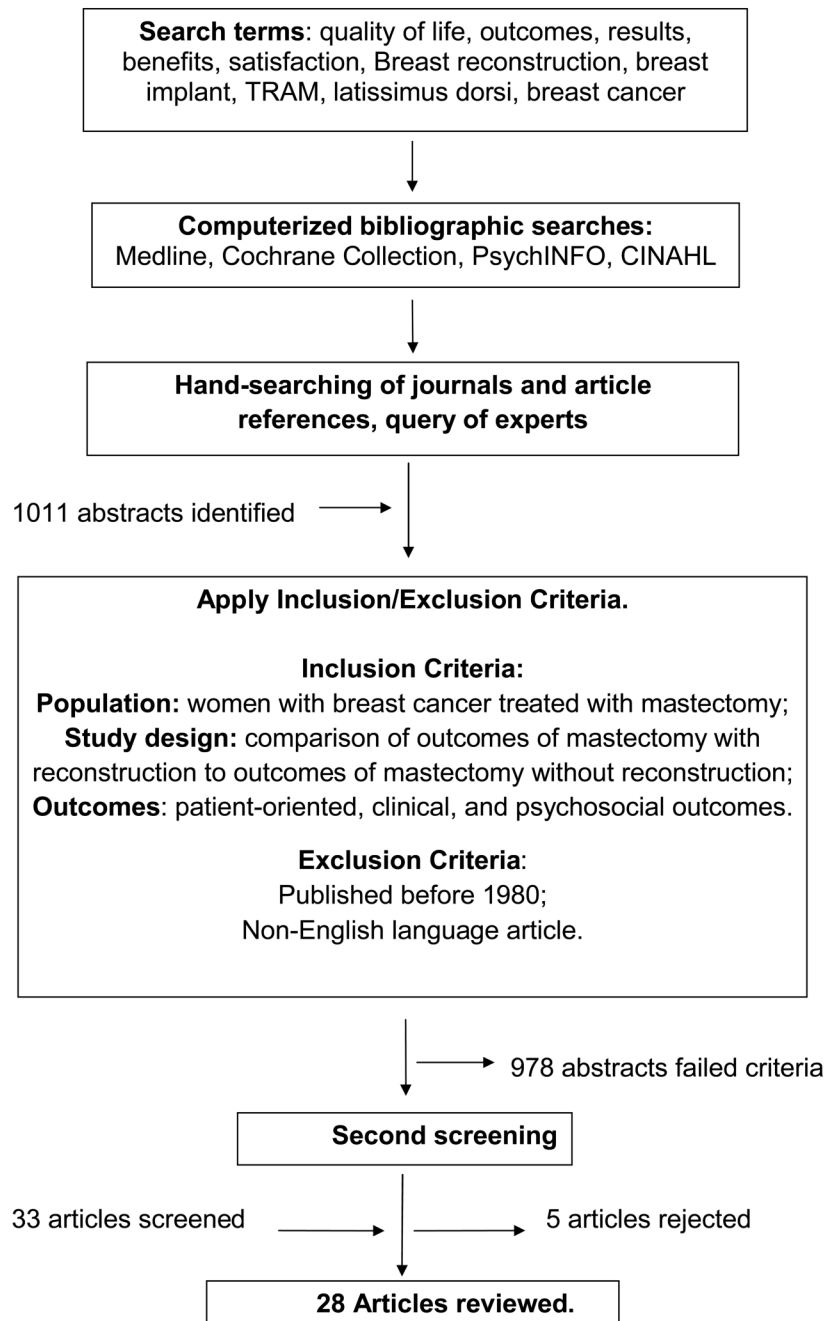


Figure 1.
Flow diagram of article selection.

Table 1
Studies examining patient-reported outcomes of breast reconstruction.

Author, year	Population	Treatments evaluated	Outcomes	Measures	Findings
Adachi 2007 ⁴⁷	BC patients at 1 institution in Japan N=102	BCT Mastectomy Mastectomy w/immediate recon	Satisfaction w/surgery Mood Physical condition	Ad hoc SV-POMS Ad hoc	Satisfaction same. M poorer mood than MR. Physical condition same.
Nicholson 2007 ³⁴	BC patients at 1 institution in UK N=370	BCT Mastectomy	Cosmetic outcome Breast satisfaction	Visual Analog Scale Visual Analog Scale	Cosmetic: R better than BCT better than M. Breast satisfaction: MR better than BCT better than M.
Noyan 2006 ²⁶	BC patients at 3 institutions in Turkey N=75	Mastectomy w/immediate or delayed recon	Body satisfaction Appearance QOL Anxiety/depression Extent of choice	Visual Analog Scale DAS-59 SF-36 HADS Ad hoc	Body satisfaction: MR better than BCT better than M. Appearance: same QOL: same HADS: same. Extent of choice: MR more than M more than BCT. Satisfaction same
Rubino 2006 ³³	BC patients at 1 institution in Sardinia, Italy N=165	Total mastectomy, mastectomy with TRAM, healthy women Group I: recon Group II: Mastectomy waiting for recon; Group III: Healthy control	Satisfaction Body image Self-esteem Social adaptation Quality of life Anxiety Depression Sexual Quality of life Body image Patient satisfaction	Satisfaction Interview Body Cathexis Scale Rosenberg Self-esteem SASS Quality of Life Index HAM-A HAM-D SASS FACT-B Ad hoc measures	Body image same Self-esteem: M lower than MR Social adaptation: MR better than M. QOL: MR better than M. Anxiety: same. Depression: MR better than M. Sexual: MR better than M. QOL same. Body image: better for BCT, MR than M. Satisfaction: MR better than BCT.
Nano 2005 ³²	BC surgery patients at one institution N=379	BCT M MR	Satisfaction w/surgery type; Satisfaction w/decision making process;	Revised Holmes-Rovner Scale; Satisfaction w/decision making process scale;	Satisfaction w/surgery: BCT better than MR. Satisfaction w/decision making: M higher than BCT; MR same as BCT.
Lantz 2005 ⁵⁰	Sample of Stage 0-III from Los Angeles & Detroit SEER N=1633	BCT M			

Author, year	Population	Treatments evaluated	Outcomes	Measures	Findings
Janz 2005 ²⁵	Sample of Stage O-II from L.A., Detroit SEER (no Asians in L.A) N=1357	MR BCT M MR	Regret about surgeries Health related QOL Body image Sexuality	Decision regret question EORTC QLQ-C30 EORTC QLQ BR-23 EORTC QLQ BR-23	Decision regret: M more than BCT; MR same as BCT. QOL: no clinically meaningful differences. Body image: MR poorer than BCT, equiv to M. Sexuality: no clinically meaningful differences. Memories: same.
Nilsson-Inrhelt 2004 ⁴⁸	BC pts at 1 clinic in Ipsala, Sweden N=26	M waiting for recon; M with DIEP recon; Age-matched control	Memory Mental flexibility Emotional distress	AMT COWAT HADS	Traumatic stress: M higher than MR
Avis 2004 ⁴²	Stage I-III BC survivors <50 years old at 6 hospitals in New England N=220	BCT M MR	Traumatic stress Psychosocial problem areas (marital, sexual, body image, children, work)	BITS CARES subscales -Marital and Sexual -Psychosocial	Frequency of problems: M and MR same; BCT better than M or MR. Body image: M slightly more body image problems than MR (NS). Sexual function same. Relationship w/partner same. Pregnancy concerns same. Premature menopause concern same. Preoperative QOL: M same as MR. Postoperative QOL: MR better than M on all dimensions except physical function. QOL: MR better postop than preop.
Veiga 2004 ³¹	M patients at 2 institutions in Sao Paulo, Brazil N=25	M M with TRAM	QOL Satisfaction	SF-36 Ad hoc	QOL: MR better postop than preop. Anxiety: trend toward more anxiety in immediate MR. Depression: Immediate MR more than M.
Harcourt 2003 ³⁰	M patients at 3 institutions in south of England N=103	M MR	Anxiety, Depression Body image	HADS HADS Hopwood Body Image Scale	Body image same preop, 6, 12 mos; comfort in clothes: MR>M at 6 mos, same at 12 mos.

Author, year	Population	Treatments evaluated	Outcomes	Measures	Findings
Caffo 2003 ⁴⁶	BC pts at 1 institution in Trento, Italy N=757	BCT MR (immediate)	Sexuality QOL Satisfaction w/decision Satisfaction w/outcome Pain	EORTC QLQ BR-23 EORT QLQ BR-23 EORTC QLQ-C30 EORTC QLQ BR-23 Ad hoc Ad hoc McGill Pain Scale	Sexuality: M poorer sexual function than MR preop; same at 6, 12 mos. QOL: same. Satisfaction w/decision: same. Satisfaction w/outcome: same. Pain frequency: BCT more than M or MR. Pain associated with poorer QOL.
Nissen 2001 ²⁸	All BC dx 1995-97 at single inst. N=198	M BCT M MR	QOL QOL Mood Uncertainty in illness	Quality of Life scale FACT-B POMS MUIS	QOL: Did not compare by surgical group. QOL: MR worse M, similar to BCT. Mood disturbance: MR more than BCT, M. Uncertainty in illness same.
Arora 2001 ²⁹	Younger BC patients getting chemotherapy at 5 institutions in Madison, Chicago, Indianapolis N=103	BCT M MR	QOL Body image	FACT-B FACT-B	MR similar at baseline except poorer well-being (1 of 5 subscales of FACT-B). Baseline postoperative well-being: MR better than M or BCT. 6, 12 months postoperative QOL: same.
Fung 2001 ⁴¹	BC patients at 1 institution in Hong Kong N=49	BCT M MR (immediate w/TRAM)	Well-being Body image Sexual functioning Social functioning	Chinese Health Questionnaire plus ad hoc	Well-being: same. Body image: BCT better than MR better than M. Sexual functioning: same. Satisfaction w/choice: same.

Author, year	Population	Treatments evaluated	Outcomes	Measures	Findings
Zweifler 2001 ⁴⁰	BC patients at I institution in New York City N=60	M	Satisfaction w/choice Satisfaction w/treatment Body image	Ad hoc	Body image: same. Trend: M more embarrassing when undressing, lower partner satisfaction w/body. Satisfaction w/sex life: MR better than M.
Al-Ghazal 2000 ³⁹	All BC surgery pts at single institution Nottingham N=577	BCT M MR (immediate recon only)	Satisfaction w/sex life Anxiety/depression	Ad hoc (SF-36 administered but not analyzed) HADS	Sexual attractiveness: same. Anxiety: BCT less than MR; MR less than M. Depression: MR less than BCT; BCT less than M.
Rowland 2000 ²³	Stage 0-II BC survivors in LA, DC from tumor registries, physician practices, clinics N=1957	BCT M MR	Body image Self-esteem Satisfaction w/cosmesis Effect on sexuality	Body Image Scale Rosenberg Self-esteem Ad hoc Ad hoc	Body image: BCT better than MR; MR better than M. Self esteem: BCT better than MR; MR better than M. Satisfaction w/appearance: BCT better than MR; MR better than M.
Yurek 2000 ³⁸	Stage II-III BC patients at from one	BCT	Health related QOL Social support Depression Body image Sexuality Physical symptoms Sexuality	SF-36 MOS social support scale CES_D CARES Watts, CARES, Revised DAS Ad hoc	Feeling sexually unattractive: BCT less than MR; MR less than M. QOL: same Social support: same Depression: same Body image: R similar to M, not to BCT. Sexual function: same. Sex life: MR more negative impact on sex life. MR less concerned about scars than M. Numbness: MR more than M or BCT. Sexual behavior preop same.

Author, year	Population	Treatments evaluated	Outcomes	Measures	Findings
	community N=190	M			Current sexual behavior frequency: MR less than M.
		MR	Body change stress	BITs	Orgasm, sexual satisfaction: MR worse than M. Body traumatic stress same.
				Situational discomfort scale	Situational discomfort same.
				Body Satisfaction Scale	Body satisfaction: MR better than M
Pusic 1999 ²⁷	Stage I,II patients at 3 institutions N=267	BCT	Quality of life	SF-36	QOL: Among younger, M lowest; among older, BCT lowest.
		M			Illness intrusiveness: same except among younger women who had mastectomy.
		MR		Illness Intrusiveness Rating Scale	Body image in clothing same.
			Body image	Questions on preop info and body image	Body image when naked: M worse than MR, MR and BCT similar.
Gross 1996 ⁴⁹	M patients in 1 institution N=36	M	Coping responses	Reaction to Diagnosis of Cancer Questionnaire	Coping responses same.
		MR			MR greater increase in coping between 2 and 30 days than M.
		M	Satisfaction	Satisfaction question	Satisfaction same.
		MR (delayed recon only)	Mastectomy attitudes (including sexuality)	Mastectomy Attitude Scale	Satisfaction w/appearance: M better than MR.
					6 other subscales (emotion, sexuality, life outlook, concealment, openness, necessity) same.
Anderson 1994 ⁴⁵	Stage I BC patients, gynecologic-oncology patients, healthy women N=144	M	Self-esteem	Rosenberg Self-esteem	Concern about complications: M and MR same.
		MR (immediate recon only)	Mood	POMS	Concern about recurrence: MR more than M.
			Vulnerability	Ad hoc	Health promotion behaviors: M, MR same.
			Symptoms/hassles	Ad hoc	Satisfaction w/decision same.
			Health behaviors	Ad hoc	
			Concern re cancer risk	Ad hoc	
			Satisfaction w/decision	Ad hoc	

Author, year	Population	Treatments evaluated	Outcomes	Measures	Findings
Mock 1993 ³⁷	BC pts at 4 institutions N=257	BCT M MR	Body image	Body Image Scale Tennessee Self Concept Scale	Body image: M and MR same. Self-concept same.
Silverman-Dresner ¹³ 1991	BC pts from 2 surgeons and 2 self-help groups N=289	M MR	Psychological symptoms	Body image visual analog scale Symptom Checklist	Psychological symptoms same for M, MR, controls.
Leinster 1989 ³⁶	BC pts from 1 institution in Liverpool N=59	Healthy controls BCT randomized BCT chosen BCT assigned M randomized M chosen M necessary MR	Body satisfaction Social adaptability Self esteem Marital adjustment Life events Anxiety, depression	Body Satisfaction Scales Social adaptability tests Dohrenwend's measures Marital Adjustment Test Holmes and Rahe's scale Leeds Scale for Anxiety and Depression	Body satisfaction: same. Social adaptability: same. Self-esteem: same. Anxiety, depression: same
Wellisch 1989 ³⁵	Stage I-II BC patients at single institution N=50	Biopsy BCT M MR	Psychosocial concerns Emotional reaction Body image Femininity Attractiveness Sexuality	State-Trait Anxiety. Inventory Ad hoc questionnaire Brief Symptom Inventory	Anxiety decreased over time for all groups Anger: M higher than MR or BCT Emotional concerns, sexuality, body image, fear of recurrence, activities, symptoms: same Nudity around partner: MR more than M
Dean 1983 ⁴³	Stage I-II BC patients at single institution N=64	M MR (immediate implant recon only)	Psychological symptoms Psychological, sexual, social, marital, work morbidity. General health	Present State Exam General Health Questionnaire Essence Personality Inventory	Psychological morbidity: MR lowers than M. Freedom of dress: MR better than M Repulsed by appearance: MR better than M. Sexuality: same

AMT = Autobiographical Memory Test
 BC = breast cancer
 BCT = breast conservation therapy
 BITS = Breast Impact of Treatment Scale
 CARES = Cancer Rehabilitation Evaluation System
 CES_D = Center for Epidemiologic Studies Depression Scale
 COWAT = Controlled Oral Word Association Test
 DAS = Dyadic Adjustment Scale
 DAS 59 = Hereford Appearance Scale
 DIEP = deep inferior epigastric perforator flap reconstruction
 EORTC QLQ-C30 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire - Cancer
 EORTC QLQ BR-23 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Breast Cancer
 FACT-B = Functional Assessment of Cancer Therapy - Breast
 HADS = Hospital Anxiety and Depression Scale
 HAM-A = Hamilton Anxiety Scale
 HAM-D = Hamilton Depression Scale
 M = mastectomy
 MOS SS = Medical Outcomes Study Social Support Scale
 MR = mastectomy and reconstruction
 MUIS = Michel Uncertainty in Illness Scale
 NS = non-significant
 POMS = Profile of Mood States
 preop = preoperative
 postop = postoperative
 QOL = quality of life
 recon = reconstruction
 SASS = Social Adaptation Self-evaluation Scale
 SEER = Surveillance Epidemiology and End Results
 SF-36 = Short Form 36 Health Survey

SV-POMS = Short Version Profile of Mood States

TRAM = transverse rectus abdominus myocutaneous flap

Table 2

Summary of findings for the most common outcomes and the measures used.

Outcome	Author, Year	Direction of finding	Measure
Quality of Life	Nicholson, 2007 ³⁴	=	SF-36
	Rubino, 2006 ³³	+	Quality of Life Index
	Nano, 2005 ³²	=	Functional Assessment of Cancer Therapy Breast
	Janz, 2005 ²⁵	=	EORTC QLQ-C30, EORTC QLQ BR-23
	Veiga, 2004 ³¹	+	Short Form 36
	Avis, 2004 ⁴²	=	Cancer Rehabilitation Evaluation Scale
	Harcourt, 2003 ³⁰	=	EORTC QLQ-C30, EORTC QLQ BR-23
	Arora, 2001 ²⁹	=	Functional Assessment of Cancer Therapy Breast
	Nissen, 2001 ²⁸	-	Functional Assessment of Cancer Therapy Breast
	Rowland, 2000 ²³	=	Short Form 36
	Pusic, 1999 ²⁷	= older, + younger	Short Form 36, Illness Intrusiveness Rating Scale
Body Image	Nicholson, 2007	+	Body Satisfaction Visual Analog Scale
	Noyan, 2006 ²⁶	=	Body Cathexis ³⁴ Scale
	Nano, 2005 ³²	+	Ad-hoc
	Janz, 2005 ²⁵	=	EORTC QLQ BR-23
	Avis, 2004 ⁴²	NS+	Cancer Rehabilitation Evaluation Scale
	Harcourt, 2003 ³⁰	=	Body Image Scale
	Fung, 2001 ⁴¹	+	Ad hoc (interview)
	Zweifler, 2001 ⁴⁰	=	Ad hoc
	Al-Ghazal, 2000 ³⁹	+	Body Image Scale
	Rowland, 2000 ²³	=	Cancer Rehabilitation Evaluation Scale
	Yurek, 2000 ³⁸	+	Body Satisfaction Scale
	Pusic, 1999 ²⁷	= naked, + in clothes	Ad-hoc questionnaire
	Mock, 1993 ³⁷	=	Body Image Scale, Body Image Visual Analogue Scale
	Leinster, 1989 ³⁶	=	Body Satisfaction Scale
	Wellisch, 1989 ³⁵	NS+	Ad-hoc questionnaire
Dean, 1983 ⁴³	+	General Health Questionnaire	
Sexuality	Rubino, 2006 ³³	+	Social Adaptation Self-evaluation Scale
	Janz, 2005 ²⁵	=	EORTC QLQ BR-23
	Avis, 2004 ⁴²	=	Cancer Rehabilitation Evaluation Scale
	Harcourt, 2003 ³⁰	=	EORTC QLQ BR-23
	Fung, 2001 ⁴¹	=	Ad hoc
	Zweifler, 2001 ⁴⁰	+	Ad hoc
	Al-Ghazal, 2000 ³⁹	+	Ad-hoc questionnaire

Outcome	Author, Year	Direction of finding	Measure
	Rowland, 2000 ²³	–	Watts sexual function scale
	Yurek, 2000 ³⁸	–	Sexual behavior scale, sexual response scale
	Reaby, 1995 ⁴⁴	=	Mastectomy Attitudes Scale
	Wellisch, 1989 ³⁵	NS+	Ad-hoc
	Dean, 1983 ⁴³	=	General Health Questionnaire

+ Reconstruction outcome better than mastectomy outcome.

– Reconstruction outcome poorer than mastectomy outcome.

= Reconstruction outcome equivalent to mastectomy outcome.

NS Statistically non-significant trend.

EORTC QLQ-C30 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire - Cancer

EORTC QLQ-BR23 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire - Breast Cancer