



What affects women's decision-making on breast reconstruction after mastectomy for breast cancer?

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Abstract

Purpose To establish the breast reconstruction rate in a large Dutch teaching hospital, and to gain insight into the motives of women to opt for or reject post-mastectomy breast reconstruction.

Methods In a retrospective, cross-sectional study, all consecutive patients who underwent mastectomy for invasive breast cancer or ductal carcinoma in situ (DCIS) were identified and categorized into two groups based on subsequent breast reconstruction or not. Patient-reported outcomes were assessed with the validated Breast-Q and a short survey about the decision-making process in breast reconstruction. These outcomes were compared between the two groups using univariable analyses, multivariable logistic regression, and multiple linear regression analyses. The Breast-Q scores were also compared to Dutch normative values.

Results A total of 319 patients were identified of whom 68% had no breast reconstruction. Of the 102 patients with breast reconstruction, the majority (93%) received immediate, instead of delayed breast reconstruction. The survey was completed by 155 (49%) patients. The non-reconstruction group, on average, reported significantly poorer psychosocial well-being, compared to the reconstruction group as well as compared to the normative data. However, the majority of the non-reconstruction group (83%) stated that they had no desire for breast reconstruction. In both groups, most patients stated that the provided information was sufficient.

Conclusion Patients have personal motives to opt for or reject breast reconstruction. It seemed that patients differ in their rating of values that affect their decision since the same arguments were used to opt for or reject reconstruction. Notably, patients were well-informed in their decision making.

Keywords Breast cancer · Postmastectomy breast reconstruction · Decision-making · Patient-reported outcomes

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Introduction

Over the past decades, the multidisciplinary treatment of breast cancer has changed, and improved 5-year survival of breast cancer up to 88% in the Netherlands, especially for early stage breast cancer [1–3]. The improved survival has led to more focus on health related quality of life (HRQoL) with emphasis on shared-decision making and aesthetic outcomes [4, 5].

In the Netherlands, approximately 40% of the patients underwent a mastectomy in the management of invasive breast cancer and ductal carcinoma in situ (DCIS) [6]. According to the Dutch breast cancer guidelines, every patient scheduled for a mastectomy must be informed about the possibility of breast reconstruction [7]. Nevertheless, some treatment and patient-specific contraindications may

limit the possibilities for breast reconstruction [8]. Despite the known positive effects on body-image, self-esteem, physiological well-being, sexuality, cosmetic outcomes and quality of life [9–13], some women do not opt for (immediate or delayed) breast reconstruction [14, 15].

In recent years, the rate of immediate breast reconstruction in the Netherlands has increased. Although less documented, delayed reconstruction rates seem to stay behind [6]. A large variation in the rate of immediate post-mastectomy breast reconstruction is observed between Dutch hospitals, with rates ranging from 0 to 64% [12, 14, 16]. Tumor and patient characteristics could not fully explain these differences [6]. Some studies evaluated patients' motives to opt for or reject breast reconstruction [14, 17–21]. However, often the focus is on tumor and patient characteristics as predictors of breast reconstruction, and not on patients' preferences. Nevertheless, knowledge of patients' preferences and decision-making is of utmost importance in the counseling of breast cancer patients in the outpatient clinic and tailoring treatment to patients' needs. As one of the first, this study combines the Breast-Q questionnaire in combination with a short survey to gain insight into the motives of women to opt for or reject post-mastectomy breast reconstruction. Additionally, this study established the breast reconstruction rate in a large Dutch teaching hospital.

Methods

Study design

The present study was a retrospective, cross-sectional study of all consecutive patients who underwent mastectomy in the management of breast cancer between January 2015 and December 2017 at a large teaching hospital in the Netherlands. The study was approved by the hospital's institutional review board.

Patient selection

Patients were included if they underwent mastectomy in the treatment of invasive breast cancer and/or DCIS. The study included patient with primary breast cancer as well as patient with a recurrence of breast cancer. Patient who received prophylactic mastectomy or mastectomy for another reason without a history of breast cancer were excluded. Males were also excluded from the study.

According to the Dutch breast cancer guideline, the management of patients was discussed in a multidisciplinary consultation. During this consultation, a radiologist, a medical oncologist, an oncologic surgeon, a plastic surgeon, a pathologist, and a radiation therapist were present.

All patients were treated following the national guidelines for breast cancer [7].

Questionnaires were sent by mail to all patients of 18 years or older, who were mentally competent, and capable of understanding and responding in the Dutch language. All questionnaires were sent at the same time in the spring of 2019, regardless of the follow-up time after treatment. Evaluation of patient-reported outcomes measures (PROMs) was performed at one moment in time, resulting in different periods of follow-up after mastectomy per patient. When patients did not respond, a phone call was made followed by a postal reminder. Written informed consent was obtained from all participating patients.

Medical data

Patient-related variables were collected from electronic medical records of our institutional database. These data included patient demographics, details of oncologic treatment, and postoperative variables. Surgical complications were defined as breast cancer surgery-related events requiring intervention.

Post-mastectomy breast reconstruction can be performed in an immediate or delayed setting. Immediate breast reconstruction is defined as breast reconstruction during the same operation as the primary oncologic surgery. Delayed breast reconstruction is breast reconstruction at any time after the primary oncologic surgery. Patients were categorized into two groups based on the presence of breast reconstruction: (1) patients who did not undergo post-mastectomy breast reconstruction (non-reconstruction group), and (2) patients who did undergo immediate or delayed post-mastectomy reconstruction (reconstruction group).

Questionnaires

Patient-reported outcomes were assessed using two questionnaires. We used the Breast-Q, which is validated in breast cancer patients [22–24]. The Breast-Q is a PROM developed to evaluate outcomes among women undergoing different types of breast surgery. For every type of breast surgery (breast conserving surgery, mastectomy and breast reconstruction), a specific module is available. Each module covers two domains: (1) HRQoL, and (2) patient satisfaction. The domain QoL consists of sub-themes psychosocial, physical, and sexual well-being, and the domain patient satisfaction consists of the subthemes satisfaction with breasts, satisfaction with outcome, and satisfaction with care. Questions are scored on a 4- or 5-point Likert scale. Raw scores can be transformed into scores ranging from 0 to 100, and higher scores indicate better QoL or higher satisfaction [22–24]. In the current study, the Breast-Q for breast cancer was used. The

non-reconstruction group received the mastectomy module, and the reconstruction group received the mastectomy with reconstruction module.

No validated questionnaires were available that specifically address decision-making on post-mastectomy breast reconstruction. Previous studies showed different variables to be associated with post-mastectomy breast reconstruction (i.e. age, appearance, more surgical procedures, and fear of complications or recurrence) [14, 17–19, 21]. These variables were incorporated into a short survey to evaluate the impact of these factors on decision making (Fig. 1). Via the option ‘Other’, a free text field appeared and patients had the possibility to elaborate on their motive. The responses to the free text field of the short survey were categorized based on meaning of these responses. The categories were: ‘Choosing for the easiest solution or prosthesis is (un)practical’, ‘provided information by the doctor’, ‘appearance or confrontation with breast cancer’, ‘pressure or limited time to make a decision’, ‘type of available reconstruction’, ‘age’, ‘number of procedures’, ‘medical indication’, ‘trust in their own breasts’, ‘no necessity’, and doubt about the decision’. Medical indication meant presence of comorbidities or need of adjuvant (radio)therapy that make patients less

ideal candidates for immediate breast reconstruction. No necessity meant that patients stated that they did not feel the need for breast reconstruction.

Statistical analyses

Patient-related variables and patient-reported outcomes were analyzed using descriptive statistics presented as means with standard deviations, or numbers with percentages. In univariable analyses, differences in patient-related variables and response outcomes between the non-reconstruction group and the reconstruction group and between respondents and non-respondents were assessed using Chi-square tests, Fisher exact tests and Mann–Whitney tests. Multivariable analyses were performed to adjust differences in response outcomes between the non-reconstruction group and reconstruction group for relevant patient characteristics. Outcomes of the short questionnaire were analyzed using multivariable logistic regression, and Breast-Q scores were analyzed using multiple linear regression. Potential confounders were patient characteristics (BMI, medical history), tumor characteristics (stage, nodal management), and treatment characteristics (adjuvant chemotherapy, radiotherapy). In both multivariable analyses, we adjusted for age, ASA classification,

Questionnaire decision-making on breast reconstruction

1.1 What was your breast size before surgery?

1.2 What is your current breast size?

Your surgical treatment was discussed with the oncologic surgeon. The following questions will gain insight in factors that affected your decision.

1.3 Did you desire breast reconstruction?

- I did not desire breast reconstruction
- I did desire breast reconstruction

1.4 Was the information about breast reconstruction sufficient?

- Yes
- No

1.5 To clarify your decision on breast reconstruction, select the options that apply for your situation (more than one option is possible)

- My age affected this decision.
- The importance of appearance of my breasts affected this decision.
- The possibility of multiple operations for breast reconstruction affected this decision.
- Fear of complications after reconstructive surgery affected this decision
- Other (free text field)

Fig. 1 Short-list with questions. Patients received a digital link to complete the questionnaire. All questionnaires were anonymous. All patients received a Dutch questionnaire. All questions needed to have

an answer to continue to the Breast-Q questionnaire and complete the survey. The questionnaire about decision-making was the same for the non-reconstruction group as the reconstruction group

and adjuvant radiotherapy. Taking into account the available sample size, we selected these three variables as a consensus of known characteristics that often differed between reconstruction and non-reconstruction patients (based on existing literature [16, 21, 25, 26]) and significant differences found in our study population.

The Breast-Q scores were compared to normative values reported by Oemrawsingh, and Clarijs et al. [27] In this study Dutch women were invited to complete a web-based survey that was disseminated through social media platforms of the Erasmus Medical Center between January and July 2020. Data were collected in 9037 women with a mean age \pm std of 44 ± 13 years. Patients who reported breast cancer in their medical history were excluded from analysis. These authors kindly provided us with the individual-level (raw) data of their study, which enabled a comparison of our Breast-Q scores with the normative values based on statistical tests for independent samples. The comparison of the

Breast-Q scores with the normative values were performed separately for the reconstruction and the non-reconstruction group, using independent samples t-tests.

In case of missing data, complete case analyses were performed. Two sided p-values of $p < 0.05$ were considered statistically significant. All statistical analyses were performed using the statistical software IBM SPSS version 24.

Results

Patient characteristics

In total, 319 patients were identified who had undergone mastectomy in the management of breast cancer between January 2015 and December 2017, and were eligible for PROMs (Fig. 2).

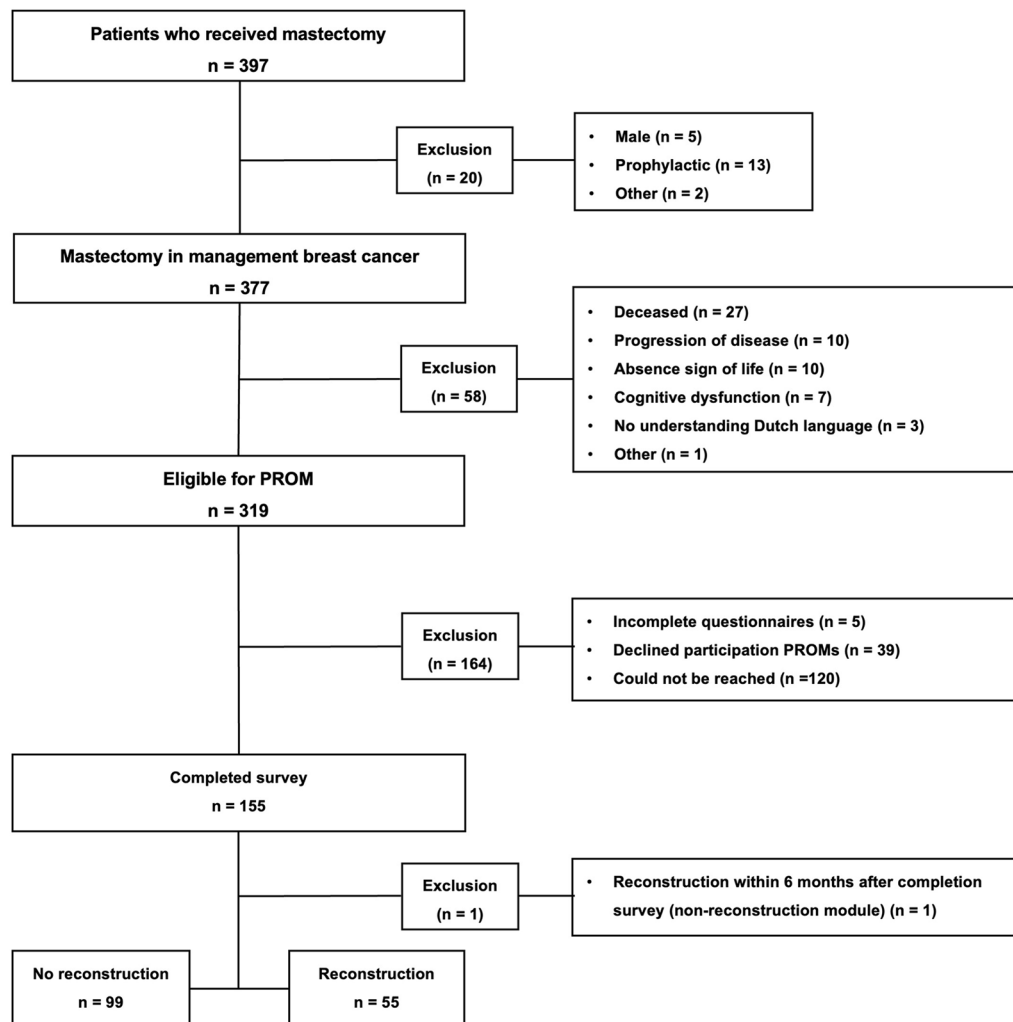


Fig. 2 Flowchart. Patient selection and flowchart of the responders to the patient-reported outcome measures

Of these patients, 217 (68%) patients underwent mastectomy without post-mastectomy reconstruction and the reconstruction group consisted of 102 (32%) patients. Patients in the reconstruction group were significantly younger than those in the non-reconstruction group. Also, a significantly lower BMI was found in the reconstruction group, whereas comorbidities and higher ASA classification were found in the non-reconstruction group. Although no significant differences in surgical treatment and postoperative complications were found between the two groups, nodal management was found to be more extensive in the non-reconstruction group. Also, significant differences were found in adjuvant radiotherapy and chemotherapy (Table 1).

Reconstructive characteristics

The reconstruction group consisted of 102 patients of whom the majority ($n = 95$) opted for immediate breast reconstruction. The majority of patients opted for an implant-based breast reconstruction (88%). In case of an implant-based breast reconstruction, anatomical shaped implants were most often used (78 patients). In case of an autologous breast reconstruction, a deep inferior epigastric perforator (DIEP) flap was used most often ($n = 14$) (see Table 2 for more details).

Five patients lost the tissue expander due to postoperative complications of whom three did not receive any other form of breast reconstruction. In one case, loss of the tissue expander was caused by development of a large postoperative hematoma, and in the other four cases, it was due to infection.

Five patients who opted for immediate breast reconstruction required adjuvant radiotherapy. In two of these cases, the tissue expander was preliminarily removed and no further reconstruction was performed. In one case, the tissue expander was preliminarily removed and eventually delayed reconstruction was performed. In two other cases, the definitive implant was placed before the start of the radiation therapy.

Patient-reported outcomes

Of the 319 patients eligible for PROMs, 155 (49%) patients completed the questionnaire (Fig. 2). In the responder group, post-mastectomy breast reconstruction was significantly more often performed than in the non-responder group ($p = 0.012$). Responders were significantly younger than non-responders ($p = 0.001$), had a lower ASA classification ($p = 0.015$), and received more often adjuvant chemotherapy ($p = 0.007$). Also, fewer smokers were counted in the responder group ($p = 0.006$; data not shown).

The non-reconstruction group had 100 (46%) responders. One patient was excluded from PROM analysis because she

received delayed breast reconstruction within six months after completion of the survey (no breast reconstruction module). The reconstruction group had 55 (53%) responders of whom two had a delayed breast reconstruction, and 53 had an immediate breast reconstruction. Between the responders of the non-reconstruction and reconstruction group, comparable significant differences in patient and treatment characteristics were found as in the entire study population (Table 3).

In the non-reconstruction group, the majority of patients ($n = 82$; 83%) confirmed that they did not want a post-mastectomy breast reconstruction. Seventeen patients (17%) stated that they had a desire for breast reconstruction. These patients had tumor and/or patient characteristics that count as a contra-indication for immediate breast reconstruction: nine out of these seventeen patients had an indication for adjuvant radiotherapy, one patient had an indication for adjuvant radiotherapy and a high BMI (> 30), three patients had a high BMI, and three patients did smoke at the time of their oncologic surgery. Four patients received a tissue-expander during the primary operation but due to infection or adjuvant radiation therapy, the tissue-expander was removed. In three cases no other reconstructive surgery was performed. In the reconstruction group, the majority of patients ($n = 53$; 96%) confirmed that they had the desire for a breast reconstruction.

Forty (40%) patients of the non-reconstruction group stated that age had an impact on their decision not to opt for breast reconstruction. However, the majority of patients (60%) stated that age did not influence the decision about breast reconstruction, and the stated influence of age was not significantly different between the two groups. In both groups, the majority stated that they received sufficient information about breast reconstruction. Nineteen patients of the non-reconstruction group stated that they had not received sufficient information, and four of these patients did have a desire for breast reconstruction. Correction for confounders in the multivariable analysis did not considerably change the results (Fig. 3).

In the non-reconstruction group, the option ‘other’ was used thirty-six times and resulted in 45 motives. These motives could be classified into eleven different categories. The categories ‘medical indication’, ‘no necessity’ and ‘type of reconstruction’ were mentioned most often (12, 6, and 5 times, respectively). Medical indication included the need for adjuvant radiation therapy, but also a higher BMI, the presence of comorbidities or smoking (for more details see Fig. 3b).

In the reconstruction group, the option ‘other’ was used ten times and resulted in fourteen motives. These motives could be classified into six different categories. Two patients selected the option ‘other’ but did not specify their motives in the free text field. The categories ‘appearance’, ‘easy/

Table 1 Patient characteristics of 319 patients with mastectomy in the management of breast cancer

	Mastectomy and no breast reconstruction (n = 217)	Mastectomy and breast reconstruction (n = 102)	p-value
Mean age at diagnosis \pm sd, years	63.4 \pm 12.3	51.9 \pm 9.1	< 0.001
Mean BMI \pm sd, kg/m ²	26.7 \pm 5.4	24.9 \pm 4.2	0.015
Smoker	163 (75.1%)	73 (71.6%)	0.440 ^c
No			
Yes	37 (17.1%)	21 (20.6%)	
Missing	17 (7.8%)	8 (7.8%)	
Referral			0.186 ^c
National screening program	60 (27.6%)	35 (34.3%)	
General practitioner	118 (54.4%)	52 (51.0%)	
Follow-up	36 (16.6%)	11 (10.8%)	
Other	3 (1.4%)	4 (3.9%)	
Medical history			
Hypertension	83 (38.2%)	16 (15.7%)	0.001 ^c
Diabetes mellitus	34 (15.7%)	2 (2.0%)	< 0.001 ^d
Breast cancer	40 (18.4%)	10 (9.8%)	0.048 ^c
Thoracic oncology ^a	2 (0.9%)	1 (1.0%)	1.000 ^d
History of breast cancer – location with respect to new lesion			0.212 ^d
Ipsilateral	19 (8.8%)	2 (2.0%)	
Contralateral	16 (7.4%)	7 (6.9%)	
Both sides	5 (2.3%)	1 (1.0%)	
History of breast cancer – treatment			0.223 ^d
No surgical treatment	3 (1.4%)		
BCS	25 (11.5%)	4 (3.9%)	
Mastectomy	12 (5.5%)	6 (5.9%)	
History of breast cancer – radiotherapy			0.382 ^c
No	14 (6.5%)	5 (4.9%)	
Yes	26 (12.0%)	5 (4.9%)	
ASA classification			< 0.001 ^d
ASA 1	63 (29.0%)	53 (52.0%)	
ASA 2	138 (63.6%)	48 (47.1%)	
ASA 3	15 (6.9%)	1 (1.0%)	
Missing	1 (0.5%)		
Tumor histology			0.593 ^c
Invasive breast cancer	179 (85.6%)	85 (83.3%)	
Pure DCIS	30 (14.4%)	17 (16.7%)	
Tumor stage			0.035 ^d
Stage 0	23 (10.6%)	15 (14.7%)	
Stage 1	64 (29.5%)	45 (44.1%)	
Stage 2	96 (44.2%)	29 (28.4%)	
Stage 3	22 (10.1%)	7 (6.9%)	
Stage 4	2 (0.9%)	6 (5.9%)	
Missing			
Neo-adjuvant chemotherapy			0.059 ^c
No	192 (88.5%)	97 (95.1%)	
Yes	25 (11.5%)	5 (4.9%)	
Surgical treatment			0.189 ^c
BCS followed by mastectomy	17 (7.8%)	4 (3.9%)	
Direct mastectomy	200 (92.2%)	98 (96.1%)	

Table 1 (continued)

	Mastectomy and no breast reconstruction (n = 217)	Mastectomy and breast reconstruction (n = 102)	p-value
Nodal management			< 0.001 ^c
No nodal management	21 (9.7%)	6 (5.9%)	
SLNB	128 (59.0%)	80 (78.4%)	
ALND	46 (21.2%)	4 (3.9%)	
SLNB followed by ALND	22 (10.1%)	12 (11.8%)	
Postoperative complications ^b			0.074 ^c
No	207 (95.4%)	92 (90.2%)	
Yes	10 (4.6%)	10 (9.8%)	
Type of postoperative complications			0.156 ^d
Infection	4 (1.8%)	3 (2.9%)	
Postoperative bleeding	1 (0.5%)	5 (4.9%)	
Pain	1 (0.5%)	1 (1.0%)	
Other	4 (1.8%)	1 (1.0%)	
Adjuvant therapy			
Radiotherapy	40 (18.0%)	7 (6.9%)	0.007 ^c
Chemotherapy	66 (30.4%)	50 (49.0%)	0.001 ^c
Endocrine therapy	125 (57.6%)	49 (48.0%)	0.110 ^c
Follow-up			0.080 ^d
No recurrence	203 (93.5%)	97 (95.1%)	
Local recurrence	4 (1.8%)		
Progression or metastatic disease	4 (1.8%)	1 (1.0%)	
Second primary tumor	1 (0.5%)	4 (3.9%)	
Metastatic disease at time of operation	4 (1.8%)		
Metastatic disease at dissemination evaluation	1 (0.5%)		

^aThoracic oncology is defined as thoracic diseases (non Hodgkin lymphoma or lung cancer) which required radiation of the chest

^bPostoperative complications are defined as complications due to surgical treatment which required treatment

^cEight patients lost their tissue-expander (5) or eventually received autologous breast reconstruction (3)

^dFisher exact tests

(un)practical', and 'provided information' were mentioned most often (4, 4, and 3 times, respectively) (for more details see Fig. 3B).

The mean Breast-Q 'psychosocial well-being' score significantly differed between the non-reconstruction group (63.0 ± 19.3) and the reconstruction group (67.5 ± 14.4; $p = 0.042$). No significant differences were found between the two groups with respect to the other Breast-Q scores. Correction for confounders in the multivariable analysis did not considerably change the results (Fig. 3c).

The normative Dutch population consisted of 9037 women. The mean patient-reported outcomes ± standard deviation per Breast-Q domain were for 'satisfaction with breasts' 64.2 ± 18.6, 'psychosocial well-being' 72.0 ± 15.9, 'physical well-being' 89.6 ± 12.4, and 'sexual well-being' 60.4 ± 15.3 [27]. Compared to Dutch normative Breast-Q data, responders of the non-reconstruction group, on average reported poorer Breast-Q 'satisfaction with breasts' (60.5 ± 19.3; $p = 0.025$), 'psychosocial well-being'

(63.0 ± 16.0; $p < 0.001$), 'physical well-being' (72.4 ± 15.3; $p < 0.001$), and 'sexual well-being' (51.0 ± 23.2; $p < 0.001$) scores [27]. Responders of the reconstruction group from the current study reported poorer average Breast-Q 'psychosocial well-being' (67.5 ± 14.4; $p = 0.046$), and 'physical well-being' (70.4 ± 16.8; $p < 0.001$) scores, compared to Dutch normative Breast-Q data [27]. For the domains 'satisfaction with breasts' (63.4 ± 16.8; $p = 0.552$) and 'sexual well-being' (55.3 ± 22.6; $p = 0.081$) no significant differences were found (Fig. 4).

Discussion

Post-mastectomy breast reconstruction restores the breast contour and positively affects body-image and well-being [8, 9, 28, 29]. Despite these benefits, not all women opt for post-mastectomy breast reconstruction. The current study showed a reconstruction rate of 32%. In most cases, it

Table 2 Reconstructive details of 102 patients who opted for breast reconstruction

	Number of patients (n)	Percentage (%)
Type of mastectomy		
Nipple-sparing mastectomy	21	20.6
Skin-sparing mastectomy	74	72.5
Conventional mastectomy	7	6.9
Timing of reconstruction		
Immediate breast reconstruction	95	93.1
Delayed breast reconstruction	7	6.9
Type of reconstruction		
Implant-based reconstruction ^a	87	80.4
Autologous breast reconstruction ^b	15	14.7
In case of implant-based breast reconstruction—use of tissue-expander		
No ^c	1	1.0
Yes	89	87.3
Causes loss of tissue expander or loss direct implant-based breast reconstruction		
Hematoma	1	
Infection	4	3.9
Adjuvant radiotherapy	4	3.9
Completion axillary lymph node dissection	1	1.0
Type of prosthesis		
Round	3	3.7
Anatomical	78	95.1
Anatomical tissue expander	1	1.2
In case of autologous breast reconstruction – use of tissue-expander		
No	5	4.9
Yes	10	9.8
Type of autologous tissue		
DIEP flap ^d	14	13.7
LD flap ^e	1	1.0
Implant combined with LD flap ^e	6	5.9
Nipple reconstruction		
No	89	87.3
Yes	13	12.7
Symmetrizing procedure contralateral breast		
No	57	55.9
Yes	45	44.1

^aFive patients lost their tissue expander and did not receive any form of breast reconstruction

^bThree patients opted for implant-based reconstruction, but eventually received an autologous breast reconstruction

^cOne patient received direct a definitive breast prosthesis. However, due to a positive sentinel node and the need for a completion axillary lymph node dissection, the prosthesis was removed. One year after the primary oncologic surgery, a two-phased (implant-based) breast reconstruction was performed

^dDIEP flap = deep inferior epigastric perforator flap

^eLD flap = latissimus dorsi flap

concerned an immediate breast reconstruction (93%). This study is one of the first to combine the Breast-Q questionnaire with a short survey to gain insight into the motives of women to opt for or reject post-mastectomy breast reconstruction. In addition, the Breast-Q scores were compared to normative values.

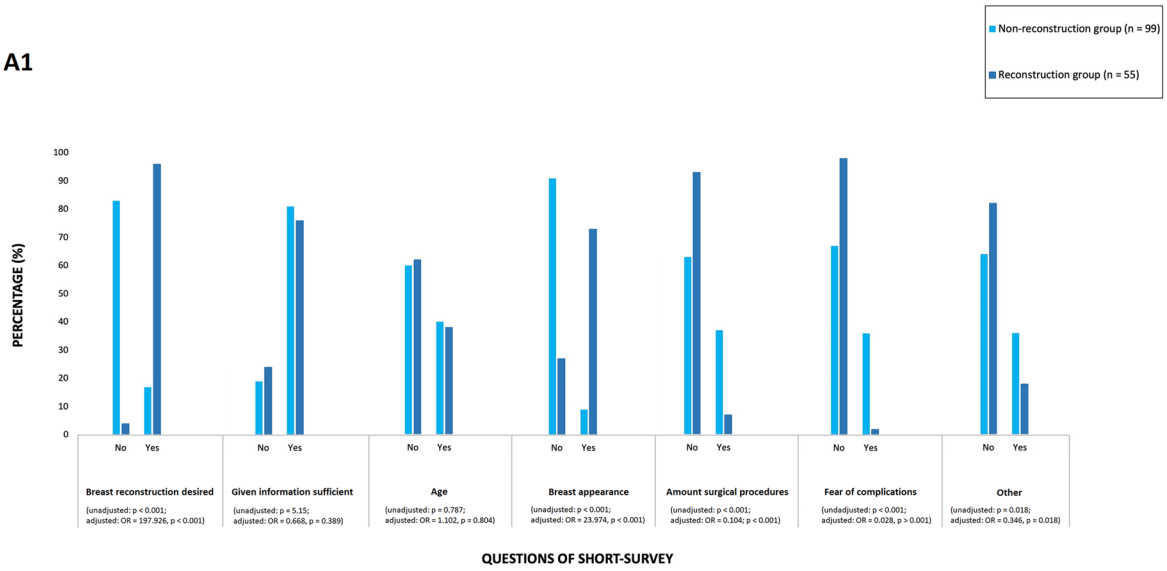
In line with previous studies [6, 15], this study showed several significant differences in patient characteristics between the non-reconstruction group and reconstruction group. A higher BMI, presence of comorbidities such as hypertension or diabetes mellitus, and a high ASA classification make patients less ideal candidates for immediate

Table 3 Patient characteristics of 99 responders without breast and 55 responders with breast reconstruction

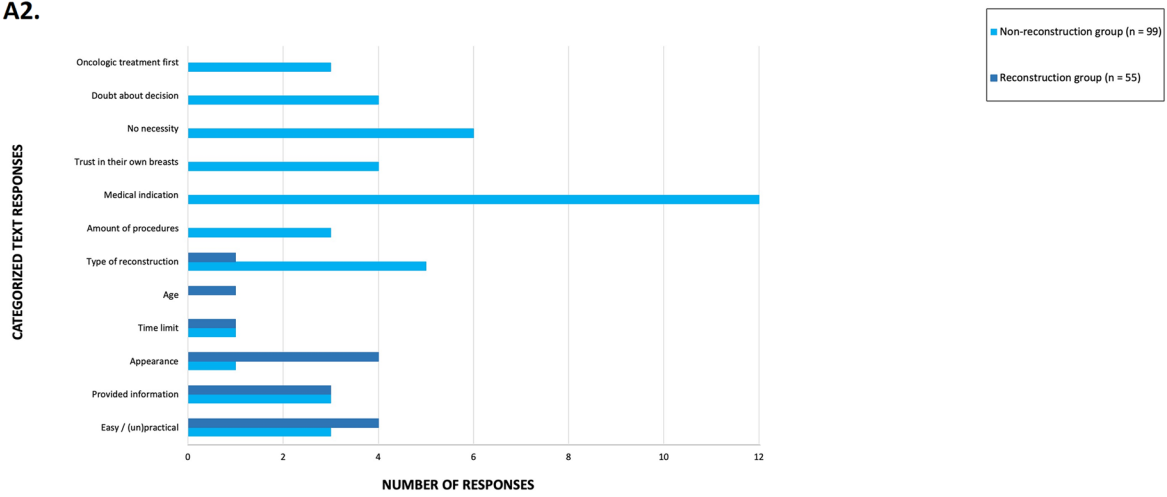
	Mastectomy and no breast reconstruction (n = 99)	Mastectomy and breast reconstruction (n = 55)	p-value
Mean age at diagnosis \pm sd, years	59.9 \pm 11.3	52.8 \pm 7.7	<0.001
Mean age at PROM \pm sd, years	62.9 \pm 11.1	55.4 \pm 7.6	<0.001
Mean BMI \pm sd, kg/m ²	26.5 \pm 5.5	24.9 \pm 4.2	0.144
Smoker			0.433 ^a
No	80 (80.8%)	44 (80.0%)	
Yes	14 (14.1%)	5 (9.1%)	
Missing	5 (2.3%)	6 (10.9%)	
Medical history of breast cancer			0.154 ^a
No	84 (84.8%)	51 (92.7%)	
Yes	15 (15.2%)	4 (7.3%)	
ASA classification			0.011 ^b
ASA 1	35 (35.4%)	32 (58.2%)	
ASA 2	60 (60.6%)	23 (41.8%)	
ASA 3	4 (4.0%)		
Neo-adjuvant chemotherapy			0.006 ^b
No	83 (83.3%)	54 (98.2%)	
Yes	16 (16.2%)	1 (1.8%)	
Surgical treatment			0.901 ^a
BCS followed by mastectomy	4 (4.0%)	2 (3.6%)	
Direct mastectomy	95 (96.0%)	53 (96.4%)	
Nodal management			0.042 ^b
No nodal management	8 (8.1%)	2 (3.6%)	
SLNB	59 (59.6%)	44 (80.0%)	
ALND	19 (19.2%)	3 (5.5%)	
SLNB followed by ALND	13 (13.1%)	6 (10.9%)	
Postoperative complications			0.412 ^a
No	92 (92.9%)	49 (89.1%)	
Yes	7 (7.1%)	6 (10.9%)	
In case of implant-based reconstruction— type of prosthesis			
Round		2 (3.6%)	
Anatomical		45 (81.8%)	
Anatomical tissue expander		1 (1.8%)	
Tumor histology			0.069 ^a
Invasive breast cancer	84 (85%)	40 (73%)	
DCIS	15 (15%)	15 (27%)	
Adjuvant therapy			
Radiotherapy	24 (24.2%)	3 (5.5%)	0.003 ^a
Chemotherapy	40 (40.4%)	27 (49.1%)	0.297 ^a
Endocrine therapy	57 (57.6%)	24 (43.6%)	0.097 ^a
Follow-up			1.000 ^b
No recurrence	95 (96.0%)	53 (96.4%)	
Local Recurrence	1 (1.0%)		
Progression or metastatic disease	1 (1.0%)	1 (1.8%)	
Second primary tumor	1 (1.0%)	1 (1.8%)	
Metastatic disease at time of operation	1 (1.0%)		

^aChi-square tests^bFisher exact tests

A1



A2.



B.

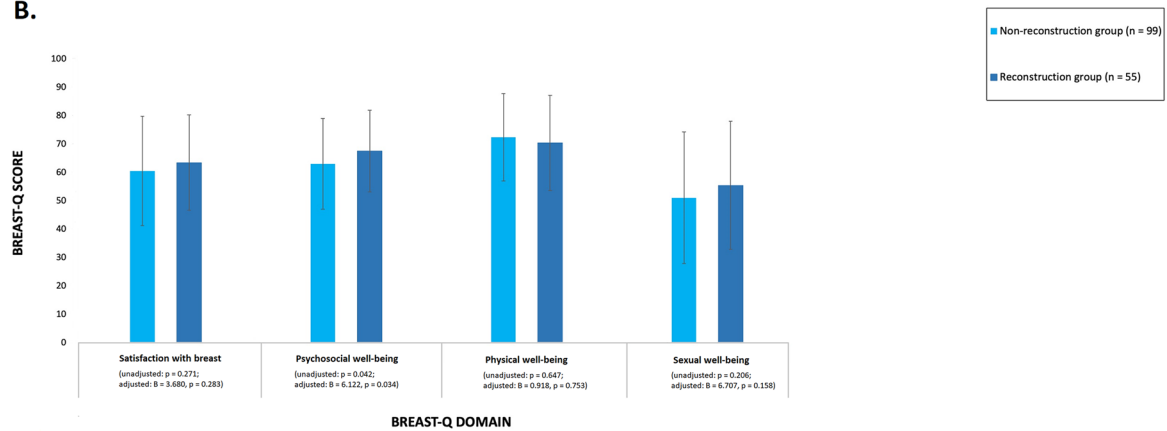


Fig. 3 Patient-reported outcomes of 154 patients after mastectomy in the management of breast cancer. (A1) Outcomes of short-survey about decision on breast reconstruction. Every question of the survey is showed in the figure. The outcomes of the non-reconstruction group were compared with the outcomes of the reconstruction group (non-adjusted p-values and adjusted p-values for age, ASA classification, and adjuvant radiotherapy); OR = Odds ratio. (A2) Outcomes of the free text field responses of the short-survey in the reconstruction group and non-reconstruction group. Categorized factors that contributed to the decision on breast reconstruction: (1) decision based on easiest outcome (prosthesis is (un)practical); (2) provided information during consultation; (3) appearance or confrontation with breast cancer; (4) pressure or time limit to make their decision; (5) age of patient at the time of decision; (6) type of reconstruction; (7) more (surgical) procedures; (8) medical indication; (9) trust in their own breasts; (10) no necessity of breast reconstruction; (11) doubt about decision. (B) Outcomes of the Breast-Q questionnaire. The figure includes the four domains of the Breast-Q questionnaire: (1) satisfaction with breasts, (2) psychosocial well-being, (3) physical well-being, and (4) sexual well-being. The outcomes of the non-reconstruction group [(1) 60.5 ± 19.3 , (2) 63.0 ± 16.0 , (3) 72.4 ± 15.3 , and (4) 51.0 ± 23.2] were compared with the outcomes of the reconstruction group [(1) 63.4 ± 16.8 , (2) 67.5 ± 14.4 , (3) 70.4 ± 16.8 , and (4) 55.3 ± 22.6], (non-adjusted p-values and adjusted p-values for age, ASA classification, and adjuvant radiotherapy); B = coefficient.

breast reconstruction. Adjuvant treatment also seems to have impact on the possibility to opt for immediate breast reconstruction. In our hospital, delayed breast reconstruction is preferred and immediate breast reconstruction is discouraged when radiotherapy is indicated due to a higher risk of complications and non-optimal aesthetic results. This issue mainly applies to implant-based reconstructions [30, 31].

Differences between the non-reconstruction group and the reconstruction group arise in factors that affected patients' decision making. The majority (73%) of the reconstruction group stated that the importance of appearance affected their decision. In the non-reconstruction group, there were considerable differences between patients to reject breast reconstruction. As expected, age differed between the non-reconstruction group and the reconstruction group. In line with previous studies, patients who opt for breast reconstruction are younger than those who do not choose for reconstruction [15, 16]. Interestingly, more than half of our respondents without breast reconstruction (60%) stated that their age did not affect their decision. Although it is expected that an older age at time of mastectomy is correlated with the rejection of breast reconstruction, this study could not find a significant correlation.

The responses of the free text field of the short survey included a wide range of factors that influenced the decision regarding breast reconstruction. Besides, in the responses to the survey of the current study, some arguments are used in both groups with different perspectives. In the non-reconstruction group multiple patients stated that they wanted to be practical, and the external prosthesis is seen as an easy solution to restore breast contour while being dressed.

Interestingly, 'being practical' is also used as an argument in favor of breast reconstruction, since external breast prosthesis can also be experienced as inconvenient. The meaning of breast reconstruction seems to differ amongst women. Some stated it as a way to forget breast cancer, while others do not want to think about breast cancer ever again and see breast reconstruction as a constant reminder of this period. So, in daily practice, it seems that two types of women may be identified. The women who desire breast reconstruction, and those who do not seem to need nor desire breast reconstruction. It is important to acknowledge these differences, but these are difficult to identify based on patient characteristics and Breast-Q scores only. Besides, in line with other studies, some patients were not ready to decide about breast reconstruction at the time of their oncologic surgery. Although the free text field was not a mandatory field, and our results should be interpreted with care, these results do highlight the importance of personalized guidance and consultation about breast reconstruction, before and after oncologic treatment, to provide women with the needed support.

In the current study, the Breast-Q was used in addition to our non-validated short survey. We hoped that a validated questionnaire could provide extra information on patients' choice on breast reconstruction and the relation to HRQoL. Based on the short list survey, a majority of patients (83%) of the non-reconstruction group did not have a desire for breast reconstruction. Nevertheless, compared to the Dutch normative population, patients without breast reconstruction had poorer results on all four domains of the Breast-Q questionnaire. These results give the impression that all these women have a lower quality of life than the Dutch normative population. Unfortunately, we did not have a baseline HRQoL score. Patients in the non-reconstruction group had a higher BMI, and a more extensive medical history. These factors may have resulted in a lower baseline HRQoL even before the diagnosis of breast cancer. Consequently, also the HRQoL after treatment will be lower than the HRQoL of the Dutch normative population. Therefore, differences in the patient-reported outcomes may not solely be explained by the breast cancer treatment. The reconstruction group had poorer results on two domains of the Breast-Q questionnaire (psychosocial well-being, and physical well-being). The majority of patients (93%) of the reconstruction group had an immediate implant-based breast reconstruction. Yoon et al. (2018) showed that immediate breast reconstruction is still the preferred choice, but delayed breast reconstruction does not appear to compromise clinical and patient reported outcomes [29]. Nevertheless, we can imagine that patients who opt for delayed breast reconstruction have more time for their decision and they had a period without a breast resulting possibly in a higher satisfaction with the reconstructed breast.

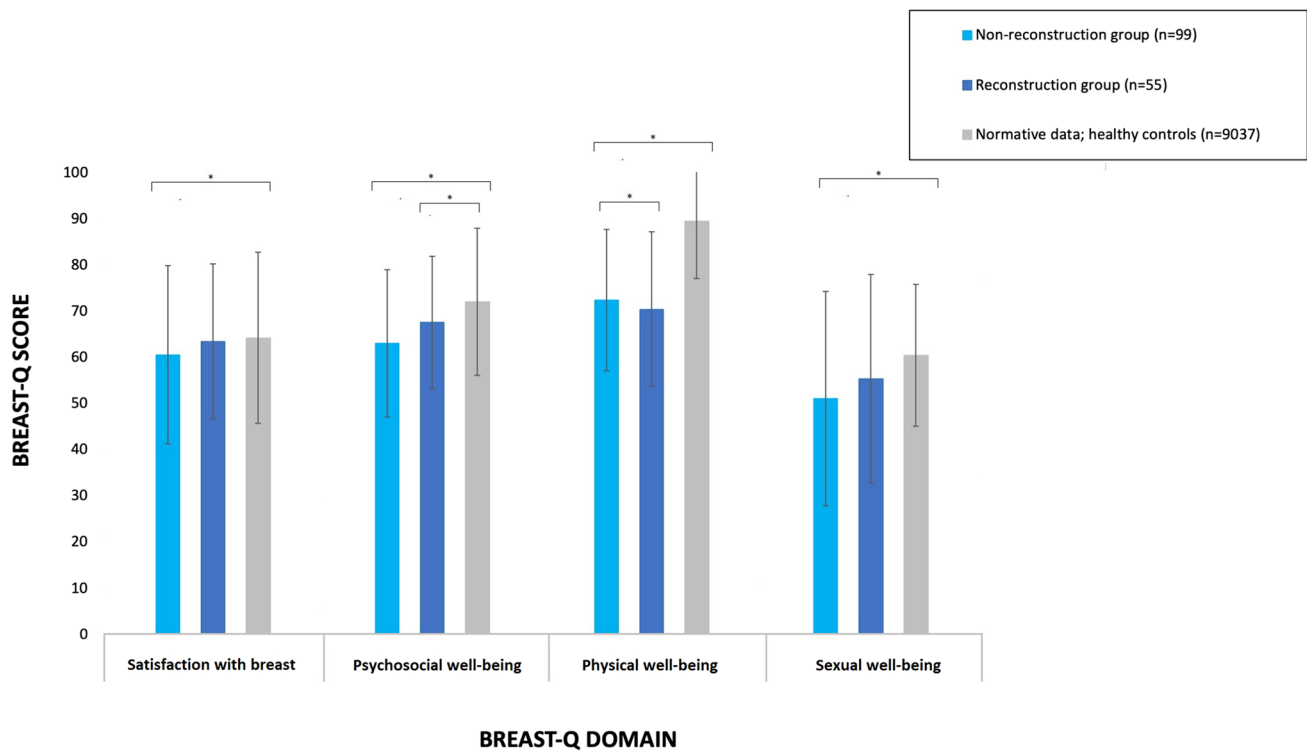


Fig. 4 Patient-reported outcomes of the four Breast-Q questionnaire. Mean patient-reported outcomes \pm standard deviation per Breast-Q domains: (1) satisfaction with breasts, (2) psychosocial well-being, (3) physical well-being, and (4) sexual well-being. Comparing the

non-reconstruction group [(1) $n=98$, (2) $n=99$, (3) $n=99$, and (4) $n=64$], the reconstruction group [(1) $n=55$, (2) $n=55$, (3) $n=55$, and (4) $n=46$], and normative Dutch data [(1) $n=9037$, (2) $n=9037$, (3) $n=9037$, and (4) $n=8957$]

This study was limited by its retrospective design, which resulted in missing data, possible recall bias, and missing baseline HRQoL scores. This makes interpretation of differences in HRQoL difficult. Also the use of NAC in the responders cohort significantly differed ($p=0.006$). Unfortunately, despite multiple attempts to increase the response rate, the response rate remained rather low. Some patients clearly stated not to be interested in answering the questions, with as main reason that they did not want to recall those memories. The poor response rate may result in selection bias, and perhaps neglecting unsatisfied patients. Consequently, this neglect may have resulted in an underestimation of the impact of mastectomy and post-mastectomy breast reconstruction. On the other hand, the poor response may also have neglected the satisfied patient. The retrospective design of the study may have also led to possible recall bias. Nevertheless, we still think that the majority of the responses clearly show the factors that patients used to make their decision. Another limitation may be the confounding due to differences in patient characteristics between the non-reconstruction group and the reconstruction group. This was partially corrected with the multivariable analysis. However, outcomes should be interpreted with care.

Our study resulted from the question on the uptake rate of breast reconstructions after mastectomy in our hospital. To address this question, it was designed as descriptive retrospective inventory. Our study showed that there seem to be a difference in patients who opt for and who reject post-mastectomy breast reconstruction. To make more solid recommendations in the pre- and postoperative consultation, a prospective longitudinal study is the next step.

Conclusion

This study showed that patients are well-informed when making their decisions regarding breast reconstruction. Although the positive effects of breast reconstruction are known, some women had well-informed motives not to choose for post-mastectomy breast reconstruction. Patients have personal motives to opt for or reject breast reconstruction. Patients differ in the rating of values that affect their decision since the same arguments were used to opt for or to reject reconstruction. Therefore, our study highlights the importance of personalized guidance and consultation.

Declarations

Conflict of interest The authors declare that they have no conflict of interests.

References

- Howard-McNatt MM. Patients opting for breast reconstruction following mastectomy: an analysis of uptake rates and benefit. *Breast Cancer Targets Ther.* 2013;5:9–15.
- Integraal Kankercentrum Nederland (IKNL). NKR cijfers. Selection: survival, invasive breast cancer, 2011–2017. <https://iknl.nl/kankersoorten/borstkanker/registratie/incidentie>. Accessed Jan 2023.
- van Maaren MC, de Munck L, de Bock GH, et al. 10 year survival after breast-conserving surgery plus radiotherapy compared with mastectomy in early breast cancer in the Netherlands: a population-based study. *Lancet Oncol.* 2016;17(8):1158–70.
- Winters ZE, Benson JR, Pusic AL. A systematic review of the clinical evidence to guide treatment recommendations in breast reconstruction based on patient-reported outcome measures and health-related quality of life. *Ann Surg.* 2010;252(6):929–42.
- Legendijk M, van Egdom LSE, van Veen FEE, et al. Patient-reported outcome measures may add value in breast cancer surgery. *Ann Surg Oncol.* 2018;25:3563–71.
- van Bommel ACM, Mureau MAM, Schreuder K, et al. Large variation between hospitals in immediate breast reconstruction rates after mastectomy for breast cancer in the Netherlands. *J Plast Reconstr Aesthetic Surg.* 2017;70:215–21.
- Dutch breast cancer guideline. <https://richtlijndatabase.nl/richtlijn/borstkanker>. Accessed Jan 2023.
- Fang SY, Shu BC, Chang YJ. The effect of breast reconstruction surgery on body image among women after mastectomy: a meta-analysis. *Breast Cancer Res Treat.* 2013;137(1):13–21.
- Retrouvey H, Kerrebijn I, Metcalfe KA, et al. Psychosocial functioning in women with early breast cancer treated with breast surgery with or without immediate breast reconstruction. *Ann Surg Oncol.* 2019;26:2444–51.
- D'Souza N, Darmanin G, Fedorowicz Z. Immediate versus delayed reconstruction following surgery for breast cancer. *Cochrane Database Syst Rev.* 2011;2011(7):CD008674.
- van Bommel ACM, de Ligt KM, Schreuder K, et al. The added value of immediate breast reconstruction to health-related quality of life of breast cancer patients. *Eur J Surg Oncol.* 2020;46(10):1848–53.
- Kouwenberg CAE, De Ligt KM, Kranenburg LW, et al. Long-term health-related quality of life after four common surgical treatment options for breast cancer and the effect of complications: a retrospective patient-reported survey among 1871 patients. *Plast Reconstr Surg.* 2020;146(1):1–13.
- Panchal H, Matros E. Current trends in postmastectomy breast reconstruction. *Plast Reconstr Surg.* 2017;140(5S):7S–13S.
- de Ligt KM, van Bommel ACM, Schreuder K, et al. The effect of being informed on receiving immediate breast reconstruction in breast cancer patients. *Eur J Surg Oncol.* 2018;44(5):717–24.
- Fliccroft K, Brennan M, Spillane A. Making decisions about breast reconstruction: a systematic review of patient-reported factors influencing choice. *Qual Life Res.* 2017;26:2287–319.
- van Bommel A, Spronk P, Mureau M, et al. Breast-contour-preserving procedure as a multidisciplinary parameter of esthetic outcome in breast cancer treatment in the Netherlands. *Ann Surg Oncol.* 2019;26:1704–11.
- Zielinski T, Lorenc-Podgorska K, Antoszewski B. Why women who have mastectomy decide not to have breast reconstruction? *Pol Przegl Chir.* 2014;86(10):451–5.
- Héquet D, Zarca K, Dolbeault S, et al. Reasons of not having breast reconstruction: a historical cohort of 1937 breast cancer patients undergoing mastectomy. *Springerplus.* 2013;2:325.
- Handel N, Silverstein MJ, Waisman E, Waisman JR. Reasons why mastectomy patients do not have breast reconstruction. *Plast Reconstr Surg.* 1990;86(6):1118–22.
- Ananian P, Houvenaeghel G, Protière C, et al. Determinants of patients' choice of reconstruction with mastectomy for primary breast cancer. *Ann Surg Oncol.* 2004;11(8):762–71.
- Brennan ME, Spillane AJ. Uptake and predictors of post-mastectomy reconstruction in women with breast malignancy—systematic review. *Eur J Surg Oncol.* 2013;39(6):527–41.
- BREAST-Q—users guide. <http://qportfolio.org/wp-content/uploads/2020/02/BREAST-Q-USERS-GUIDE-V2.pdf>. Accessed Jan 2023.
- Cano SJ, Klassen AF, Scott AM, Cordeiro PG, Pusic AL. The BREAST-Q: further validation in independent clinical samples. *Plast Reconstr Surg.* 2012;129(2):293–302.
- Pusic AL, Klassen AF, Scott AM, Klok JA, Cordeiro PG, Cano SJ. Development of a new patient-reported outcome measure for breast surgery: the BREAST-Q. *Plast Reconstr Surg.* 2009;142(2):345–53.
- Metcalfe KA, Semple J, Quan ML, et al. Why some mastectomy patients Opt to undergo delayed breast reconstruction: results of a long-term prospective study. *Plast Reconstr Surg.* 2017;139(2):267–75.
- Molenaar S, Oort F, Sprangers M, et al. Predictors of patients' choices for breast-conserving therapy or mastectomy: a prospective study. *Br J Cancer.* 2004;90(11):2123–30.
- Oemrawsingh A, Clarijs M, Pusic A, et al. BREAST-Q breast-conserving therapy module: normative data from a Dutch sample of 9059 women. *Plast Reconstr Surg.* 2022;150(5):985–93.
- Pittermann A, Radtke C. Psychological aspects of breast reconstruction after breast cancer. *Breast Care.* 2019;14:298–301.
- Yoon AP, Qi J, Brown DL, et al. Outcomes of immediate versus delayed breast reconstruction: results of a multicenter prospective study. *Breast.* 2018;37:72–9.
- Ricci JA, Epstein S, Momoh AO, Lin SJ, Singhal D, Lee BT. A meta-analysis of implant-based breast reconstruction and timing of adjuvant radiation therapy. *J Surg Res.* 2017;218:108–16.
- Lam TC, Hsieh F, Boyages J. The effects of postmastectomy adjuvant radiotherapy on immediate two-stage prosthetic breast reconstruction: a systematic review. *Plast Reconstr Surg.* 2013;132:511–8.

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