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ORIGINAL ARTICLE

Breast cancer survivors suffer from persistent postmastectomy pain syndrome and posttraumatic stress disorder (ORTHUS study): a study of the palliative care working committee of the Turkish Oncology Group (TOG)

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Abstract
Purpose Persistent postmastectomy pain syndrome (PMPS) is one of the most important disturbing symptoms. Posttraumatic stress disorder (PTSD) is an anxiety disorder which is characterized by reactions to reminders of the trauma that has been experienced. The purpose of this study is to evaluate the predictors of PMPS and PTSD in Turkish breast cancer survivors and the correlation between PMPS and PTSD.
Method The study is designed as a multicenter survey study. Breast cancer patients in remission were evaluated. Patients were evaluated with structured questionnaires to assess the PMPS and clinical parameters associated with it. The Turkish version of the posttraumatic stress disorder checklist—civilian version (PCL-C) was used.
Results Between February 2015 and October 2015, 614 breast cancer survivors in outpatient clinics were evaluated. The incidence of PMPS documented is 45.1 %. In the multivariate analysis low income, presence of PTSD and <46 months after surgery were associated with increased risk of PMPS. PTSD was documented in 75 %, and the mean PCL-C score was 32.4 ± 11.1. PMPS and being married at the time of the evaluation were linked with PTSD.
Conclusions It is the first data about the association between PMPS and PTSD. The clinicians should be aware of PMPS and PTSD in breast cancer survivors.

Keywords Breast cancer survivor · Persistent postmastectomy pain syndrome · Posttraumatic stress disorder

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Introduction

Breast cancer is the most common malignancy and the leading cause of cancer related deaths in women [1]. Although there is a progressive improvement in diagnostic and therapeutic modalities, there are still short- and long-term of toxicities and complications of surgery, radiotherapy and chemotherapy. Persistent postmastectomy pain syndrome (PMPS) is one of the most important disturbing symptoms. It has been reported with an incidence of 23.9–47.6 % in the literature [2–6]. Young age, increased body mass index or weight, breast conservative surgery (BCS), axillary lymph node dissection, tumor with upper lateral localization, chemotherapy,

radiotherapy, and psychosocial variables have been associated with increased risk of PMPS [7–10].

Posttraumatic stress disorder (PTSD) is an anxiety disorder which is characterized by reactions to reminders of the trauma that has been experienced. These reactions can be cognitive, affective, and behavioral. During the treatment period of cancer is an important trauma for both cancer survivors and their relatives [7–20]. The incidence has been reported up to 35 % of cancer survivors [21–23]. Although a detailed psychiatric evaluation is necessary for the diagnosis of PTSD, PTSD checklist—civilian version (PCL-C) is a valuable instrument for screening PTSD [24–27].

Both PMPS and PTSD are important long-term complications of breast cancer survivor. In the literature, they have been extensively studied separately as two different clinical entities. To the best of our knowledge, the relation between them has not been studied yet. In addition, these common problems have not been studied with medical oncologists' point of view. The purpose of this study is to evaluate the predictors of PMPS and PTSD in Turkish breast cancer survivors and the correlation between PMPS and PTSD.

Method and patients

Study design

The study was planned as a multicenter study with the members of Palliative Care Working Committee of the Turkish Oncology Group (TOG). Six oncology clinics in Turkey were included in the study. Institutional Ethics Committee approved the study protocol, and the study was in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study.

Between February 2015 and October 2015, patients in outpatient clinics were evaluated. Female patients older than 18 years old, with a diagnosis of breast cancer whose disease were in remission, were included. The patients who had completed adjuvant chemoradiotherapy and passed a minimum 6 months of interval after operation were selected. The patients under adjuvant trastuzumab therapy were also included. Patients with a history of bilateral breast cancer, secondary primary breast cancer in the follow-up, premalignant pathology, and neoadjuvant chemotherapy were excluded.

After outpatient visit, appropriate patients were evaluated face to face by the oncologist. The data about the breast cancer was noted by the clinician and the questionnaire was filled with a qualified colleague to prevent observer related bias. Participants were evaluated through structured interviews. The questionnaire was structured with questions about demographic data, sociocultural background, co-morbidities, psychiatric history, morbidity after breast surgery, and postmastectomy pain syndrome (PMPS). Presence of diabetes mellitus and more details about the clinical features were detailed due to neuropathic component of the PMPS. The ones defining PMPS were further asked about the characteristics of pain experienced. The last part of the questionnaire was formed by the Turkish version of PCL-C [27].

Statistical analysis

Baseline characteristics of the patient group were described using means ± SD for continuous variables and frequencies and proportions for dichotomous and categorical variables. Differences between continuous variables were assessed with the Student *t* test and non-parametric tests for repeated measures (Friedman Test). The chi-square or Fisher exact tests were used to compare categorical variables. Multivariate analysis was performed using a logistic regression model. Univariate analysis of the predictors of PMPS performed with the chi-square or Fisher exact tests. The income parameter was grouped according to the minimum wage in Turkey (<1000 Turkish lira vs >1000 Turkish lira). The dominant hand (ipsilateral of operated breast vs contralateral), type of operation (BCS vs MRM), level of income (low vs high), PTSD, taxane therapy, radiotherapy, history of psychiatric support, age (<65 vs ≥65), elapsed time after surgery (<46 months vs ≥46 months), and social support after diagnosis (low vs high) were further evaluated with a logistic regression model. The answers to social support during disease process were grouped as high (scores 4–5) and low (1–3). The median time of 46 months after surgery was used for grouping. The predictors of PTSD were tested with the independent sample *t* test and chi-square or Fisher exact tests after grouping the PTSD scores. The analysis of PTSD score was performed in the light of the Turkish validation study and the clinical experiences in Turkish population. The cutoff value for the diagnosis of PTSD was 24 [27–29]. Multivariate analysis was tested with linear regression and the presence of PMPS, regular analgesic usage, history of psychiatric support medication for depression, marital status, social support, and age were further tested with logistic regression analysis.

All analyses were performed using the SPSS 17.0 for Windows (IBM Corp., Armonk, NY). Values of p of less than 0.05 were considered to be statistically significant.

Results

Patients' characteristics

Six hundred fourteen female patients with a mean age of 54.4 ± 10.1 were evaluated. The elderly patients (≥65 years old) constituted 16.1 % (99/614) of the group (Table 1). Of the participants, 38.8 % of them were obese and 39.1 % of them had at least one comorbidity. Diabetes mellitus and

Table 1 Properties of the PMPS present and absent groups

	PMPS + (n, %)	PMPS − (n, %)	Total	*p*
Age	57.8 (±7.5)	61.4 (±7.0)	54.4 (±10.1)	<0.001
Age group				
• >65	34 (34.3)	65 (65.7)	99	0.01
• <65	243 (47.2)	272 (52.8)	515	
Height (cm)	157.5 (±6.2)	1159.1 (±6.8)	159.3 (±6.1)	0.12
Weight (kg)	76.0 (56–125)	75.5 (60–100)	74 (40–130)	0.30
Body mass index (BMI)	31.5 (±4.5)	30.9 (±4.9)	29.4 (±4.9)	0.61
BMI groups				
• Underweight	2 (66.7)	1 (33.3)	3	0.84
• Normal	60 (45.8)	71 (54.2)	131	
• Overweight	106 (43.8)	136 (56.2)	241	
• Obese	109 (45.8)	129 (54.2)	238	
Smoker				
• Smoker	33 (50)	33 (50.0)	66	0.66
• Non-smoker	185 (44.2)	234 (55.8)	419	
• Ex-smoker	58 (45.7)	69 (54.3)	127	
Alcohol				
• Present	15 (57.7)	11 (42.3)	26	0.18
• Absent	261 (44.5)	325 (55.5)	586	
Comorbidity				
• Present	104 (43.3)	136 (56.7)	240	0.51
• Absent	167 (46.0)	196 (54.0)	363	
Diabetes mellitus				
• Present	61 (48.4)	65 (51.6)	126	0.38
• Absent	210 (44.1)	266 (55.9)	476	
Marital status				
• Married	214 (46.1)	250 (53.9)	464	0.44
• Single	18 (43.9)	23 (56.1)	41	
• Widow	45 (41.2)	64 (58.8)	109	
Children				
• Present	244 (45.7)	290 (54.3)	534	0.54
• Absent	28 (41.8)	39 (58.2)	67	
No. of household	2 (1–15)	3 (1–6)	2.5 (1–15)	0.13
Total monthly income				
• <1000 Turkish lira	45 (59.2)	31 (40.8)	76	0.009
• >1000 Turkish lira	232 (43.3)	304 (56.7)	536	
Educational status				
• Illiterate	27 (47.4)	30 (52 6)	57	0.81
• Literate	17 (54.8)	14 (45.2)	31	
• Elementary school	108 (44.8)	133 (55.2)	241	
• Intermediate school	28 (46.7)	32 (53.3)	60	
• High school	43 (40.6)	63 (59.4)	106	
• University	54 (45.4)	65 (54.6)	119	
Job				
• Retired	50 (41.0)	72 (59.0)	122	0.55
• Working	52 (47.7)	57 (53.2)	109	
• No job	173 (45.6)	206 (54.4)	379	
History of psychiatric support				
• Present	106 (52.0)	98 (48.0)	204	0.01
• Absent	171 (41.7)	239 (58.3)	410	
History of regular use of analgesics				
• Present	211 (47.6)	232 (52.4)	443	0.06
• Absent	66 (39.3)	102 (60.7)	168	
PTSD				
• Present	234 (54.0)	199 (46.0)	433	<0.001
• Absent	43 (26.2)	121 (73.8)	164	
Breast cancer and treatment features				
Operation				
• MRM	168 (42.3)	229 (57.7)	397	0.02
• BCS	109 (51.4)	103 (48.6)	212	
Pathology				
• IDC	247 (44.7)	306 (55.3)	561	0.63
• ILC	12 (60.0)	8 (40)	22	
• Mixed (IDC + ILC)	3 (33.3)	9 (50)	18	
• Others	5 (41.7)	6 (66.7)	11	

Table 1 (continued)

	PMPS + (n, %)	PMPS − (n, %)	Total	*p*
Stage				
• I	60 (48.0)	65 (52.0)	131	0.70
• II	143 (43.7)	184 (56.3)	333	
• III	62 (48.8)	65 (51.2)	133	
No. of resected lymph nodes	16 (1–37)	14 (2–51)	14 (0–53)	0.75
Infection or drainage after operation				
• Present	33 (49.3)	34 (50.7)	67	0.47
• Absent	244 (44.6)	303 (55.4)	547	
History of reoperation				
• Present	32 (56.1)	25 (43.9)	57	0.053
• Absent	245 (44.0)	312 (56.0)	557	
Breast implant				
• Present	14 (42.4)	19 (57.6)	33	0.75
• Absent	263 (45.3)	318(54.7)	581	
Estrogen receptor				
• Positive	224 (46.7)	256 (53.3)	480	0.20
• Negative	46 (41.8)	64 (58.2)	110	
Progesterone receptor				
• Positive	208 (44.6)	258 (55.4)	466	0.32
• Negative	61 (49.6)	62 (50.4)	123	
C-erbb2				
• Positive	87 (51.8)	81 (48.2)	168	0.06
• Negative	184 (43.3)	241 (56.7)	425	
Time elapsed after surgery (months)	43 (7–190)	62 (6–288)	46 (6–258)	<0.001
Adjuvant treatment modality				
• Only chemotherapy	53 (36.6)	92 (63.4)	145	0.09
• Chemoradiotherapy	192 (48.2)	206 (51.8)	398	
• Only radiotherapy	6 (35.3)	11 (64.7)	17	
• Only hormonal therapy	23 (46.9)	26 (53.1)	49	
• None	3 (75.0)	1 (25.0)	4	
Radiotherapy				
• Present	165 (48.5)	175 (51.5)	416	0.03
• Absent	99 (41.4)	140 (58.6)	197	
Taxane in adjuvant regimen				
• Present	165 (48.5)	175 (51.5)	340	0.054
• Absent	99 (41.4)	140 (58.6)	23	

BCS breast conserving surgery, *IDC* invasive ductal carcinoma, *ILC* invasive lobular carcinoma, *MRM* modified radical mastectomy, *PTSD* posttraumatic stress disorder

hypertension were the most common diseases reported, 20.5 and 11.8 %, respectively. Participants were in a wide range of differences in socioeconomic status. Only 6.6 % were single and 86.9 % of the group had children with a median number of 3 [1–6]. Median number of households was 2.5 [1–15], and the patients whose monthly income was below the minimum wage constituted the 12.3 % of the group. Eighty-eight (14.3 %) of the patients had not attended to school and 9 % was illiterate. Most of the patients (61.7 %) were housewives at the time of evaluation. Patients had been followed for 46 months (6–258) after surgery. Invasive ductal carcinoma was the most common pathology, and chemoradiotherapy was the most common adjuvant modality.

PMPS and variables associated with PMPS

Two hundred seventy-seven (45.1 %) of the patients reported PMPS at the time of questionnaire and 124 (44.7 %) of them had been experiencing pain since the initial surgery (Table 2). The severity of pain ranges between 1 and 10 (median 3) and the mostly reported location (84.1 %) where the pain was experienced was the scar tissue or the residual breast in BCS patients. The axilla and the ipsilateral arm were other important regions described (53.4 and 31.0 %, respectively). Eighteen percent of them experience pain daily. Physical exertion was the most common triggering factor. Although, most of the patients try to relieve the pain with different maneuvers, PMPS in 95 (34.2 %) regress spontaneously.

In the univariate analysis, risk factors for PMPS were young age (<65), low income, BCS, adjuvant radiotherapy history of psychiatric support, and presence of PTSD. The presence of reoperation for any reason after initial surgery and adjuvant taxanes regimen were associated with PMPS ($p = 0.053$ and $p = 0.054$, respectively). Time elapsed after surgery was negatively correlated with the presence of PTSD (Table 1). In the multivariate analysis low income, presence of PTSD and <46 months after surgery were associated with increased risk of PMPS (Table 3).

Table 2 Properties of PMPS

	N (%)
Location of pain	
• Mastectomy scar of residual breast	233 (84.1)
• Axilla	148 (53.4)
• Ipsilateral arm	86 (31.0)
• Other	13 (4.6)
Severity of pain	3 (1–10)
Frequency of pain	
• Daily	50 (18.0)
• 1–3/week	102 (37.0)
• 1–3/month	76 (27.4)
• Less	49 (1.6)
Duration of pain	
• Seconds	72 (25.9)
• <5 min	85 (30.6)
• 5–30 min	70 (25.2)
• >30 min	50 (18.0)
Triggering factors	
• Physical exertion	175 (72.6)
• Sudden movements	100 (41.4)
• Touch	93 (38.5)
• Hot-cold climate	59 (23.8)
• Friction of clothes	51 (20.6)
Maneuvers to relieve pain	
• Resting	152 (54.8)
• Analgesic (systemic-topical)	115 (41.5)
• Massage	47 (16.9)
• Spontaneously relieving	95 (34.2)

Table 3 Multivariate analysis of factors associated with PMPS

	OR	CI (%95)	*p*
Low income[a]	1.89	1.08–3.38	0.03
PTSD	3.14	2.05–4.81	<0.001
Short interval after surgery (<46 months)	1.71	1.18–2.49	0.004
BCS	1.28	0.85–1.92	0.23
Radiotherapy	1.09	0.70–1.72	0.68
Taxane in adjuvant therapy	1.19	0.79–1.81	0.39
Age <65	1.46	0.87–2.44	0.14
Psychiatric support	1.31	0.89–1.91	0.15
Reoperation	1.57	0.85–2.89	0.14
Regular use of analgesic	1.45	0.96–2.17	0.07
Low social support	1.08	0.73–1.61	0.66

BCS breast conserving surgery

[a] Low income was assigned as <1000 Turkish lira which is the minimum wage in Turkey

PTSD and variables associated with PTSD

The mean PTSD score was 32.4 (±11.1) and, 433 (72.5 %) of the patient group was documented to have PTSD. Being married, presence of PMPS, younger age (<65), history of psychiatric evaluation, or antidepressant medication were associated with increased risk of PTSD in the univariate analysis (Table 4). However, in logistic regression analysis, only PMPS and being married at the time of the evaluation were linked with PTSD (Table 5).

Discussion

PMPS

Although a clear definition is not present, it is defined as chronic neuropathic pain in the mastectomy scar, residual breast tissue, axilla, ipsilateral arm, or chest wall after breast surgery which lasts beyond 6 months after surgery [2]. Due to the neuropathic nature of the pathology, electric shock-like, shooting, or burning pain and altered skin sensations are the most common symptoms in the surgically manipulated axilla or breast [3, 4].

The incidence rates of PMPS have been reported as low as 20 % [3, 9, 30], and as high as 40–50 % [6, 7, 31]. In this study, the incidence of PMPS documented is 45.1 %, upper limit of the previous reports. Also, 31 % of the group reported pain at the ipsilateral arm and 4 % at the anteroposterior of chest. Aggravating and alleviating factors are similar with the previous analysis [3, 7]. Symptoms improve without any maneuver in 34.2 % of the patients, and median pain score of 3/10 was similar with the data in literature [30].

Table 4 Univariate analysis of factors associated with PTSD

Parameters	PTSD + (n, %)	PTSD − (n, %)	Total	*p*
Age				
• >65	59 (63.8)	38 (39.2)	97	0.005
• <65	374 (74.8)	126 (25.2)	500	
Married				
• Yes	340 (75.2)	112 (24.8)	452	0.009
• No	93 (64.1)	52 (35.9)	145	
History of psychiatric support				
• Present	278 (69.5)	122 (30.5)	400	0.018
• Absent	155 (78.7)	42 (21.3)	197	
History of antidepressant medication				
• Present	159 (78.3)	44 (21.7)	203	0.023
• Absent	274 (69.5)	120 (30.5)	394	
PMPS				
• Absent	199 (62.2)	121 (37.8)	320	<0.001
• Present	234 (84.5)	43 (15.5)	277	

PMPS postmastectomy pain syndrome

Table 5 Multivariate analysis of factors associated with PTSD

	OR	CI (%95)	*p*
Married	1.57	1.0–2.41	0.03
PMPS	3.02	2.01–4.55	<0.001
Age <65	1.56	0.9–2.54	0.07
History of psychiatric support	1.16	0.63–2.14	0.62
Presence of psychiatric support at the time of evaluation	1.38	0.65–2.93	0.39
History of antidepressant medication	1.12	0.62–2.02	0.69
Regular analgesic usage	1.32	0.87–1.99	0.18
Low social support	1.34	0.88–2.04	1.16

PMPS postmastectomy pain syndrome

The etiopathogenesis is poorly defined. It is considered that the damage to nerve pathways is the underlying cause. Intercostobrachial neuralgia, neuroma pain, or phantom breast pain are the most related pathogenic mechanisms [5, 6].

Although anticonvulsants and antidepressant therapies are the mainstay treatment of PMPS, there is no specific treatment modality [11]. In addition to promising effective local therapies [12, 13], systemic therapies showed conflicting results both in the prophylaxis and treatment [14–16] Spontaneously disappearing symptom can be the cause of not complaining in routine visits and also not seeking a cure for the problem. This is also true for the physicians who can ignore a symptom that does not need any further treatment. Stevens et al. concluded that the patients with PMPS were undertreated and generally obtained poor pain relief from their symptoms [4]. In addition, PMPS results in poor quality of life and worse scores in role limitations due to physical problems, body pain, general health, vitality, role limitations due to emotional problems, and mental health [30–32]. In the light of the findings, physicians working with breast cancer should especially evaluate patients for PMPS.

When managing pain, different physiological, sensory, behavioral, sociocultural, affective, and cognitive components should be discussed to determine pain perception and expression [10]. Our study is unique due to its focusing on the socioeconomic and psychological data. Patient-related parameters which were found to be related with PMPS were young age, low income, and presence of PTSD. Young age has been the best described parameter, and it has been related with the aggressive nature and worse prognosis at younger ages. Increased nerve sensitivity and tendency to anxiety are other factors claimed [4, 7, 8, 30, 31, 33]. Younger age as a risk factor was not significant in the multivariate analysis. There are conflicting results about the BMI-PMPS association [7, 8, 34]. However, our analysis on body composition was inconclusive. The sociocultural properties which have not been studied before are important determinants of PMPS. Monthly total income, which is under minimum wage in Turkey, was found to be associated with PMPS (OR 1.89; $p=0.03$) in multivariate analysis. Psychological problems, difficulty in approaching health services, and operations by trainee surgeons as a consequence of poverty are the probable mechanisms. In addition, low income and being a housewife have been associated with decreased pain threshold [35, 36]. The history of psychiatric support was associated with PMPS (OR 1.31; $p=0.15$). PTSD which is also a psychiatric disorder was documented in 72.5 % of the patients. Presence of PTSD increase the PMPS risk 3.14-fold. A decrease in the pain threshold has been documented in PTSD patients [37]. This is the first report that defined an association between these two pathologies. However, it is difficult to conclude which came first, PTSD or PMPS? Higher incidence of PTSD and the relation between PTSD and PMPS are important areas that must be further studied.

In oncology practice, treatment modalities and their long-term consequences are sometimes challenging. Adjuvant therapies, radiation therapies, or systemic treatments have been related with PMPS. Surgery which is the primary cause of damage to neurons has been well associated with PMPS. Although BCS, breast augmentation, and reconstruction have been claimed [10, 38], some of the data pointed out the importance of axillary intervention other than mastectomy [6, 39]. In the study group, BCS reoperation after primary surgery was related with PMPS, but could not reach statistical significance. The impacts of adjuvant chemoradiotherapy have been studied, and radiotherapy was noted as a risk factor [6, 34]. This could not be confirmed in the analysis. The effects of adjuvant chemotherapy on PMPS were shown by Gartner et al. [6]. However, the impact of taxane regimens which are related with neuropathy has never been studied in PMPS. In the multivariate analysis, taxane regimens were not related with PMPS (OR 1.19; $p=0.39$). In the study of Andersen et al., docetaxel as an adjuvant treatment for breast cancer did not increase the risk of persistent pain after breast cancer treatment, sensory disturbances in the surgical area, or functional impairment [40]. Cumulative dosage, time of therapy, and other medications causing neuropathy should be further studied. There found to be a negative correlation between time period after surgery and incidence of PMPS. In the 46 months of follow-up, PMPS risk increases 1.71-fold ($p=0.004$). As

concluded by Smith et al. [7] and Macdonald et al. [8], time of onset is usually within 1 month after surgery, and the number of patients complaining about pain progressively decreases. This can be explained by the decrease in the effects of chemoradiotherapy, frequency of outpatient clinic visits, psychological distress, and probable approach to therapy.

PTSD

PTSD symptoms usually appear within 3 months of a traumatic event, last longer than a month, and severely affect daily life. In some cases, symptoms do not appear for years after the traumatic event. Psychological disturbances prior to cancer diagnosis, elevated psychological distress subsequent to the diagnosis, younger age, female gender, lower socioeconomic status, education level, poor social functioning and support, emotionally reactive temperament, avoidant coping style, and reduced physical functioning have been associated with PTSB in cancer patients [23–25]. Due to its nature, cancer is an inevitable trauma for patients. The trauma starts with learning the diagnosis and continues with surgery, chemotherapy, and radiation therapy and even in the every single outpatient clinic visit. PTSD and its predictors have been well studied in breast cancer patients [41]. However, we have no data in the Turkish breast cancer population and about the clinical impacts of PTSD. Unlike the results in literature in which PTSD incidence in breast cancer patients was recorded most often in the range of 10 % and up to 35 % [42], we documented PTSD in 72.5 % of the group. Some of the patients were further consulted for psychiatric evaluation. Similar with the data in literature, history of psychiatric disorder prior to cancer and therapy for depression were associated with PTSD (OR of 1.56 ($p=0.62$) and 1.12 ($p=0.69$), respectively) [43, 44]. In contrast to previous data, marriage was found to increase the PTSD by 1.57-fold ($p=0.03$). Social support and being married have been defined as protectors to psychological distress and important determinants of survival [25, 42, 45]. The positive effect of social support has been also confirmed in the Turkish population [46, 47]. However, as Kinsinger et al. noted, baseline perceptions of negative partner support were related to less relationship satisfaction, and this can negatively affect the cancer patients in the disease process [48]. In addition, adaptation of the family can be negatively affected in some patients due to the absence of this type of support related to the uncertainty and fear about cancer. The changes in the husbands' attitude toward cancer and changes in support during therapy should be further investigated. The best defined association with PTSD was PMPS (OR 3.02; $p<0{,}001$). As discussed previously, further studies are needed for clarifying this association.

There are some inevitable limitations of the study. Firstly, due to mainly relying on a questionnaire, some of the data were subjective. In addition, there were six different interviewers in six different cancer centers, so this could have affected the evaluation process. There was also an inevitable heterogeneous sociocultural background in different regions of Turkey. The surgical interventions have been performed in six different hospitals in Turkey and also by different surgeons. The surgical experiences of the surgeons also were not known. Center- and surgeon-related differences can confound the effects of surgery on PMPS. The analysis of surgeons' experience and its effects on PMPS can give further information. In the study, the effect of taxanes on PMPS was evaluated. However, the cumulative dosages and other neurotoxic chemotherapeutics were not included in the analysis. This can decrease the effects of taxanes on PMPS. The radiotherapy technique used, the total radiation exposed, and the radiated fields were not evaluated. The medications used for any purposes were recorded. However, over-the-counter drugs used or other herbal medications could not be declared by the patients. Insufficient data about adjuvant therapy and medications can confound the results. The psychiatric disease histories before surgery could only be documented via medical records and patient history. Unrecorded psychiatric events and evaluations can be missed. Some of the patients could have been treated with a diagnosis of PTSD.

To the best of our knowledge, this is the first study in Turkey evaluating predictors of PMPS and PTSD in cancer patients. It is also the first data about the association between PMPS and PTSD. Further studies are necessary. The clinicians should be aware of PMPS and PTSD in breast cancer survivors. The physicians working with breast cancer and caring breast cancer survivors should evaluate patients both for PMPS and PTSB. Patients with clinical PMPS should be further evaluated for PTSD.

Compliance with ethical standards Institutional Ethics Committee approved the study protocol, and the study was in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study.

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

References

1. Forouzanfar MH, Foreman KJ, Delossantos AM, Lozano R, Lopez AD, Murray CJ et al (2011) Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. Lancet 378(9801):1461–1484
2. Foley KM (1987) Pain syndromes in patients with cancer. Med Clin North Am 71(2):169–184
3. Carpenter JS, Andrykowski MA, Sloan P, Cunningham L, Cordova MJ, Studts JL et al (1998) Postmastectomy/postlumpectomy pain in breast cancer survivors. J Clin Epidemiol 51(12):1285–1292

4. Stevens PE, Dibble SL, Miaskowski C (1995) Prevalence, characteristics, and impact of postmastectomy pain syndrome: an investigation of women's experiences. Pain 61(1):61–68
5. Jung BF, Ahrendt GM, Oaklander AL, Dworkin RH (2003) Neuropathic pain following breast cancer surgery: proposed classification and research update. Pain 104(1-2):1–13
6. Gartner R, Jensen MB, Nielsen J, Ewertz M, Kroman N, Kehlet H (2009) Prevalence of and factors associated with persistent pain following breast cancer surgery. JAMA 302(18):1985–1992
7. Smith WC, Bourne D, Squair J, Phillips DO, Chambers WA (1999) A retrospective cohort study of post mastectomy pain syndrome. Pain 83(1):91–95
8. Macdonald L, Bruce J, Scott NW, Smith WC, Chambers WA (2005) Long-term follow-up of breast cancer survivors with postmastectomy pain syndrome. Br J Cancer 92(2):225–230
9. Vilholm OJ, Cold S, Rasmussen L, Sindrup SH (2008) The postmastectomy pain syndrome: an epidemiological study on the prevalence of chronic pain after surgery for breast cancer. Br J Cancer 99(4):604–610
10. Caffo O, Amichetti M, Ferro A, Lucenti A, Valduga F, Galligioni E (2003) Pain and quality of life after surgery for breast cancer. Breast Cancer Res Treat 80(1):39–48
11. Finnerup NB, Sindrup SH, Jensen TS (2007) Chronic neuropathic pain: mechanisms, drug targets and measurement. Fundam Clin Pharmacol 21(2):129–136
12. Watson CP, Evans RJ (1992) The postmastectomy pain syndrome and topical capsaicin: a randomized trial. Pain 51(3):375–379
13. Wisotzky EM, Saini V, Kao C. Ultrasound guided intercostobrachial peri-neural injection for intercostobrachial neuralgia in breast cancer patients: a case series. PM & R: the journal of injury, function, and rehabilitation. 2015.
14. Amr YM, Yousef AA (2010) Evaluation of efficacy of the perioperative administration of venlafaxine or gabapentin on acute and chronic postmastectomy pain. Clin J Pain 26(5):381–385
15. Eisenberg E, Pud D, Koltun L, Loven D (2007) Effect of early administration of the N-methyl-d-aspartate receptor antagonist amantadine on the development of postmastectomy pain syndrome: a prospective pilot study. J Pain 8(3):223–229
16. Vilholm OJ, Cold S, Rasmussen L, Sindrup SH (2008) Effect of levetiracetam on the postmastectomy pain syndrome. Eur J Neurol 15(8):851–857
17. Hahn EE, Hays RD, Kahn KL, Litwin MS, Ganz PA (2015) Posttraumatic stress symptoms in cancer survivors: relationship to the impact of cancer scale and other associated risk factors. Psychooncology 24(6):643–652
18. Ljungman L, Hoven E, Ljungman G, Cernvall M, von Essen L (2015) Does time heal all wounds? A longitudinal study of the development of posttraumatic stress symptoms in parents of survivors of childhood cancer and bereaved parents. Psychooncology 24(12):1792–1798
19. Wachen JS, Patidar SM, Mulligan EA, Naik AD, Moye J (2014) Cancer-related PTSD symptoms in a veteran sample: association with age, combat PTSD, and quality of life. Psychooncology 23(8):921–927
20. Tremolada M, Bonichini S, Aloisio D, Schiavo S, Carli M, Pillon M (2013) Post-traumatic stress symptoms among mothers of children with leukemia undergoing treatment: a longitudinal study. Psychooncology 22(6):1266–1272
21. Alter CL, Pelcovitz D, Axelrod A, Goldenberg B, Harris H, Meyers B et al (1996) Identification of PTSD in cancer survivors. Psychosomatics 37(2):137–143
22. Mundy EA, Blanchard EB, Cirenza E, Gargiulo J, Maloy B, Blanchard CG (2000) Posttraumatic stress disorder in breast cancer patients following autologous bone marrow transplantation or conventional cancer treatments. Behav Res Ther 38(10):1015–1027
23. Kangas M, Henry JL, Bryant RA (2002) Posttraumatic stress disorder following cancer. A conceptual and empirical review. Clin Psychol Rev 22(4):499–524
24. Rustad JK, David D, Currier MB (2012) Cancer and post-traumatic stress disorder: diagnosis, pathogenesis and treatment considerations. Palliat Support Care 10(3):213
25. Andrykowski MA, Cordova MJ, McGrath PC, Sloan DA, Kenady DE (2000) Stability and change in posttraumatic stress disorder symptoms following breast cancer treatment: a 1-year follow-up. Psychooncology 9(1):69–78
26. Dobie DJ, Kivlahan DR, Maynard C, Bush KR, McFall M, Epler AJ et al (2002) Screening for post-traumatic stress disorder in female Veteran's Affairs patients: validation of the PTSD checklist. Gen Hosp Psychiatry 24(6):367–374
27. Kocabaşoğlu NÇÖA, Yargıç İ, Geyran P (2005) Türkçe "PTSD checklist—civilian version" (PCL-C) ölçeğinin geçerlilik ve güvenilirliği. Yeni Symposium 43(3):126–134
28. Semiz MEF, Erdem A, Tuman TC, Oran Demir M, Kayka N, Yıldırım O (2015) Posttraumatic stress disorder symptoms in patients with acute myocardial infarction. Abant Med J 4(1):47–53
29. Balaban H, Semiz M, Senturk IA, Kavakci O, Cinar Z, Dikici A et al (2012) Migraine prevalence, alexithymia, and post-traumatic stress disorder among medical students in Turkey. J Headache Pain 13(6):459–467
30. Meijuan Y, Zhiyou P, Yuwen T, Ying F, Xinzhong C (2013) A retrospective study of postmastectomy pain syndrome: incidence, characteristics, risk factors, and influence on quality of life. Sci World J 2013:159732
31. Couceiro TC, Menezes TC, Valenca MM (2009) Post-mastectomy pain syndrome: the magnitude of the problem. Rev Bras Anestesiol 59(3):358–365
32. Tasmuth T, von Smitten K, Kalso E (1996) Pain and other symptoms during the first year after radical and conservative surgery for breast cancer. Br J Cancer 74(12):2024–2031
33. Katz J, Poleshuck EL, Andrus CH, Hogan LA, Jung BF, Kulick DI et al (2005) Risk factors for acute pain and its persistence following breast cancer surgery. Pain 119(1-3):16–25
34. Poleshuck EL, Katz J, Andrus CH, Hogan LA, Jung BF, Kulick DI et al (2006) Risk factors for chronic pain following breast cancer surgery: a prospective study. J Pain 7(9):626–634
35. Altinel L, Kose KC, Ergan V, Isik C, Aksoy Y, Ozdemir A et al (2008) The prevalence of low back pain and risk factors among adult population in Afyon region, Turkey. Acta Orthop Traumatol Turc 42(5):328–333
36. Pina P, Sabri E, Lawlor PG (2015) Characteristics and associations of pain intensity in patients referred to a specialist cancer pain clinic. Pain Res Manag 20(5):249–254
37. Dunne-Proctor RL, Kenardy J, Sterling M. The impact of posttraumatic stress disorder on physiological arousal, disability and sensory pain thresholds in patients with chronic whiplash. Clin J Pain, 2015
38. Wallace MS, Wallace AM, Lee J, Dobke MK (1996) Pain after breast surgery: a survey of 282 women. Pain 66(2-3):195–205
39. Tasmuth T, Kataja M, Blomqvist C, von Smitten K, Kalso E (1997) Treatment-related factors predisposing to chronic pain in patients with breast cancer—a multivariate approach. Acta Oncol 36(6): 625–630
40. Andersen KG, Jensen MB, Kehlet H, Gartner R, Eckhoff L, Kroman N (2012) Persistent pain, sensory disturbances and functional impairment after adjuvant chemotherapy for breast cancer: cyclophosphamide, epirubicin and fluorouracil compared with docetaxel + epirubicin and cyclophosphamide. Acta Oncol 51(8):1036–1044

41. Mehnert A, Koch U (2007) Prevalence of acute and posttraumatic stress disorder and comorbid mental disorders in breast cancer patients during primary cancer care: a prospective study. Psychooncology 16(3):181–188
42. Mulligan EA, Wachen JS, Naik AD, Gosian J, Moye J (2014) Cancer as a criterion a traumatic stressor for veterans: prevalence and correlates. Psychol Trauma-Us 6:S73–S81
43. Widows MR, Jacobsen PB, Fields KK (2000) Relation of psychological vulnerability factors to posttraumatic stress disorder symptomatology in bone marrow transplant recipients. Psychosom Med 62(6):873–882
44. Green BL, Rowland JH, Krupnick JL, Epstein SA, Stockton P, Stern NM et al (1998) Prevalence of posttraumatic stress disorder in women with breast cancer. Psychosomatics 39(2):102–111
45. Jacobsen PB, Sadler IJ, Booth-Jones M, Soety E, Weitzner MA, Fields KK (2002) Predictors of posttraumatic stress disorder symptomatology following bone marrow transplantation for cancer. J Consult Clin Psychol 70(1):235–240
46. Ozkaraman A, Culha I, Fadiloglu ZC, Kosgeroglu N, Gokce S, Alparslan GB (2015) Relationships between social support and social image concerns in Turkish women with breast cancer. Asian Pac J Cancer Prev 16(5):1795–1802
47. Dedeli OFÇ (2008) Uslu R A survey of functional living and social support in patients with cancer. J Med Oncol 28:132–139
48. Kinsinger SW, Laurenceau JP, Carver CS, Antoni MH (2011) Perceived partner support and psychosexual adjustment to breast cancer. Psychol Health 26(12):1571–1588