The Necessity of Upper Extremity Neurologic Examination while Evaluating Breast Pain

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Keywords

Breast pain · Cervical root disorders · Differential diagnosis · Incidence · Mastalgia · Pain management · Quality of life

Abstract

Introduction: Breast pain is one of the most frequent complaints and occurs in 45–69% of all women. Cervical disc herniation is a common cause of cervical radiculopathy with an incidence rate of 18.6 per 100,000, and it should be considered as a cause of breast pain. **Objective:** To identify the extent to which upper extremity neurologic findings and cervical root disorders accompany breast pain. **Methods:** We prospectively collected clinical features of patients with breast pain. An upper extremity neurologic examination was performed in patients and controls. Patients who had neurologic findings underwent cervical spine magnetic resonance imaging (MRI) to identify cervical root disorders. **Results:** Out of the 554 participants, 233 had breast pain, and 321 were controls. Women with breast pain had more numbness (116 [49.8%] vs. 104 [32.4%], $p < 0.001$) and more dysesthesia (36 [15.5%] vs. 17 [5.3%], $p < 0.001$) than the controls, but they had similar upper extremity weakness (10 [4.3%] vs. 14 [4.4%], $p > 0.05$). The number of women with one neurologic finding was significantly greater in the group with breast pain (119 [51.1%] vs. 111 [34.6%], $p < 0.001$). Ninety (16.2%) patients underwent a cervical vertebra MRI, which showed

that 86 (95.6%) patients had cervical root disorders including 21 (23.3%) cases of bulging, 9 (10%) of annular tear, and 56 (62.2%) of central disc protrusion; 4 (4.4%) patients had normal findings. The multivariate logistic regression analysis revealed that age was the only significant predictor of neurologic findings in patients with breast pain ($p < 0.05$, OR: 1.02, CI: 1.002–1.053). **Conclusions:** Cervical root disorders should be considered as a cause of extramammary breast pain.

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Introduction

Breast pain is one of the most frequent complaints, which occurs in 45–69% of all women in the reproductive age and leads them to consult primary care physicians, general surgeons, breast surgeons, or gynecologists for further evaluation [1, 2]. In the past, breast pain was not seen as a symptom that required treatment because physicians thought that breast pain was a result of physiological changes and occurred in frustrated unhappy nulliparas [3]. In 1976, Preece et al. [4] classified breast pain into six groups: cyclic breast pain, ductal ectasia, Tietze's syndrome, trauma, sclerosing adenosis, and cancer. However, this classification was reduced to three groups consisting of cyclic breast pain, non-cyclic breast pain, and extramammary pain [5]. Cyclic pain is related to the men-

strual cycle of a woman. It is usually bilateral and diffuse and occurs more in the luteal phase of the menstrual cycle in which breast swelling occurs. Non-cyclic pain is not related to menstrual cycle, can be unilateral in the breast and more common in women who are 40–50 years of age [6, 7]. Costochondritis, Tietze's syndrome, angina, rib injuries, and cervical root disorders are some of the causes of extramammary breast pain.

Cervical disc herniation is a common cause of cervical radiculopathy with an incidence rate of 18.6 per 100,000. The risk factors of the disease are male gender, heavy lifting, cigarette smoking, diving, and it peaks after the sixth decade of life [8, 9]. Neck and arm pain are the cardinal symptoms of the disease. Conservative treatment including lifestyle changes is the first-line treatment of the disease, and approximately 26% of the cases require surgical intervention [10]. Dowle [11] was first to report that cervical root disorders should be considered as a cause of breast pain. Moreover, in our daily practice, we noticed that women with breast pain have a significant number of accompanying upper extremity neurologic findings which suggested cervical root disorders. However, there has been no study that reported the extent to which cervical root disorders accompany breast pain. The aim of this study is to identify the rate at which upper extremity neurologic findings and cervical root disorders accompany breast pain.

Materials and Methods

Patient Selection and Outcome Variables

We prospectively collected clinical features of patients who presented with breast pain to our institution's breast clinic after obtaining informed consent and ethical approval. A detailed patient history including past medical, family, gynecologic, obstetric and social history was taken in addition to the breast and upper extremity neurologic examination. Patients who were younger than 16 years old, male patients, or those who did not want to participate in the study were excluded. A control group was selected from women without breast pain and same variables were recorded for comparison.

Assessment of Breast Pain

We questioned location, intensity, quality, duration, frequency, and radiation of the pain along with associated symptoms such as gastroesophageal reflux disease and neck or back pain. Pain intensity was determined by displaying a visual analog scale to each patient and asking them to score their pain. In the physical examination, all four quadrants of the breast were examined to find the tenderness site in addition to the axillae, head, and neck exam. Breast pain related to menses were determined as cyclic, and breast pain not related to menses was determined as non-cyclic. Mammography, breast sonography, or both were utilized depending on the patient's age to exclude any underlying pathology. Patients re-scored their pain after 3–4 days of oral analgesic treatment.

Upper Extremity Neurologic Examination

We carried out an upper extremity neurologic examination for all patients. Pain or numbness in the upper extremity was ques-

tioned, and any dysesthesia in the upper extremity like hypo- or hyperesthesia or any weakness in the upper extremity were recorded. Patients who had numbness or one of the neurologic findings were consulted with a neurosurgeon for further evaluation and underwent cervical spine magnetic resonance imaging (MRI). The control group was also evaluated with an upper extremity neurologic examination; however, no imaging studies were done because of the ethical format of the study.

Statistical Analysis

IBM SPSS Statistics Data Editor 22.0 was used to display frequencies and to perform the comparison. Initially, variables were categorized into categorical or scale data. For the scale data, the Shapiro-Wilks test was used to analyze normal distribution. Two categorical data were compared with the χ^2 test and categorical and scale data were compared with an independent samples *t* test if the distribution was normal. On the other hand, we run a non-parametric *t* test if the distribution was not normal. Educational status was categorized into women whose education was less than high school grade or equal or more than high school grade. A univariate and multivariate logistic regression analysis was performed to find the significant variables related to the presence of the neurologic findings.

Results

Of the 554 participants, 233 had breast pain and 321 were controls. Regarding pain characteristics, 45 (19.3%) had cyclic and 177 (76%) non-cyclic breast pain. Sixty-three (27%) had right, 117 (50.2%) left, and 53 (22.7%) bilateral breast pain. The pain was intermittent in 190 (81.5%) of the patients, and the median duration of the pain was 3 (0–365) months. The median pain VAS score was 5 (0–10) points, and it decreased to 1 (0–9) point after 3–4 days of oral analgesic treatment.

There were no differences in age (median 37 [12–76] vs. 36 [16–71] years), menopausal status (187 [80.3%] vs. 248 [77.3%] premenopausal), abortus (38 [16.3%] vs. 53 [16.5%], curettage [56 [24%] vs. 61 [19%]) history, or accompanying gastroesophageal reflux symptoms (88 [37.8%] vs. 99 [30.8]) ($p > 0.05$) between patients and controls.

Women with breast pain had a significantly greater prevalence of accompanying neck or back pain (156 [67%] vs. 165 [51.4%]); they were more likely to have a live birth history (178 [76.4%] vs. 214 [66.7%]), and breastfeeding history (207 [88.8%] vs. 200 [62.3%]). Moreover, occupational status (87 [37.3%] vs. 174 [54.2%]) and educational level (95 [40.8%] vs. 202 [62.9%]) were lower in women with breast pain ($p < 0.001$). Regarding upper extremity neurologic findings, women with breast pain more frequently had numbness (116 [49.8%] vs. 104 [32.4%], $p < 0.001$) and dysesthesia (36 [15.5%] vs. 17 [5.3%], $p < 0.001$) than the controls, but they had similar rates of upper extremity weakness (10 [4.3%] vs. 14 [4.4%], $p > 0.05$). The presence of one of the

Table 1. Clinical features of the patients with and without breast pain

Clinical features/patients	Breast pain group (<i>n</i> = 233; 42.1%)	Control group (<i>n</i> = 321; 57.9%)	<i>p</i>
Age, years	37 (12–76)	36 (16–71)	0.4
Gender (female)	233 (100)	321 (100)	NA
Pain type		NA	NA
Cyclic	45 (19.3)		
Non-cyclic	177 (76)		
Missing	11 (4.7)		
Pain location		NA	N
Right breast	63 (27)		
Left breast	117 (50.2)		
Bilateral	53 (22.7)		
Median duration of pain, months	3 (0–365)	NA	NA
Pain consistency		NA	NA
Constant	42 (18)		
Intermittent	190 (81.5)		
Initial pain score	5 (0–10)	NA	NA
Pain score after treatment	1 (0–9)	NA	NA
Neck or back pain	156 (67)	165 (51.4)	<0.001
Gastroesophageal reflux symptoms	88 (37.8)	99 (30.8)	0.09
Menopausal status			0.3
Premenopausal	187 (80.3)	248 (77.3)	
Postmenopausal	46 (19.7)	73 (22.7)	
Live birth history	178 (76.4)	214 (66.7)	0.008
Abortus	38 (16.3)	53 (16.5)	0.95
Curettage	56 (24)	61 (19)	0.15
Breastfeeding history	207 (88.8)	200 (62.3)	<0.001
Occupational history			
Housewife	146 (62.7)	147 (45.8)	<0.001
Employed	87 (37.3)	174 (54.2)	
Educational background			
None or primary school	135 (57.9)	119 (37.1)	<0.001
High school or university	95 (40.8)	202 (62.9)	
Upper extremity numbness	116 (49.8)	104 (32.4)	<0.001
Upper extremity hypo-/hyperesthesia	36 (15.5)	17 (5.3)	<0.001
Upper extremity weakness	10 (4.3)	14 (4.4)	0.97
Having one of the neurologic findings	119 (51.1)	111 (34.6)	<0.001
Cervical spine MRI		NA	
Normal	4 (4.4)		
Bulging	21 (23.3)		
Annular tear	9 (10)		
Protrusion	56 (62.2)		

Data are presented as *n* (%) or median (range). NA, not applicable.

neurologic findings was significantly more frequent in the women with breast pain (119 [51.1%] vs. 111 [34.6%], $p < 0.001$). Ninety (16.2%) patients underwent a cervical vertebra MRI, which displayed 86 (95.6%) cervical root disorders including 21 (23.3%) cases of bulging, 9 (10%) of annular tear, and 56 (62.2%) of central disc protrusion; 4 (4.4%) patients had normal findings (Table 1). The association between the presence of neurologic findings and breast pain was evaluated with univariate and multivariate logistic regression analysis, and we found that age was the only significant predictor ($p < 0.05$, OR: 1.02 CI:

1.002–1.053; Tables 2–3). The ROC curve analysis revealed an area under curve value of 0.61 ($p < 0.05$), and it displayed a cutoff value (sensitivity: 72.4%, specificity: 53%, likelihood ratio: 1.54) at age 32.5 (Fig. 1).

Discussion/Conclusion

This study showed that patients with breast pain had a significantly increased rate of upper extremity neurologic findings compared to the controls. To the best of our

Table 2. Univariate logistic regression analysis to predict neurologic findings in patients with breast pain

Clinical features	Univariate logistic regression analysis			
	beta	OR	p	CI
Age	0.033	1.03	0.004	1.01–1.05
Pain duration	0	1	0.69	1–1
Pain consistency	–0.3	0.75	0.41	0.38–1.48
VAS score	0.08	1.1	1.8	0.96–1.22
Pain type (cyclic, non-cyclic)	0.08	1.1	0.81	0.56–2.1
Parity	0.57	1.77	0.07	0.95–3.3
Abortus	0.16	1.17	1.17	0.58–2.4
Curettage	–1	0.9	0.74	0.49–1.66
Breastfeeding	0.66	1.94	0.16	0.77–4.88
Occupation	–0.5	0.07	0.07	0.35–1.03
Education	0.61	1.83	0.03	1.07–3.13

Table 3. Multivariate logistic regression analysis to predict neurologic findings in patients with breast pain

Clinical features	Multivariate logistic regression analysis			
	beta	OR	p	CI
Age	0.02	1.02	0.03	1.002–1.053
Education	–0.3	0.73	0.31	0.4–1.3

knowledge, there has been no study that reported the exact rate of upper extremity neurologic findings accompanying breast pain. Detailed patient history taking, including pain characteristics such as location, radiation, quality, intensity, duration, and frequency of the pain, and gynecologic and family history, must be performed as an initial step. Then, a comprehensive physical examination of the breasts, head and neck, and chest and heart and upper extremity neurologic examination should be done to determine the laboratory work to find the exact cause of the breast pain.

In our previous study, we found that a personal history of breast or gynecologic disease, or family history of breast cancer was the major reason for women with breast pain to visit breast clinics [12]. Since breast cancer is the most common cancer in women, many women have considerable concern about having breast cancer and they are followed by the screening programs such as close physical examination and mammography. The assumption of having breast cancer may be climaxed when the level of pain peaks, which may increase patients' anxiety level to the extent that they visit a breast clinic. Barros et al. [13] assessed the impact of reassurance on the breast pain and showed that it decreased the breast pain in 70.2–85% of the patients. Nevertheless, physicians usually focus on excluding breast cancer and reassuring the patients rather

Fig. 1. ROC curve diagram of the variable age to predict neurologic findings in patients with breast pain.

than finding the cause of breast pain. Therefore, extramammary causes of breast pain such as cervical root disorders have been generally omitted, and the patient could not be referred to any treatment that is specific to the cause. To our knowledge, this study has unique results on the rate of upper extremity neurologic findings and cervical MRI findings accompanying breast pain.

It is expected that nerve root pain should follow a specific dermatome, so that physicians can diagnose it as radicular pain. Radiculopathy is a term defined as a constellation of symptoms like paresthesia, hypoesthesia, anesthesia, and motor and/or sensory disturbance [14]. Patients with spinal pain can perceive the pain in a wider area than the expected site of origin which is called referred pain [15]. It is an axiom that nerve root pain or neurologic symptoms should follow a dermatomal distribution; however, some studies showed that it was not a strict rule [16–18]. Murphy et al. [19] investigated the distribution of pain by evaluating 226 nerve roots in 169 patients. They found that cervical nerve roots followed non-dermatomal area in nearly two-thirds of the patients (69.7%). Moreover, pain perceived around the scapulae was present in half of their patients. In our study, we found that neurologic findings were significantly more frequent in women with breast pain (119 [51.1%] vs. 111 [34.6%], $p < 0.001$), and patients with neurologic findings

had 95.6% of cervical disc disorders. Although breast pain dermatome area, T4 in the nipple, does not correspond to a cervical root disorder, we believe that referred pain, scapular area pain, or the periscapular area muscle tension may cause the breast pain. Moreover, stress occurring from either cervical root disorder or any external cause may tense up head and neck, upper extremity or chest muscles, so that it may give rise to extramammary breast pain. Furthermore, musculoskeletal symptoms may interact with physical or psychosocial conditions. Physical inactivity might also increase lower back, shoulder, and neck pain in this patient group [20]. In our study, the patients who had breast pain indicated that they might be physically inactive because they had more neck and back pain and lower educational levels, and less of them were employed.

In conclusion, this unique study showed that there was a considerable amount of cervical root disorders accompanying breast pain in women. If physicians include cervical root disorders in the differential diagnosis of the breast pain, question neurologic symptoms, and do an upper extremity neurologic examination, patients can be diagnosed more accurately and may be given alternative treatment such as physical therapy or spinal surgery.

Statement of Ethics

This research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Patients and controls have given their written informed consent, and the study protocol was approved by the institute's committee on human research.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Conception: A.K. Belli; design: A.K. Belli; supervision: A.K. Belli; materials: A.K. Belli, F. Dinc Elibol, O. Ozcan, O. Dere, C. Yazkan, C. Elibol, O. Nazli; data collection and processing: A.K. Belli, F. Dinc Elibol, O. Ozcan, O. Dere, C. Yazkan, C. Elibol, O. Nazli; analysis and interpretation: A.K. Belli, K. Tosun; literature review: F. Dinc Elibol, O. Ozcan, O. Dere, C. Yazkan, C. Elibol; writers: A.K. Belli, F. Dinc Elibol, O. Ozcan, O. Dere, C. Yazkan, C. Elibol, K. Tosun, O. Nazli; critical review: A.K. Belli.

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