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Depressive symptomatology correlates with phantom breast syndrome in mastectomized women

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■ **Abstract** *Objective* Phantom breast syndrome (PBS) after mastectomy has been hypothesized to represent a complex psychological reaction to mastectomy, but psychological studies concerning PBS are few and inconclusive. This study aimed to assess possible correlations of PBS to current psychopathology and personality dimensions, as well as to examine subjectively experienced provoking and relieving factors for the experience of PBS. *Method* A total of 105 women who had undergone modified radical mastectomy were interviewed by a structured questionnaire after breast surgery. Moreover, they completed a set of self-administered psychometric scales consisting of Symptom Checklist-90-R, Eysenck personality questionnaire, Zung depression scale, State-Trait Anxiety Inventory and Whiteley Index of hypochondriasis. *Results* PBS was experienced by 24 women (22.9%). The majority of them thought that PBS did not interfere with their everyday life. Women with PBS scored significantly higher on the Zung depression scale. Multiple logistic regression analysis revealed that women aged more than 66 years were 82% less likely to have PBS compared to those aged less than 51 years. *Conclusion* These findings provide evidence that PBS is associated with higher scores of depressive symptomatology and younger age. The

nature of such an association remains unclear and calls for further investigation.

■ **Key words** breast cancer · depression · mastectomy · phantom breast syndrome · psychopathology

Introduction

Phantom breast syndrome (PBS) is characterized by the sensation of the continued presence of the breast after its removal by mastectomy [4, 15, 16, 21, 20]. PBS may appear with mild sensations related to the entire breast or parts of it, mostly of the nipple [4, 34, 26]; or in some cases it may be a painful condition [20]. Despite the fact that PBS was already noted by Mitchell [23], it still remains a phenomenon not well appreciated. One reason may be the fact that women do not report their phantom breast sensations to their physicians [9, 15, 34], either because PBS is not so disturbing [16], or because they feel anxious about reporting sensations without the existence of the “appropriate” anatomical background that could therefore be perceived as illusional [18, 30]. Another reason could be that since mastectomy is performed because of a malignant disease, the main focus of the treatment is cancer per se and the life of the patient, so that issues such as PBS are usually ignored.

There are few studies of PBS that focused on its prevalence, its relationship to demographic data, therapeutic interventions and postoperative sequelae [4, 15, 16, 19–21, 26, 28, 31, 34, 36]. The studies that looked upon its association with psychological issues are even less. In a study by Christensen et al. [4] it was found that the group with PBS had a predominance of women with a severely damaged body image and impaired sexual function compared to the group without PBS, but the predominance did not reach statistical significance. Jamison et al. [15] reported that women with PBS perceived both that they did not receive much emotional support from their surgeons, and

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that most of their emotional problems were secondary to mastectomy. In 1967 Jarvis found that women with PBS reported more often the occurrence of post-mastectomy depression and commented that PBS seemed not to occur in the place of post-mastectomy depression but in addition to it. Despite the sparse and inconclusive results, it is believed that PBS may be a complex psychological reaction to mastectomy [4, 15, 16]. In 1975, Woods put forward the hypothesis that “in women whose female identity is marginal, attempts to retain feminine identification and sexual qualities are expressed in phantom breast” [37]. But the nature of such a hypothetical psychological reaction and even more its real existence are not yet elucidated. In a recent study, no significant association was found with the prior to mastectomy scores of a quality of life questionnaire that assessed emotional, cognitive and social functioning, body image and sexual functioning and satisfaction [8].

In view of the above, we hypothesized that it would be of value to identify possible associations between PBS and objectively measured dimensions of psychopathology and personality, as it can be reflected by the use of self-administered psychometric scales, as well as to assess subjectively experienced qualities of PBS, and factors provoking and relieving it.

Methods

■ Participants

A total of 105 women who had undergone modified radical mastectomy due to breast cancer were included in this study, at least 2 months after breast surgery. They were all outpatients, who were asked to participate in the study during one of their scheduled postoperative assessments. Informed consent was obtained in advance from all participants. In order to avoid the discrepancy on PBS that could be provoked by different operation strategies, only patients who had undergone the same type of surgery—modified radical mastectomy—were included. At the time of the interview the patients were all menopausal, either because they were mastectomized after entering menopause, or because they had induced menopause due to therapeutic interventions (chemotherapy, hormonal therapy). From our sample, three women had undergone reconstructive surgery, whereas 80 patients used prosthesis.

Women in the early postoperative phase (less than 2 months) were excluded in order to ensure sufficient wound healing and consequently avoid the confusion between phantom sensations and sensations arising from the wound. Women with metastatic disease, or lumpectomy were excluded. Women with metastases were excluded, because it was hypothesized that the severity of their medical condition would be of major concern and as such, an obstacle for appropriate participation to the study; for those with lumpectomy, it was thought that it would be an almost impossible task to make the distinction between sensations coming from the rejected or the residual breast tissue. The study protocol was approved in advance, by the appropriate ethical committee.

■ Assessment instruments

Women were interviewed once through a structured questionnaire which assessed for the sensation of the presence of the whole or part of the breast that was removed by mastectomy. Clear distinction was made between phantom breast pain or phantom sensations, such as itches, burning etc., and the postoperative pain at

the place of the scar. The interviewer (A.C.S) provided appropriate information to the patients in order to avoid misunderstandings. It is hypothesized that the amputee's inability to distinguish pain in the residual limb from phantom limb pain, is a possible explanation for the disparity in prevalence rate for phantom limb pain [14].

The questionnaire also included inquiry, regarding subjectively perceived consequences of phantom sensations. Women were asked about the impact of PBS on their ordinary life, if they had to ask for medical care, and if PBS had any influence to their sexual life. Furthermore factors that subjectively interfered with PBS appearance or disappearance were examined. The provoking and relieving factors that were asked for, were emotional states (e.g. feeling sad, happy, angry or anxious), environmental stimuli (e.g. weather), body oriented thoughts (e.g. thinking of the breast), sexual intercourse, getting rest or being tired, local stimulation at the place of the scar (e.g. while wearing the prosthesis, or taking bath). In order to quantify the perceived liveliness of phantom experience, a 100-mm visual analogue scale (VAS) was administered in women with PBS. VAS left end signified the experience of a foreign object and the right end the feeling of real breast.

Moreover participants completed a set of self-administered psychometric tests: Symptom Checklist 90-Revised (SCL-90-R), Eysenck personality questionnaire (EPQ), Zung self-rating depression scale, State-Trait Anxiety Inventory (STAI) and Whiteley Index (a screening device for hypochondriasis). SCL-90-R [6] is designed to screen for a broad range of psychological problems and symptoms of psychopathology occurring during the last week. We assessed the 9 symptom subscales: somatization, obsessional-compulsiveness, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism and the global severity index (GSI). EPQ [11] is a well-known measure of three personality dimensions E (extraversion), N (neuroticism) and P (psychoticism), and also the L (lie) scale. Zung self-rating scale [38] is already tested for its utility and reliability as a screening tool to identify depressive symptoms in oncology patients [10]. STAI measures inbuilt tendency to anxious response and current feelings of anxiety, thus making possible the distinction between the trait and state of anxiety [33]. Whiteley Index that derived from the dimensions of hypochondriasis presented by Pilowski [25], is nowadays accepted as a discriminating tool of hypochondriacal symptomatology [32]. Higher scores across all these psychometric scales indicate higher psychopathology.

■ Statistical analysis

Descriptive statistics were computed to examine the sample in terms of age, years of education, family status and number of children. The sample was divided into two groups: women who experienced PBS (either painful, either not) and women who never had phantom breast sensations. Chi-square and Fisher's exact tests were used to explore the association of PBS with demographics. Variables were first tested for normality. Normal variables are expressed as mean \pm standard deviation, while variables with skewed distribution are expressed as median (interquartile range).

Scores of all the psychometric scales were used as continuous variables. If the normality assumption was satisfied for the comparison of means between the two groups Students' *t*-test was used and the Mann-Whitney test when the distribution was not normal. Multiple logistic regression analysis was applied to explore the association of the psychometric scales which differed significantly in univariate analyses, with PBS after adjustment for age, years of education, family status and number of children. All statistical tests were two-tailed, and *P*-values less than 0.05 were considered to be statistically significant.

Results

The sample consisted of 105 women with mean age 59.4 years (SD = 11.4 years). Women were classified in two groups according to the presence or not of

Table 1 Demographic characteristics of the total sample and the two sub-groups

	Total <i>n</i> (%)	PBS <i>n</i> (%)	No PBS <i>n</i> (%)	<i>P</i>
<i>Age in years</i>				
<51	39 (37.1)	13 (33.3)	26 (66.7)	0.099 ^a
51–66	33 (31.4)	7 (21.2)	26 (78.8)	
>66	33 (31.4)	4 (12.1)	29 (87.9)	
<i>Education</i>				
<7 Years	42 (40.0)	8 (19.1)	34 (80.9)	0.394 ^a
7–12 Years	45 (42.9)	13 (28.9)	32 (71.1)	
>12 Years	14 (13.3)	2 (14.3)	12 (85.7)	
Data missing	4 (3.8)			
<i>Family status</i>				
Married	72 (68.6)	17 (23.6)	55 (76.4)	0.927 ^b
Single	9 (8.6)	2 (22.2)	7 (77.8)	
Divorced-widow	21 (20.0)	4 (19.1)	17 (80.9)	
Data missing	3 (2.8)			
<i>No. of children</i>				
None	22 (21.0)	6 (27.3)	16 (72.7)	0.838 ^b
One	16 (15.2)	3 (18.8)	13 (81.3)	
≥2	63 (60.0)	14 (22.2)	49 (77.8)	
Data missing	4 (3.8)			

^aChi-square test^bFisher's exact test

PBS. The group of women who experienced PBS consisted of 24 women (22.9%) with mean age equal to 56.4 years (SD = 10.5 years) and the other that did not refer any phantom breast sensations or pain of 81 (77.1%) with mean age = 60.3 years (SD = 11.6). Demographic characteristics, as well as the statistical association between demographics and PBS are presented in Table 1; the two groups did not differ statistically in terms of their demographic characteristics. Phantom pain appeared in 6 patients, which means that 25% of PBS patients suffered from painful sensations. All the 6 women that suffered from phantom pain, also reported other types of sensations (e.g. pins and needles, itching).

The amount of trouble related to PBS was limited. Concerning the impact of PBS on everyday life, 75.0% considered that it did not influence everyday life. Only one PBS patient looked for medical advice and another one thought that PBS influenced her sexual life. The appearance of PBS could be provoked (Table 2) or relieved by various stimuli (Table 3); among the provoking factors “feeling anxious” and “getting rest” were shown to be the more powerful, while among relieving factors the more powerful were “feeling happy” and “thinking of the breast”.

Scores on the dimensions of SCL-90-R, EPQ, STAI, Zung and Whiteley index in the total sample and for women with and without PBS are shown in Table 4. Women with PBS were found to have a significantly greater score on Zung, than women without phantom sensations. Furthermore, women with PBS scored higher on the SCL-90-R subscale of depression and on the EPQ dimension of psychoticism, but the differences between the two groups

Table 2 Factors provoking PBS

Provoking factors			
		<i>n</i>	%
When I am happy	No	14	77.8
	Yes	4	22.2
When I am sad	No	15	88.2
	Yes	2	11.8
When I am anxious	No	9	52.9
	Yes	8	47.1
When I am angry	No	17	100.0
	Yes	0	
Looking at my body	No	14	82.4
	Yes	3	17.6
Thinking of the body	No	15	88.2
	Yes	2	11.8
Thinking of my breast	No	14	82.4
	Yes	3	17.6
Sexual intercourse	No	16	94.1
	Yes	1	5.9
Taking bath	No	16	94.1
	Yes	1	5.9
Wearing the prosthesis	No	14	82.4
	Yes	3	17.6
When it is cold	No	14	82.4
	Yes	3	17.6
When it is hot	No	14	82.4
	Yes	3	17.6
Tired	No	12	70.6
	Yes	5	29.4
Exercise	No	16	94.1
	Yes	1	5.9
Remembering happy moments	No	14	82.4
	Yes	3	17.6
Planning something pleasant	No	15	88.2
	Yes	2	11.8
Getting rest	No	11	64.7
	Yes	6	35.3
Alcohol	No	17	100.0
	Yes	0	

showed only a trend toward statistical significance (*P*-values less than 0.1).

As, Zung was the only scale that was found to have a significant association in univariate analysis with PBS, we conducted multiple logistic regression analysis in order to investigate the association of Zung with PBS after adjustment for age, years of education, family status and number of children. Based on the results of multiple logistic regression analysis, Zung was shown to have a strong association with PBS (Table 5). For one unit increase of the score on Zung, the likelihood of having PBS increases about 5%. Also, multiple logistic regression analysis revealed that women aged more than 66 years are 82% less likely to have PBS compared to those aged less than 51 years.

The perceived liveliness of phantom breast presence, as assessed through a 100 mm visual analogue scale (VAS) had a mean of 47.0 (SD = 36.7, range = 0.1–100). There was not a significant correlation between Zung score of depression and VAS (pearson correlation coefficient = −0.21, *P* = 0.383).

Table 3 Factors relieving PBS

Relieving factors		n	%
When I am happy	No	7	53.8
	Yes	6	46.2
When I am sad	No	13	100.0
	Yes	0	
When I am anxious	No	13	100.0
	Yes	0	
When I am angry	No	13	100.0
	Yes	0	
Looking at my body	No	12	92.3
	Yes	1	7.7
Thinking of my body	No	13	100.0
	Yes	0	
Thinking of my breast	No	10	76.9
	Yes	3	23.1
Sexual intercourse	No	12	92.3
	Yes	1	7.7
Taking bath	No	12	92.3
	Yes	1	7.7
Wearing prosthesis	No	11	84.6
	Yes	2	15.4
When it is cold	No	13	100.0
	Yes	0	
When it is hot	No	13	100.0
	Yes	0	
Tired	No	12	92.3
	Yes	1	7.7
Exercise	No	13	100.0
	Yes	0	
Getting rest	No	12	92.3
	Yes	1	7.7
Remembering happy moments	No	11	84.6
	Yes	2	15.4
Planning something pleasant	No	12	92.3
	Yes	1	7.7
Alcohol	No	13	100.0
	Yes	0	

Table 4 Mean scores of the psychometric scales, in the total group and the two subgroups

	Total Mean ± SD	PBS		p
		No Mean ± SD	Yes Mean ± SD	
SCL-90-R				
SCL-90-R , somatization	10.0 (5.0–15.8) ^c	8.0 (4.0–16.0) ^c	10.0 (7.0–14.5) ^c	0.276 ^a
SCL-90-R , obsessiveness	11.0 (6.0–14.8) ^c	11.0 (6.0–15.0) ^c	10.0 (6.0–14.0) ^c	0.817 ^a
SCL-90-R , interpersonal sensitivity	6.0 (3.0–11.0) ^c	6.0 (3.0–11.0) ^c	9.0 (3.5–13.0) ^c	0.361 ^a
SCL-90-R , depression	11.0 (6.0–17.0) ^c	11.0 (6.0–15.0) ^c	15.0 (7.5–19.5) ^c	0.090 ^a
SCL-90-R , anxiety	6.0 (3.0–11.0) ^c	6.0 (3.0–11.0) ^c	8.0 (5.0–11.5) ^c	0.268 ^a
SCL-90-R , hostility	2.0 (1.0–7.0) ^c	2.0 (1.0–7.0) ^c	4.0 (1.0–8.0) ^c	0.338 ^a
SCL-90-R phobic anxiety	1.0 (0.0–4.0) ^c	1.0 (0.0–4.0) ^c	1.0 (0.5–5.0) ^c	0.371 ^a
SCL-90-R , paranoid ideation	5.0 (2.0–10.5) ^c	5.0 (2.0–11.0) ^c	6.0 (2.0–10.5) ^c	0.817 ^a
SCL-90-R , psychoticism	3.0 (1.0–8.8) ^c	3.0 (1.0–8.0) ^c	4.0 (1.0–10.5) ^c	0.711 ^a
SCL-90-R , general index	61.0 (41.0–101.5) ^c	60.0 (38.0–94.0) ^c	77.0 (47.0–104.0) ^c	0.301 ^a
EPQ, extroversion	13.0 (10.0–15.0) ^c	13.0 (10.0–15.0) ^c	14.0 (7.5–17.5) ^c	0.642 ^a
EPQ,psychoticism	2.0 (1.0–4.0) ^c	3.0 (1.0–4.0) ^c	2.0 (0.5–3.0) ^c	0.060 ^a
EPQ,neuroticism	12.2 ± 4.8	12.1 ± 4.5	12.5 ± 5.6	0.782 ^b
ZUNG	56.2 ± 14.0	52.4 ± 14.5	57.9 ± 12.1	0.050^b
STAI, state	35.5 ± 13.9	35.5 ± 14.4	35.2 ± 13.0	0.928 ^b
STAI, trait	40.9 ± 11.3	40.4 ± 11.3	42.0 ± 11.4	0.578 ^b
Whiteley index	6.2 ± 3.7	6.2 ± 3.8	6.5 ± 3.6	0.766 ^b

^aMann–Whitney test^bt-Test^cMedian (interquantile range)

Discussion

The main aim of the present study was to assess the relationships between PBS and objectively measured psychopathological parameters, as it can be reflected by the use of self-administered psychometric scales, in women with mastectomy due to breast cancer. The prevalence of PBS was found to be 22.9%. Women with PBS scored significantly higher on the Zung depression scale. Women aged more than 66 years were 82% less likely to have PBS compared to those aged less than 51 years. The majority of women that reported phantom breast sensations thought that it did not interfere with their everyday life.

The finding that PBS has a significant association with depressive symptomatology is in agreement with the finding of Jarvis [16], who reported on a relationship between phantom breast and post-mastectomy depression. However it should be mentioned that in his study depression was estimated by the report of the patient, and was not measured by any psychometric scale. Jarvis put forward the hypothesis of “some common factors that underlie the occurrence of phantom breast sensations and post-mastectomy depression”. He proposed that some factors to be considered are the threat to life attendant to most mastectomies, the loss of the breast as a badge of femininity, feelings of shame or rejection, and guilt [16]. Hill [14], in a review on phantom limb pain, states that “psychological theories were grounded in psychoanalytic principles or theories of personality of chronic pain, which propose that phantom limb pain results from pre-amputation psychological disturbance”. This is not the point of our research results,

Table 5 Odds ratios and confidence intervals derived from multiple logistic regression analysis with PBS as dependent variable

Variables	Odds ratio (95% CI) ^a adjusted	P
Zung	1.05 (1.00–1.11)	0.043
Age in years		
<51	1.00 ^b	
51–66	0.48 (0.13–1.74)	0.262
>66	0.18 (0.04–0.80)	0.025
Education		
<7 Years	1.00 ^b	
7–12 Years	1.54 (0.41–5.81)	0.525
>12 Years	0.55 (0.08–3.62)	0.536
Family status		
Married	1.00 ^b	
Single	0.82 (0.11–11.67)	0.924
Divorced-widow	0.92 (0.21–4.10)	0.918
No. of children		
None	1.00 ^b	
One	0.82 (0.12–5.46)	0.838
≥2	0.92 (0.20–4.15)	0.915

^a95% Confidence interval^bIndicates reference category

neither of those of Jarvis [16], where the findings concern depressive symptomatology assessed after breast surgery.

Although the present study is a correlative study with an inherent methodological limitation—the inability to deduce causal relationships—it could be hypothesized either that the association between depression and PBS is a causal one, or that some common factors underlie both conditions. From the current literature it is difficult to discern whether PBS processes are responsible for the depressive symptoms or the depressive state sets the stage for the activation of PBS. Depression-PBS interaction could be hypothesized to take place on the central nervous system. The central nervous system is the basis of a number of the explanatory models put forward for phantom limb pain, such as the theory of the neuromatrix [22] and the findings that are indicative of cortical reorganization in the somatosensory cortex in limb amputees [13, 27]. It is likely that several mechanisms operate interactively in the association between PBS and depressive symptomatology that could be based on the interrelationship between brain mechanisms and circuits that are responsible for affective symptoms [3] and phantom phenomena.

PBS was found to be more frequent among younger women. This finding is previously reported in several studies [1, 16, 31, 15, 34, 36]. In the study of Dijkstra et al. [8] based on 29 previously published studies, it was supposed that age is a potential risk factor for PBS. An explanation for age's influence on PBS could be attributed to the greater importance that is ascribed to the breast as a symbol of femininity, sexuality and body image for younger women.

The prevalence of PBS was 22.9% that is obviously close to that reported in other studies [1, 8, 16, 21, 26, 35]. The prevalence of PBS is decisively lower than the

one related to amputation of a limb, where phantom limb pain occurs in 50–80% of all amputees [12]. The explanation for the relatively low prevalence of PBS could be linked to the smaller representation of the breast in the primary somatosensory cortex [2] and the absence of kinesthesia [21, 31].

The majority of the 24 women that reported phantom breast sensations found that it did not interfere with everyday life. The subjective experience of a rather non-disturbing phenomenon, may have contributed to the rather scarce research that has investigated PBS. Previous studies reported that PBS is a minor issue in the process of coping with mastectomy [5, 8, 24]. This is another parameter that differentiates PBS from phantom limb. In the latter, pain and other disturbing phenomena frequently make it the point of special medical concern [7, 17].

PBS may be provoked or relieved by various stimuli. The more powerful factor in subjectively provoking PBS is “feeling anxious”; whereas the parameter mostly referred to diminish its appearance is “feeling happy”. So in both cases, psychological factors seem to play a core role in the appearance and disappearance of PBS. This is in accordance to what is believed in the case of phantom limb pain [29]; where “psychological factors do not seem to contribute to the causation of phantom limb pain but may instead affect the course and the severity of the pain” [12].

In conclusion, the findings of this study demonstrate that depressive symptomatology, particularly in younger women who had undergone modified radical mastectomy, appear to be associated with PBS. Taking into account the cross-sectional design of the present study, further prospective studies are needed in order to confirm if there are causal relationships between psychopathological factors and PBS and to test for potential confounders (e.g. age, personality etc.) that may be responsible for these associations. Furthermore, it would be valuable for future studies to make use of structured interviews for depression, which could make an accurate distinction between subjects who suffer from clinical depression and those who do not. Better understanding of the relationship between PBS and psychopathology could be proven to be valuable for the adequate care and support of a great number of mastectomized patients.

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