

Research Article

The Prevalence and Influencing Factors of Post-Mastectomy Pain Syndrome Among Breast Cancer Patients in Tertiary Hospitals in China: A Cross-Sectional Study

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Abstract

Background: Surgical treatment is a common method for breast cancer, with many advantages, such as low recurrence rate and high lesion clearance rate. However, due to the traumatic operation, patients are prone to various complications after treatment, such as postoperative pain, which will not only have a negative impact on patients' physical and mental health, but also affect their postoperative recovery. **Objective:** To investigate the current prevalence of Post-Mastectomy Pain Syndrome in patients with breast cancer in tertiary hospitals in China and analyze the influencing factors, so as to provide evidence for postoperative pain. **Methods:** This study was a cross-sectional study. Breast cancer patients followed up in the outpatient department of oncology in a tertiary hospital in Sichuan Province from February 2024 to December 2024 were investigated by convenience sampling method. They were grouped according to whether they had pain syndrome or not, and SPSS 27.0 was used for statistical analysis, with $P < 0.05$ as statistical difference. **Results:** The results of this study showed that the incidence of postoperative pain syndrome in breast cancer patients was 42.9%, and the mode of operation and postoperative adjuvant radiotherapy were the influencing factors for the occurrence of postoperative pain syndrome in breast cancer patients. **Conclusion:** The incidence of postoperative pain syndrome in patients with breast cancer is relatively high. Surgical methods and postoperative adjuvant radiotherapy are the factors affecting the occurrence of postoperative pain syndrome in patients with breast cancer. It is necessary to formulate scientific and effective preventive measures according to the actual situation of patients to alleviate the pain of patients.

Keywords

Post-Mastectomy Pain Syndrome, Breast Cancer, Influencing Factors

1. Introduction

According to GLOBOCAN 2022 data, there were 2.3 million new cases of breast cancer worldwide, accounting for 25% of cancer cases in women, equivalent to one in 20 women.

By 2050, the number of new cases is expected to increase by 38% to 3.2 million, with the largest increase in low - and middle-income countries [1]. In 2022, 670,000 deaths from

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breast cancer will occur globally, accounting for 15.5% of cancer deaths among women. The number of deaths is expected to rise to 1.1 million by 2050. In 2022, 357,200 new cases of breast cancer were reported in China, accounting for about 1/6 of the global total, with the incidence increasing year by year [1-3]. In China, breast cancer has become the largest malignant tumor threatening women's health, the annual increase of incidence is twice that of the world average, and the 5-year survival rate of breast cancer survivors is close to 90%. Currently, modified radical surgery is a common means to treat breast cancer, with many advantages, such as low recurrence rate and high lesion clearance rate. Patients are prone to various complications after treatment, such as postoperative pain, which will not only have a negative impact on patients' physical and mental health, but also affect their postoperative recovery. It has been reported in the literature that chronic postsurgical pain (CPSP) often occurs in breast cancer patients, with the incidence up to 78% [4, 5]. CPSP is a common complication after breast surgery, and chronic pain is very common in breast cancer patients, resulting in huge personal and socio-economic costs [6].

Pain has become an important fifth vital sign, with the continuous development of scientific research and the continuous improvement of people's understanding of pain, pain has become an important indicator to assess the comfort of patients. The International Association for the Study of Pain (IASP) considers pain to be an unpleasant sensory and emotional experience caused by actual or potential tissue damage. It is a subjective experience influenced by factors such as sensation, emotion and experience, and is one of the most common clinical symptoms. Its subjectivity makes it very difficult to evaluate pain objectively and make scientific diagnosis [7]. In medicine and biology, it is also a worldwide problem affecting human health and one of the major challenges faced by international pain experts. Compared with patients with low pain fear levels, patients with high pain fear levels were more sensitive to pain, suggesting a significant correlation between pain fear and pain perception in different individuals [8]; Similarly, for the same patient, the higher the current level of pain fear, the higher the pain intensity reported at the time of pain assessment, suggesting that fear of pain is also significantly associated with pain perception in the same body. Previous studies have shown that young age, preoperative anxiety and depression, postoperative acute pain and axillary lymph node dissection are independent risk factors for CPSP [9]. Pain is an important factor in psychological stress, and the increase of pressure can reduce the pain threshold and tolerance. Patients with a high level of psychological resilience will maintain themselves in a relatively balanced state in the face of pain, and patients can quickly identify pain and actively seek treatment, shortening the course of the disease. Some scholars believe that psychological resilience can also be used as a potential ability to reduce the psychological pressure caused by the disease, and promote the correct treatment of the disease or

the pain caused by the treatment of the disease, so as to promote the recovery of the body [10]. Zinger et al.'s study showed that the higher the patient's expectation of pain, the stronger the degree of pain felt, while the vice versa [11]. Compared with patients with low pain fear level, patients with high pain fear level are more sensitive to pain, which indicates that there is a significant correlation between pain fear and pain perception in different individuals. Similarly, for the same patient, the higher the current level of pain fear, the higher the pain intensity reported at the time of pain assessment, suggesting that fear of pain is also significantly associated with pain perception in the same body [12].

In recent years, more and more scholars have begun to pay attention to the problem of Post-Mastectomy Pain Syndrome (PMPS), which usually refers to chronic pain after breast cancer surgery, usually occurring in the weeks to months after surgery. Such long-term and persistent pain will have a serious impact on patients' daily life. The pathogenesis of breast cancer is complex, if the treatment is not timely, cancer cell metastasis will cause damage to the important organs of patients, and even endanger life. Modified radical mastectomy can reduce the clinical symptoms and prolong the survival of patients, but some patients have PMPS after surgery, which affects the postoperative recovery [13]. This study explored the status quo and influencing factors of PMPS in Chinese breast cancer patients to provide theoretical basis for the next early intervention.

2. Methods

2.1. Participants

Inclusion criteria: (1) Female patients diagnosed with primary breast cancer before surgery; (2) Surgical treatment, including total mastectomy, modified radical mastectomy with sentinel lymph node biopsy or axillary lymph node dissection, and breast-conserving surgery with sentinel lymph node biopsy or axillary lymph node dissection; Age ≥ 18 years old; (3) No previous impairment of motor sensory function of the affected limb; Can clearly express ideas and answer questions, with a certain degree of reading and writing skills.

Exclusion criteria: (1) Patients with serious diseases of the heart, liver, kidney or other systems or mental diseases; (2) Long-term analgesic drug use or opioid addiction; Sample size calculation: Most scholars believe that the number of items in a cross-sectional survey is directly related to the number of sample size. After testing the validity and reliability of the questionnaire, the sample size is usually positioned as 5 to 10 times the number of items in the questionnaire [14]. This parameter standard is the most conducive to maintaining the stability of the questionnaire structure and the most suitable for factor analysis. A total of 10 indicators of general data were included in this study. Considering 10% invalid sample size, the minimum sample size should be 110 patients,

and a total of 154 patients were actually included in the study.

2.2. Measures

The patients were followed up for 3 months after the operation, and the occurrence of PMPS in the patients was analyzed. Diagnostic criteria: Breast cancer pain within 3 months after surgery, including the chest, armpit, lateral shoulder and upper arm. If the above conditions are met, PMPS occurs; otherwise, it does not occur. Researchers make their own decisions through literature review and consultation with experts. Including Age, educational level, religious belief, living style, marital status, working status, monthly family income, disease stage, surgical method, postoperative adjuvant radiotherapy.

2.3. Data Collection Methods

First, communicate and coordinate with relevant departments of the hospital to obtain the consent and cooperation of relevant personnel; The investigator should explain the purpose and significance of this study to the patients. After obtaining the informed consent of breast cancer patients, the members of the research group guided the patients to fill in the questionnaire. Homogeneous training was provided to the members of the research group before the start of the study,

the purpose and significance of the study were explained to the patients in the investigation stage, the survey was carried out on the basis of informed consent, the questionnaires were collected on site, and the patients were urged to fill in the missing questions again, and the data entry process was completed by double-checking. This study has been approved by the hospital Ethics Committee (202104052K01).

2.4. Statistical Methods

SPSS 27.0 software was used for data analysis. The measurement data was described by mean \pm standard deviation, and the counting data was described by case number and component ratio. The single factor analysis was performed by t test, Chi-square test or Fisher exact probability method, $P < 0.05$ was considered statistically significant.

3. Results

The results of this study showed that the incidence of postoperative pain syndrome in patients with breast cancer was 42.9%. The results of this study showed that Operation method and postoperative adjuvant radiotherapy were the influencing factors of PMPS after breast cancer surgery ($P < 0.05$), as shown in Table 1.

Table 1. Analysis of influencing factors of postoperative PMPS in patients with breast cancer.

Item	PMPS n=66	Not PMPS n=88	t/X ²	P
Age	46.25 \pm 5.14	47.68 \pm 4.56	-1.792	0.075
Education level [n (%)]			3.786	0.151
Junior high school and below	20 (30.3%)	40 (45.5%)		
High school and technical secondary school	27 (40.9%)	30 (34.1%)		
University and above	19 (28.8%)	18 (20.5%)		
Religious belief [n (%)]			0.131	0.717
have	7 (10.6%)	11 (12.5%)		
no	59 (89.4%)	77 (87.5%)		
Living style [n (%)]			1.549	0.213
Live alone	15 (22.7%)	28 (31.8%)		
non-solitary	51 (77.3%)	60 (68.2%)		
Marital status [n (%)]			1.422	0.233
unmarried	18 (27.3%)	32 (36.4%)		
Be married	48 (72.7%)	56 (63.6%)		
Working status [n (%)]				
Working	40 (60.6%)	57 (64.8%)		

Item	PMPS n=66	Not PMPS n=88	t/X ²	P
Not working	26 (39.4%)	31 (35.2%)		
Monthly household income (Yuan) [n (%)]			0.125	0.939
< 2000	21 (31.8%)	28 (31.8%)		
2000 ~ 5000	30 (45.5%)	38 (43.2%)		
> 5000	15 (22.7%)	22 (25.0%)		
Disease stage [n (%)]			0.988	0.610
Phase I	8 (12.1%)	13 (14.8%)		
Stage II	47 (71.2%)	56 (63.6%)		
Phase III	11 (16.7%)	19 (21.6%)		
Operation method [n (%)]			4.888	0.027*
Modified radical surgery	55 (83.3%)	83 (94.3%)		
Breast-conserving surgery	11 (16.7%)	5 (5.7%)		
postoperative adjuvant radiotherapy [n (%)]			7.189	0.007*
Yes	31 (47.0%)	23 (26.1%)		
No	35 (53.0%)	65 (73.9%)		

Note: * means $P < 0.05$

4. Discussion

As a common malignant disease leading to breast loss and death in women, breast cancer is generally treated with surgery, such as radical surgery and breast-conserving surgery. However, due to the possible injury of the brachial plexus during surgery, postoperative paresthesia or pain in the arm and armpit may occur, that is, PMPS occurs [15]. PMPS may occur immediately after surgery, or several months after surgery, and can last for many years, seriously reducing the quality of life of patients after surgery and increasing patient pain. This study explored the influencing factors of postoperative pain in breast cancer patients through univariate analysis, and the results showed that the mode of surgery and postoperative adjuvant radiotherapy were statistically significant independent predictors, which provided an important reference for clinical pain management. Social demographic characteristics (such as age, education level, etc.) and some clinical characteristics (such as disease stage) included in this study did not show significant correlation, which may be related to the study sample size and group characteristics, and need further verification. The effect of surgical methods on postoperative pain was consistent with previous studies. This study found that the incidence of pain in patients receiving modified radical surgery was significantly higher than that in the breast-conserving surgery group ($P < 0.05$), which may be directly related to the degree of surgical trauma, and modified radical surgery has lower risk, harm and

postoperative complications. The application of modified radical surgery can preserve the pectoralis major muscle of the patient, so the appearance of the chest wall is closer to the normal state, and the surgery can also alleviate the symptoms of upper limb edema, which is conducive to the maintenance of function, and plays an important role in postoperative breast reconstruction. However, it is easy to cause damage to the intercostal brachial nerve and long thoracic nerve, resulting in chronic neuropathic pain. According to the literature, breast conserving surgery can reduce nerve damage in the chest wall by preserving breast tissue, and the incidence of pain at 3 months after surgery is about 40% lower than that of total mastectomy.

Secondly, there was a significant positive correlation between postoperative adjuvant radiotherapy and pain occurrence. This is closely related to the mechanism of tissue fibrosis induced by radiotherapy. Radiation can cause local microvascular damage and continuous release of inflammatory factors (such as $\text{TNF-}\alpha$ and IL-6), and induce soft tissue fibrosis in the chest wall and armpit area, exacerbating pain symptoms. Studies have shown that patients receiving radiotherapy have a 1.8-fold increased risk of moderate or higher pain, suggesting that clinical pain monitoring should be strengthened during radiotherapy, and prophylactic use of neuralgia drugs such as gabapentin may be considered [16, 17]. It is worth noting that social factors such as marital status and family income did not show statistical significance, which may be related to the bicategorical variable setting adopted in this study. The quality of family support and the

level of financial stress are also predictive of pain experience, suggesting the need for more refined assessment tools in future studies.

The results of this study have guiding value for clinical practice: surgical teams should establish a pain warning system based on surgical methods, and implement early intervention for high-risk patients undergoing total mastectomy and radiotherapy. At the same time, it is suggested that pain management should be included in the routine follow-up project of radiotherapy department, and individual analgesia program should be developed through multidisciplinary collaboration, so as to improve the postoperative quality of life of patients.

5. Conclusion

The results of this study showed that the incidence of postoperative pain syndrome in patients with breast cancer was 42.9%, and surgical methods and postoperative adjuvant radiotherapy were influential factors in the occurrence of postoperative pain syndrome in patients with breast cancer. It was necessary to formulate scientific and effective preventive measures according to the actual situation of patients in clinical practice to alleviate the pain of patients.

6. Limitation

Due to the limitation of manpower and material resources, the sample size of this study is small, so it is suggested to conduct a large sample survey in the next step. In addition, the cross-sectional design of this study failed to track the dynamic evolution of pain, so it is recommended to conduct a multi-center cohort study in the future, combining multi-factor analysis and pain scale score, to further explore the interaction between various factors.

Abbreviations

CPSP	Chronic Postsurgical Pain
IASP	International Association for the Study of Pain
PMPS	Post-Mastectomy Pain Syndrome

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Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author.

Conflicts of Interest

All authors disclosed no relevant relationships.

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