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CHAPTER 4 THE SHORT-TERM PSYCHOLOGICAL IMPACT OF COMPLICATIONS AFTER BREAST RECONSTRUCTION

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Abstract

Objectives Few studies have focused on the psychological impact of postoperative complications after breast reconstruction (BR). As postoperative complications after BR usually lead to a prolonged recovery time and sometimes require additional surgery, the short-term impact on distress was investigated.

Methods Pre- and postoperatively, psychological questionnaires were sent to 152 women who underwent either implant BR (ImBR) or Deep Inferior Epigastric artery Perforator flap BR (DiepBR). In addition, patients and physicians reports of post-operative complications during the first 4 to 6 weeks after BR were scored. The course of anxiety, depression and cancer-specific distress and the effect of complications on distress were investigated.

Results ImBR patients reported decreased anxiety after surgery, and both groups reported reduced cancer-specific distress after surgery. However, depressive symptoms tended to increase after DiepBR. If complications occurred, both reconstruction groups reported increased depressive and anxiety symptoms, DiepBR patients even had depressive symptoms of clinical concern. A significant number of patients with complications reported alarming levels of distress. Timing and laterality were not significantly correlated with distress.

Conclusions Complications after BR have a significant impact on emotional well-being shortly after surgery. As distress affects quality of life and health outcomes, it is of great importance to offer psychological support to these patients. Distress can be evaluated by monitoring the emotional impact of BR during post-surgery consults, or with the standard use of short psychological questionnaires that patients can complete at home.

Introduction

Post mastectomy breast reconstruction (BR) for breast cancer can improve quality of life and patient satisfaction with the aesthetic result [1-4]. Unfortunately, most BR techniques have a considerable risk for complications [5-8], which could negatively affect psychosocial outcomes. Although many studies focused on psychosocial outcomes after BR, only very few have specifically focused on the psychological impact of complications after BR [9].

Implant BR can be performed either one-staged (direct insertion of prosthesis) or two-staged (insertion of tissue expander followed by replacement with definite implant). The overall short and long-term complication rates after implant BR vary from 18% to 51% [7;8;10-12]. Complications like infections, seroma and hematoma occur in between 15% to 39% of cases, of which 3% to 20% result in implant removal on short-term [8;11].

The short and long-term complication rates after autologous BR vary between 32% and 43% [6;7]. After Deep Inferior Epigastric artery Perforator (DIEP) flap BR immediate complications like hematoma, seroma and partial flap necrosis occur in about 2%, 5% and 15%, respectively [13]. In experienced hands total flap loss occurs in about 2% of DIEP flap reconstructions [14;15].

Factors such as the reconstruction method, type of prosthesis, and risk factors for wound healing problems such as obesity, smoking, hypertension and pre- or postoperative radiation therapy influence the chance for BR failure [11;16-18]. In particular, postoperative radiation therapy in patients with implant BR increases the complication risk, when compared to women with autologous BR [10;17]. For abdominal flap BR, the number of perforators included in the flap is also related to the occurrence of complications such as fat necrosis [19].

Women diagnosed with breast cancer can experience elevated stress levels around the time of surgery and prior to BR [20;21]. Pre-surgery distress has shown to contribute to post-surgery nausea, fatigue and discomfort [22]. In addition, postoperative complications may increase stress, which decreases the immune response and in turn may impede the healing process and increase the risk for infection [23;24].

We hypothesized that patients with complications after BR would experience increased psychological distress while recovering. To our knowledge, a prospective exploration of the relationship between psychological distress and postoperative complications after breast reconstructive surgery has not yet been performed. Exploring patients' emotional wellbeing after BR provides the opportunity to support them during an adverse recovery period, which may lead to better health and psychosocial outcomes. DIEP flap BR is a relatively new technique [25] of which the psychosocial effects have been less studied than the more often performed implant BR. Our main goal was to examine the relationship of short-term complications and psychological distress of women undergoing either implant or DIEP flap BR**.**

Patients and Methods

Patients

This study is part of a multi-centre prospective follow-up study on the psychological impact of BR. Participants were women who opted for post mastectomy reconstruction after breast cancer (unilateral or bilateral)[2]. Reconstructions were either implant or DIEP flap based, and were immediate or delayed. All patients consented to participate in the study.

Exclusion criteria were a BR in the past, a detection of residue or metastasis of breast cancer, and not being able to understand and speak the Dutch language sufficiently. Women who did not consent or respond two weeks after the invitation were considered as non-respondents. Patients were approached between December 2007 and May 2010 at the Leiden University Medical Center (LUMC), Erasmus University Medical Center Rotterdam (EMCR), Daniel den Hoed Cancer Center, Haga Teaching Hospital, Rijnland Hospital Leiderdorp, the Lange Land Hospital, Hospital Walcheren, Oosterschelde Hospital and at the Hospital Zorgsaam. Ethics approval was obtained from all participating hospitals.

Implant BR

All 96 patients who were scheduled for implant BR (usually preceded by tissue expansion) were invited to participate in the study. Fifteen women did not respond, 10 patients declined and 71 women consented to participate (74%).

DIEP flap BR

All 100 women who were scheduled for a DIEP flap BR were asked to take part in the study. Seven women did not respond, 12 patients declined and 81 women consented to participate (81%).

Procedure

Preoperatively, an invitation letter explaining the procedure and purpose of the study, an informed consent, and a prepaid envelope were sent to all women on the BR waiting lists of the participating hospitals. If patients did not respond within two weeks, a reminder was sent by letter or by phone if surgery was planned in the short term. Patients who returned informed consent received a questionnaire that they had to complete preoperatively. Postoperatively, patient-reported clinical data were confirmed by medical records. Four weeks post-surgery, patients completed same the questionnaire that was sent preoperatively and they were contacted by telephone to assess complications and pain levels.

Questionnaires

Demographic information (e.g. age, having a partner or children (at home), educational level), and clinical data (e.g. indication for mastectomy, body mass index (BMI)) were collected using self-report questionnaires.

[2] For 34 patients (31respondents) in addition to unilateral therapeutic mastectomy, contralateral prophylactic mastectomy was performed because of a BRCA1 or BRCA2 (13x) or unknown mutation (1x); a familial risk (6x); a high risk for developing breast cancer following treatment for Hodgkin's disease (3x); or for unknown reasons (11x).

Anxiety and Depression

Pre- and post-surgery, anxiety and depressive symptoms were measured with the Hospital Anxiety and Depression Scale (HADS) [26]. Questions to measure anxiety were, for example, "Do you worry a lot?"; "Do you feel something awful is about to happen?" and for depression: "Do you look forward with enjoyment to things?" and "Do you feel generally optimistic about the future?" Reported reliability and validity are sufficient [27;28].The HADS uses a 4-point Likert scale and includes two subscales that measure anxiety and depression (each consists of 7 items). Both subscale scores range from 0 to 21. A score of 8 or above was used to indicate anxiety and depression of clinical concern [26;28], which we describe as patients with serious or alarming levels of distress.

Breast cancer specific distress

Pre- and postoperatively, cancer-specific distress (CSD) was measured using the Impact of Event Scale (IES), which includes 15 items [29;30]. The IES measures the extent to which one is overwhelmed by intrusive thoughts and avoidant behavior regarding a specific traumatic event, in this case breast cancer. Items can be scored as follows: 0 'not at all', 1 'seldom', 3 'sometimes' and 5 'often', for example: "I had trouble falling asleep or staying asleep, because of pictures or thoughts about breast cancer that came into my mind". The total IES score is used in this study with a range from 0 to 75. Reported reliability and validity of the IES are satisfactory [29;31]. The categorization of the IES score is not indicative for specific clinical diagnoses, but a cutoff score of 20 or higher can be used to indicate high symptom levels [31;32].

Complications

A complication was defined as any adverse event which occurred during the first four to six weeks after surgery. A major complication was defined as an adverse event leading to a re-operation. A structured complication list was added to the medical records to inquire postoperative complications related to BR, which was filled in by the plastic surgeon and complemented by the data manager of the study. In addition, the list was completed by patients during post-surgery telephone contacts to measure self-reported complications. Patients were also asked to rate the average pain experienced from the immediate postoperative period until the time of the interview on a 10-point scale, with 1 indicating "no pain" and 10 indicating "extreme pain". A numeric pain rating scale has been found to be a reliable and valid method [33;34]. A cutoff score equal to or higher than 4 was used to indicate serious pain.

Statistical analyses

Differences between implant and DIEP flap BR for dichotomous variables were analyzed with Fisher's exact tests. Normally distributed continuous variables were analyzed using Student's t-tests; for non-normally distributed variables transformed data were used. Ordinal variables were analyzed with Mann-Whitney tests. We corrected for demographic and clinical variables in which patient groups differed if a correlation of at least 0.24 with

the outcome variable was found [35]. Repeated-measures analysis of covariance (ANCOVA) was used for longitudinal analyses. Data were analyzed with the statistical package SPSS 17.0 (SPSS Inc., Chicago). Two-sided p-values < .05 were considered statistically significant.

Results

Non-respondents

Three non-respondents (7%) underwent a contralateral prophylactic mastectomy in addition to unilateral therapeutic mastectomy, compared to 31 respondents (20.4%; p = 0.04). Non-respondents and respondents did not significantly differ in age and timing of BR (p = 0.50 and p = 0.35, respectively).

Dropouts and lost to follow-up

One patient with diabetes mellitus died 18 days after DIEP flap BR due to unexpected sepsis as a result of pneumonia. Three patients who developed metastases during follow-up were excluded from analyses regarding distress: one patient's implant BR was postponed when skeletal, liver and kidney metastases were detected; in one DIEP flap patient a residue of breast cancer was detected during surgery; and one DIEP flap patient was diagnosed with skeletal metastases after BR. Furthermore, one woman withdrew from the study; three patients did not return the follow-up questionnaire and two patients refused telephone contact.

Demographic and clinical characteristics

A description of the patient characteristics in each reconstruction group is demonstrated in table 1.

Postoperative pain and complications

Telephone calls with 150 patients were performed on average 4.2 weeks after surgery (sd=2.1). Women with implant BR (n=64) reported a mean postoperative breast pain level of 4.3 (sd=2.3) compared to 2.4 (sd=1.6) after DIEP flap BR (n=75; p < .001). Furthermore, significantly more patients reported considerable pain symptoms (≥ 4) after implant BR (n=37; 58%) than after DIEP flap BR (n=14; 19%), p <0.001). A mean abdominal pain level of 3.5 (sd=2.3) was reported by DIEP flap patients (n=76) and 42% indicated this pain level with 4 or higher.

More postoperative complications after DIEP flap BR (36%) than following implant BR (21%) were reported, following the surgeon reports, while patient-reports did not show differences in postoperative complications (46% and 35%, respectively). About 13% of patients from both groups had to be re-operated due to major complications within 6 weeks after the initial BR. Both patient groups reported the same rate of wound healing disturbances, however, more women tended to report wound dehiscence after DIEP flap surgery (p=0.07, Table 2). Finally, 11% of the implant BRs failed (tissue expander or implant was removed) and 6% of the patients with DIEP flap BR had either partial (5%) or total (1%) flap loss.

Table 1. Participant characteristics

	Implant group	DIEP flap group	*p* Value*
	n = 71 (%)	n = 81 (%)	
Mean age at time of breast reconstruction (sd)	49.1 (10.0)	49.3 (7.9)	0.90**
Having a partner	62 (87.3)	64 (79.0)	0.20
Having children	62 (87.3)	69 (85.2)	0.82
Having children at home	42 (59.2)	43 (53.1)	0.51
Education level			
low	15 (21.1)	16 (19.8)	
intermediate	27 (38.0)	28 (34.6)	0.59¶
high	29 (40.8)	37 (45.7)	
Inherited predisposition for BC[a]	21 (29.6)	17 (21.0)	0.26
Laterality			
Unilateral BR	43 (60.6)	70 (86.4)	< 0.001
Bilateral BR	28 (39.4)	11 (13.6)	
BR Timing			
Immediate BR	43 (60.6)	2 (2.5)	
Delayed BR	15 (21.1)	75 (92.6)	
Immediate + delayed BR	13 (18.3)	4 (4.9)	< 0.001***
Mean time since mastectomy in years (sd)	1.4 (3.6)	3.2 (2.6)	< 0.001¶
Mean BMI (sd)	24.1 (4.1)	27.6 (3.7)	< 0.001**
Chemotherapy prior to BR	18 (25.4)	57 (70.4)	< 0.001
Radiation therapy prior to BR	10 (14.1)	28 (34.6)	0.005
Chemotherapy after BR	12 (16.9)	1 (1.2)	< 0.001
Radiation therapy after BR	5 (7.8)	1 (1.2)	0.02

[a]: brca1/brca2/familial risk; BC: breast cancer; BMI: body mass index; DIEP: Deep Inferior Epigastric artery Perforator; SD: standard deviation; * Fisher's exact test unless otherwise indicated; ** Student's t-test; *** Chi-Square test; ¶ Mann-Whitney test.

Pre- and postoperative anxiety, depression and cancer-related distress

After implant BR, patients reported a decline in anxiety and cancer-related distress (p=0.04 and p < 0.001, respectively, Table 3). Their depression scores did not significantly change. Women with DIEP flap BR reported a slight increase in depressive symptoms, but significantly less cancer-related distress after surgery then before surgery (p=0.09 and p < 0.001, respectively). However, their anxiety symptoms did not change significantly over time (Table 3).

Patients who were about to undergo implant BR experienced more CSD preoperatively, but the reconstruction groups did not significantly differ in anxiety and depression symptoms (p=0.007, p=0.13 and p=0.59, respectively). Post-surgery scores of anxiety, depression and cancer-related distress did not differ between the patients who underwent implant and those who underwent DIEP flap surgery (p=0.51, p=0.92 and p=0.11, respectively).

Table 2. Type of self-reported complications

	Implant Group	**DIEP flap Group**	**p Value***
	n = 66 (%)	**n = 79 (%)**	
*Major complications (leading to re-operation)***	9 (13.6)	11 (13.9)	1.00
Wound healing complications			
Wound dehiscence	6 (9.1)	16 (20.3)	0.07
Wound infection	10 (15.2)	14 (17.7)	0.82
Haemorrhage (bleeding)	4 (6.1)	2 (2.5)	0.41
Hematoma	1 (1.5)	3 (3.8)	0.63
Fat necrosis	0	2 (2.5)	0.50
Skin necrosis	2 (3.0)	4 (5.1)	0.69
Seroma	3 (4.5)	3 (3.8)	1.00
Spitting of resorbable stitches	1 (1.5)	0	0.46
Implant-related complications			
Tissue expander/implant removal	7 (10.6)		-
Flap complications			
Partial flap loss		4 (5.1)	-
Total flap loss		2 (2.5)	-
Circulation problems flap		13 (16.5)	-
General complications			
Painful arm	0	1 (1.3)	1.00
Symptomatic pulmonary embolism	0	2 (2.5)	0.50
Pneumonia	0	2 (2.5)	0.50

DIEP: Deep Inferior Epigastric artery Perforator; * Fisher's exact test
** Re-operations due to wound dehiscence and/or infection (n = 6), haemorrhage (n = 6), skin necrosis (n = 3), circulation problems flap (n = 5) and seroma (n =1)

Table 3. Pre- and postoperative distress scores of women undergoing BR

	Implant BR						DIEP flap BR					
		Preoperative		Postoperative		p Value*		Preoperative		Postoperative		p Value*
	N	M	(sd)	M	(sd)		N	M	(sd)	M	(sd)	
Anxiety (0-21)a	67	5.6	(4.0)	4.6	(3.5)	.04	77	4.6	(4.1)	4.2	(3.8)	.35
Depression (0-21)[a]	67	5.4	(3.6)	6.2	(4.6)	.39	77	5.1	(3.7)	6.5	(5.4)	.09
Cancer-specific distress (0-75)b	65	26.0	(13.7)	19.2	(13.6)	<.001	76	19.9	(12.6)	15.9	(12.8)	<.001

DIEP: Deep Inferior Epigastric artery Perforator; BR: breast reconstruction; M: mean; sd: standard deviation; * Student's t-test on transformed data; [a]HADS: Hospital Anxiety and Depression Scale, higher scores mean higher anxiety and depression levels; [b]IES: Impact of Event Scale, higher scores mean higher distress levels.

The effect of complications on anxiety, depression and cancer-specific distress

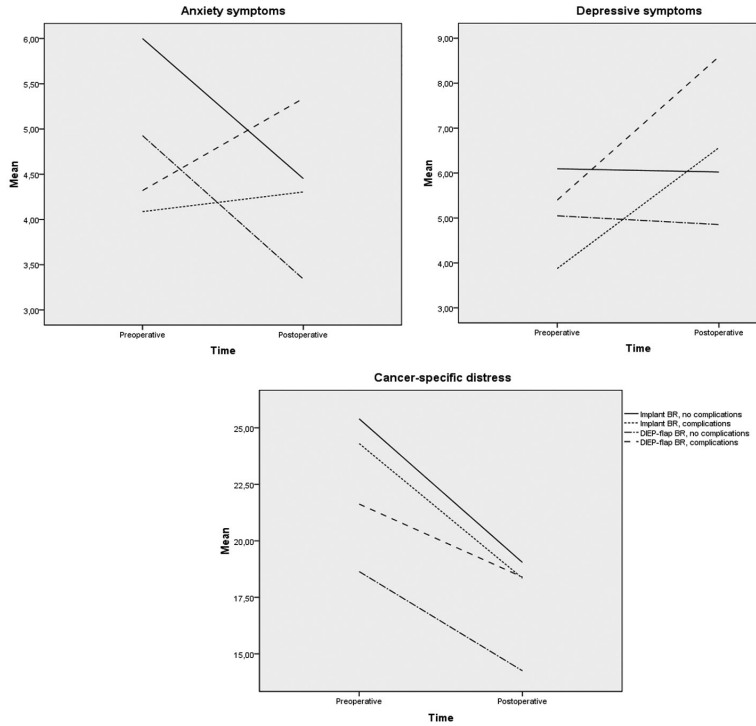
Covariates

The correlation of different clinical variables with distress was explored to identify covariates. Pre-surgery anxiety and CSD were significantly related to breast pain (r=0.27, p=0.001 and r=0.28, p=0.001, respectively), indicating that patients who felt more anxious and had more CSD before surgery experienced more pain after BR. Post-surgery CSD was related to chemotherapy after surgery and breast pain (r=0.24, p=0.003 and r=0.25, p=0.003, respectively), indicating increased symptoms of CSD were associated with more pain and undergoing chemotherapy after surgery.

The variable 'self-reported complications' was not significantly related to the clinical variables (including breast pain) indicating that this was an independent measure. Self-reported complications for each patient correlated strongly with surgeon-reported complications for each patient (r=0.56, p < .001), demonstrating that the reported complications concerned generally the same patients. Other characteristics, such as laterality and timing of BR had no significant relation with anxiety, depression and CSD.

To analyze the effect of complications on the course of anxiety, depression and cancer-related distress, we corrected for 'breast pain' and 'postoperative chemotherapy', if relevant.

Figure 1. The course of anxiety, depression and cancer-specific distress symptoms if complications were reported after implant or DIEP flap breast reconstruction



Anxiety

Correcting for breast pain, the course of anxiety was significantly related to complications $F(1, 130)=5.29$, $p=0.02$, indicating that patients who experienced complications had increased anxiety symptoms after surgery compared to patients not reporting complications. Additionally, a significant interaction effect between the type of BR and complications was found, $F(1, 130)=7.28$, $p=0.02$, demonstrating that patients with DIEP flap BR experienced a greater increase of anxiety after surgery when reporting complications (Figure 1).

Depression

Depression was also significantly related to complications $F(1, 137)=11, 74$, $p=0.001$, indicating that patients who reported complications had more depressive symptoms after surgery than patients without self-reported complications. Between-subjects effects showed an interaction between the type of BR and complications $F(1, 137)=5.59$, $p=0.02$, indicating that DIEP flap patients felt more depressed after surgery if complications occurred (Figure 1).

Cancer-specific distress

Correcting for 'breast pain' and 'post-surgery chemotherapy,' the course of CSD was not significantly related to complications $F(1, 127)=0.75$, $p=0.39$. No interaction effect was found in type of BR and complications $F(1, 127)=0.70$, $p=0.40$, demonstrating that both reconstruction groups reported decreased CSD symptoms independent of experiencing complications (Figure 1).

Occurrence of disturbing levels of distress after experiencing complications

Of the women reporting post-surgery complications after implant BR, 13%, 39% and 44% reported anxiety, depression and cancer-related distress of clinical concern, respectively (Table 4). Of the women with complications following DIEP flap BR, 31%, 49% and 40% reported alarming levels of anxiety, depression and cancer-related distress, respectively, after surgery.

Table 4. Occurrence of disturbing levels of anxiety, depression, and cancer-related distress, preoperatively and after experiencing postoperative complications

	Implant BR		**DIEP flap BR**	
	n = 23		**n = 35**	
	T0	***T1***	***T0***	***T1***
Anxiety[a] ≥ 8	17%	13%	11%	31%
Depression[a] ≥ 8	17%	39%	17%	49%
Cancer-specific distress[b] ≥ 20	61%	44%	51%	40%

DIEP: Deep Inferior Epigastric artery Perforator; BR: breast reconstruction; M: mean; SD: standard deviation; [a]HADS: Hospital Anxiety and Depression Scale, higher scores mean higher anxiety and depression levels; [b]IES: Impact of Event Scale, higher scores mean higher distress levels. T0 = prior to surgery, T1 = after surgery

Discussion

In this study we prospectively explored the relationship between psychological distress and short-term complications after BR in women who underwent either implant or DIEP flap BR following mastectomy. As the two reconstruction groups were pre-selected and as they differ in important clinical characteristics, they theoretically cannot be compared. The patient groups are, nevertheless, representative for the Dutch population, as we recruited patients from different areas in the Netherlands. We should bear in mind that BR should be tailored to the needs of the patient. We will provide further clarification to explain the clinical differences between the two reconstruction groups and their possible influences on distress.

It is understandable that more women scheduled for immediate and bilateral BR underwent implant BR. Immediate bilateral BR with more complex methods such as a DIEP flap is difficult to schedule due to logistic problems, such as long operation times resulting in prolonged waiting lists. In addition, bilateral DIEP flap BR requires abdominal tissue for two flaps, which could have been a limitation for women in the implant group having a lower mean BMI. However, the timing and laterality of BR were not significantly correlated with the psychological outcomes, nor with the complication rate.

In congruence with previous findings, patients with DIEP flap BR had a relatively high BMI [36;37]. This could have affected the complication rate [10]. Although more DIEP flap patients had undergone chemo- and radiation therapy prior to BR, this does not seem to be a risk factor for major complications in autologous BR [10]. However, more women in the implant group received chemo- and radiation therapy after BR, which might have increased their complication rate [17]. Other risk factors might have played a role in the occurrence of complications in both groups; however, this study focused on the *psychological impact* of complications.

Patients with implant BR reported serious breast pain which is not surprisingly as the tissue expander or prosthesis is subpectorally placed [38]. Women with DIEP flap BR experienced more abdominal than breast pain, as a result of abdominal tightness after closure of the DIEP flap donor-site. Although we did not structurally assess pain management after surgery, their lower mean pain scores are probably related to the standardized pain management after DIEP flap BR, consisting of a patient-controlled analgesia pump followed by conversion to oral narcotics [39].

Interestingly, more patients reported complications compared to the surgeon-reports. Based on the surgeon-reports, more patients in the DIEP flap group had postoperative complications compared to women with implant BR. It is possible that not all (minor) complications were registered in the medical records. On the other hand, patients may have a subjective perception of complications, which could have led to an increased self-reported complication rate. However, as we focused on patients' quality of life, we assumed their own perception was of greater relevance. The total self-reported complication rate did not significantly differ between women who underwent either implant or DIEP flap BR, which is congruent with current literature [10].

Preoperatively, women scheduled for implant BR even had CSD levels of clinical concern (> 20). This can be explained by the fact that most of the implant BR patients were about to have immediate BR and were awaiting mastectomy. As a consequence of a recent breast cancer diagnosis they were still in the emotional rollercoaster of the treatment. After surgery anxiety and CSD decreased in congruence with earlier findings [40]. CSD also decreased in DIEP flap BR patients, who showed lower preoperative scores, possibly because the majority was already cured from cancer. However, timing of BR was not significantly correlated to distress. Therefore, a more plausible explanation for higher preoperative scores in the implant group, could be that more anxious women tended to choose for implant BR, as this type of surgery seems less intimidating than DIEP flap BR. Post-surgery, depressive symptoms slightly increased in women who had DIEP flap BR. An explanation would be the heavy physical burden of DIEP flap BR which can be very intense, as it additionally includes recovery from abdominoplasty.

Patients reporting complications had increased anxiety and depressive levels, particularly, DIEP flap patients who even reported critical depression levels. Serious complications after DIEP flap BR, such as flap circulation problems, can lead to immediate partial or total flap loss which may be physically as well as psychologically threatening. Common complications occurring after implant BR, such as minor wound infections, could, in contrast, resolve more easily and do not necessarily lead to immediate expander/implant loss, which may be less psychologically challenging. Increased distress after having complications after BR, is comparable with inclined distress after recovering from mastectomy with complications, perhaps indicating recovery from BR reminds patients of mastectomy [41]. However, CSD decreased, as women were possibly relieved that surgery had passed, and that possible cancer risks declined if they also underwent mastectomy.

It remains important to differentiate between the psychological effect of minor versus major complications, as the latter may lead to more psychological disturbances. However, the sample size limits the power for more detailed subgroup analyses, and therefore we recommend including more patients in future studies.

The aesthetic outcome directly after BR could have also influenced psychological wellbeing, as in the immediate postoperative period an aesthetic *end result* had not yet been reached. Particularly for the women who had received a tissue expander in the implant group. Body image and aesthetic satisfaction could be diminished immediately post-surgery, which could negatively impact distress. We did not measure body image or aesthetic satisfaction at this point, which may be a limitation of the present study. Postoperative radiation therapy (PRT) could have also influenced body image and aesthetic satisfaction and therefore, distress, but PRT was not significantly correlated with distress ($r < 0.09$). As PRT generally started within six weeks after surgery, its effect may not have been as damaging yet. Nevertheless, the small number of patients that had PRT may limit the detection of a statistically significant difference.

Significant proportions of women with complications after BR reported critical distress, particularly patients with DIEP flap BR. However, the actual chance for partial or total flap failure is lower compared to implant loss [8;11;13-15]. To identify *clinical cases* of anxiety and

depression a cut off score of 11 is recommended [26;28]. Post hoc analyses demonstrated that 9% of the implant group and 11% of the DIEP flap group had *clinical* anxiety after complications. However, still considerable proportions (implant BR: 22%; DIEP flap BR: 40%) had *clinical* depression levels after surgery if complications occurred.

In conclusion, although BR can improve quality of life, patients may experience significant distress immediately before surgery. After surgery, patients with complications report high levels of distress, especially DIEP flap BR patients. A significant number of women with complications experienced serious levels of anxiety, depression and CSD post-surgery. Although the present study included only the immediate postoperative period, it suggests that some patients may need more attention or even clinical referral for coping with distress while recovering from BR. In particular, post-operative distress may predict poorer longer-term psychosocial outcomes while better early post-operative outcomes may predict resilience to distress [42;43]. This hypothesis will be studied in our follow-up study of wellbeing one year after BR.

In practice, preoperatively patients should be clearly informed about the consequences of direct postoperative complications on mood and stress levels. They can be reassured that these feelings are not uncommon. Plastic surgeons and mamma-care nurses can specifically ask during pre- and post-surgery consults or surveillance how patients are feeling. Levels of distress especially need to be monitored in patients with complications, for example by completing a short distress-questionnaire like the HADS, which can be returned by mail to the nurse. In case of clinical concern, psychological referral is recommended to better cope with pre- and post-surgery distress. This may positively affect quality of life as well as health since distress could negatively affect the immune system as well as wound healing [23;24;44].

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