OPEN

The Influence of Preoperative Waiting Time on Anxiety and Pain Levels in Outpatient Surgery for Breast Diseases

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Objective: This study aims to examine the effects of different preoperative waiting times on anxiety and pain levels in patients undergoing outpatient surgery for breast diseases, providing insights for clinical interventions during the perioperative phase.

Methods: Patients who underwent outpatient surgery at a hospital breast center in Ningbo between January 2021 and December 2021 were selected. Their anxiety levels at the time when they entered the preoperative preparation room and when they ended the postoperative waiting period for the rapid frozen section procedure were assessed using the State Anxiety Inventory (S-AI) questionnaire, and their pain levels at the end of the postoperative waiting period were assessed using the short-form McGill Pain Questionnaire. The patients enrolled were divided into 3 groups according to the preoperative waiting time: <2 hours (T1 group), 2 to 4 hours (T2 group), and >4 hours (T3 group); there were 150 patients in each group, and the anxiety and pain levels were compared between the groups.

Results: At the time of entering the preoperative preparation room, patients' S-AI score T1 = T2 ($P > 0.05$), both T1 and T2 < T3 ($P < 0.05$); however, at the time of the postoperative waiting period, patients' S-AI score was T1 < T2 < T3 ($P < 0.05$), and the postoperative waiting period patients' short-form McGill Pain Questionnaire scores were T1 = T2 < T3 ($P < 0.05$).

Conclusions: The perioperative anxiety and pain levels of patients undergoing outpatient breast surgery increased with the prolongation of preoperative waiting time; 4 hours was the critical time point for change, after which the anxiety and pain levels of patients increased significantly.

Key Words: breast surgery, outpatient surgery, preoperative waiting time, anxiety, pain

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B.W. and H.-J.W. contributed equally to this study.

This study was conducted in accordance with the Declaration of Helsinki. This study was conducted with approval from the ethics committee of the Women and Children's Hospital of Ningbo (ethics no: EC2022-M017). Written informed consent was obtained from all participants.

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

All data generated or analyzed during this study are included in this published article.

At present, with the gradual standardization of the outpatient surgery management model and the improvement of surgical and anesthesia techniques, outpatient surgery has received significant attention both in China and abroad. Among these techniques, surgery for benign breast lesions has been carried out in outpatient surgery earlier because of its characteristics of less trauma and faster recovery, which is in line with the concept of rapid recovery from outpatient surgery. Furthermore, in recent years, breast-conserving surgery, cosmetic surgery, and anterior lymph node biopsy for breast cancer have all been tried in outpatient surgery.[1,2] To promote the development of outpatient breast surgery and standardize clinical practice, the 2021 Chinese Expert Consensus on Outpatient Surgery in Breast Surgery has standardized the surgical management model, team building, admission system, and surgical care unit.[3] Although the consensus has provided detailed specifications for preoperative preparation for outpatient breast surgery, there are still more details that have not been standardized, including preoperative waiting time. The study by Pokharel et al[4] showed that excessive preoperative waiting time increases patients' psychological stress and anxiety. Contrarily, other studies have reported negative effects on patients due to short preoperative waiting times.[5] The current studies on preoperative waiting time are mainly limited to the time spent waiting in the preoperative preparation room, and few involve outpatient surgery. The China Outpatient Surgery Cooperative Alliance in 2015 defines outpatient surgery as surgery where patients enter and leave the hospital within 24 hours.[6] Typically, each operating theater in Shanghai Tongji Hospital executes 11 to 12 operations daily. There can be a 7-hour gap between the first and final operations; patients are usually required to check in at 7:30 A.M. for management considerations, resulting in various preoperative waiting periods for patients.[7] Based on the outpatient surgery's unique perioperative management model, this study used breast surgery as an example to analyze the effect of different preoperative waiting times outside the preoperative preparation room on patients' anxiety and pain levels and to provide a clinical basis for future interventions.

METHOD

Objective of the Study

This is a prospective study. Patients who underwent outpatient surgery at a hospital breast center in Ningbo between January 2021 and December 2021 were selected. The inclusion criteria were as follows: (1) age >18 years; (2) preoperative diagnosis confirmed by ultrasound and mammography; (3) preoperative assessment for surgery under local anesthesia; (4) first breast type surgery; and (5) voluntary participation in this study. The exclusion criteria were as follows: (1) a combination of serious cardiac, hepatic, and renal organic diseases (including coronary artery disease, dilated cardiomyopathy, hypertrophic cardiomyopathy, valvular heart disease, and congenital heart disease with a New York Heart Association functional classification of grade II or above); (2) sedative drugs over a long period or within the last 3 months (including barbiturates,

benzodiazepines, propylene glycol-based drugs, pyridinedione-based drugs, and aldehyde-based drugs); (3) patients with severe anxiety, depression, or other psychiatric disorders; and (4) pregnant or lactating patients. The withdrawal criteria were as follows: (1) intraoperative rapid freezing suggests malignancy requiring a change of anesthesia and expansion of the surgical scope and (2) those who requested to withdraw during the procedure.

The sample size was calculated as follows. First, the preoperative waiting time was determined based on the difference between the patient's admission time and the start time of surgery. According to the central limit theorem, when the sample size is 30, the sampling distribution will be very close to the normal distribution. Therefore, a minimum sample size of 30 cases per group was determined for the quantitative study so that the probability P of each sample falling into each group obeys the average distribution, that is, $P = 33.33\%$. The random sampling law follows the normal distribution; let the experimental sampling data be 95% of the confidence interval of the normal distribution, and check the standard normal distribution table to obtain $Z = 1.96$ and the standard sample difference $E = 0.05$. Therefore, according to the sample size formula $N = Z^2 \times [P \times (1 - P)] / E^2$, the total sample size required for sampling is 384; this gives a sample size of 128 cases per group, and taking into account the 10% to 15% sampling error, the sample was extended to 150 cases per group. The study was approved by the ethics committee of the hospital (approval EC2022-M017), and the patients signed the informed consent form.

Research Method

Research Tools

This study applied the State-Trait Anxiety Inventory and the short-form McGill Pain Questionnaire (SF-MPQ) to investigate the related indicators.

The State-Trait Anxiety Inventory was developed by Spielberger et al[8] and is divided into 2 parts: the State Anxiety Inventory (S-AI) and the Trait Anxiety Inventory (T-AI). The S-AI is suitable for assessing the anxiety state of patients in a specific state, including stressful states such as before examinations and surgery, so this self-rated anxiety scale was selected for assessing the anxiety state of perioperative patients. The scale has 20 items to evaluate the stress and anxiety of the observed patients, with a 4-point scale (l–4 points) and a total score (20–80 points).

The SF-MPQ is a simplified version of the original McGill Pain Questionnaire that provides a comprehensive assessment of the nature, extent, and affective state of patients' pain[9] and is suitable for clinical research and nonacute patient investigations. Melzack[10] simplifies the original questionnaire, retaining the 11 items of pain assessment and the 4 items of affective assessment in the SF-MPQ and adding the visual analog scale, making the assessment more accurate than the VAS alone and reducing the assessment time to 2 to 5 minutes.

Investigation Method

Patients were grouped according to their preoperative waiting time, and 150 study participants were randomly selected from each group using the random number table method and divided into less than 2 hours (T1 group), 2 to 4 hours (T2 group), and more than 4 hours (T3 group). The researchers applied S-AI to assess the anxiety status of patients at 2 time points, namely, when they entered the preoperative preparation room (a designated area within a medical facility where patients are prepared before undergoing surgery) and during the postoperative waiting period for the rapid frozen section procedure, and applied SF-MPQ to assess their pain status at the end of the postoperative waiting period.

Statistical Analysis

The SPSS 22.0 statistical software package was used for processing and analysis. Count data were analyzed using frequency and composition ratio for description and the χ^2 test for analysis; measurement data were expressed as mean ± standard deviation, and the Student-Newman-Keuls q test was used for comparison between multiple groups; a value of $P < 0.05$ was considered statistically significant.

RESULTS

General Information of Patients' Families in Each Group

The general information of patients in each group is presented in Table 1. The preoperative waiting times after admission were 1.52 ± 0.30, 2.99 ± 0.58, and 5.22 ± 0.74 hours for patients in groups T1, T2, and T3, respectively. The differences in age distribution among the groups were not statistically significant ($P = 0.386$). There were no statistically significant differences in the payment method, education level, distribution of previous surgical history, surgery time, Breast Imaging Reporting and Data System grading, site of lump, and surgery method among the different waiting time groups ($P > 0.05$).

Comparison of Questionnaire Scale Scores Between Groups

(1) The S-AI scores of patients at each time point were as follows: the S-AI self-rating scale scores of patients in group T1 were 49.28 ± 5.70 and 51.95 ± 5.37 at the 2 time points of entering the preoperative preparation room and waiting for the rapid frozen section procedure after surgery, respectively; 49.59 ± 6.55 and 55.07 ± 5.88 in group T2; and 52.52 ± 7.30 and 61.53 ± 6.98 in group T3, respectively. The differences between the S-AI self-rating scale scores of the above 3 groups were statistically significant at $P < 0.05$ when compared at 2 time points preoperative and postoperatively. The data of the above groups were made into box plots, as shown in Figure 1.

(2) Figure 2 compares the S-AI results at the 2 points between the T1, T2, and T3 groups when they entered the preoperative preparation area and waited for surgery after a rapid frozen section exam. The scores of the T1 and T2 groups in the preoperative preparation room did not differ statistically ($P > 0.05$), and the scores of the T3 group were marginally higher than the scores of the T1 and T2 groups ($P < 0.05$); the rapid frozen section postoperative recovery time S-AI scores in all 3 groups over the period were significantly different when compared ($P < 0.05$), and the scores were T1 < T2 < T3, as shown in Table 2.

(3) The comparison between groups of patients' SF-MPQ scores was as follows: SF-MPQ scores of T1, T2, and T3 groups were 18.43 ± 1.65, 18.05 ± 1.91, and 22.95 ± 3.17.8, respectively ($P > 0.05$). The T1 and T2 group scores were lower than the T3 group scores, and the difference was statistically significant ($P < 0.05$), as shown in Table 3.

DISCUSSION

The Preoperative Waiting Time Influences Perioperative Anxiety Levels in Patients Undergoing Outpatient Breast Surgery

This study showed that patients' anxiety levels increased during the postoperative waiting period compared with the preoperative period. Moreover, the increase in anxiety was directly associated with the length of the preoperative waiting time. The difference

TABLE 1. Comparison of Patients' General Information, n (%)

Projects	<2 h (n = 150)	2–4 h (n = 150)	>4 h (n = 150)	χ^2	*P*
Age, y					
≤29	47 (31.3)	45 (30.0)	51 (34.0)	4.150	0.386
30–39	52 (34.7)	43 (28.7)	53 (35.3)		
≥40	51 (34.0)	62 (41.3)	46 (30.7)		
Payment method					
Medical insurance	96 (64.0)	95 (63.3)	102 (68.0)	0.841	0.657
Self-financed	54 (36.0)	55 (36.7)	48 (32.0)		
Education level					
Undergraduate	71 (47.3)	69 (46.0)	76 (50.7)	0.694	0.707
Bachelor's degree and above	79 (52.7)	81 (54.0)	74 (49.3)		
Previous surgical history					
There are	39 (26.0)	45 (30.0)	49 (32.7)	1.622	0.444
None	111 (74.0)	105 (70.0)	101 (67.3)		
Surgery time, min					
<10	106 (70.7)	112 (74.7)	113 (75.3)	4.021	0.403
10–20	27 (18.0)	30 (20.0)	25 (16.7)		
>20	17 (11.3)	8 (5.3)	12 (8.0)		
BI-RADS grading					
Level 3	106 (70.7)	93 (62.0)	109 (72.7)	4.465	0.107
Level 4	44 (29.3)	57 (38.0)	41 (27.3)		
Site of lump					
Unilateral	112 (74.7)	107 (71.3)	107 (71.3)	0.557	0.757
Bilateral	38 (25.3)	43 (28.7)	43 (28.7)		
Surgery method					
Excision of masses (A)	48 (32.0)	37 (24.7)	49 (32.7)	3.568	0.468
The Mammotome surgery (B)	94 (62.7)	104 (69.3)	90 (60.0)		
A + B	8 (5.3)	9 (6.0)	11 (7.3)		

BI-RADS, Breast Imaging Reporting and Data System.

in S-AI scale scores before and after surgery in the T1 to T3 groups was 2.67 ± 3.27, 5.48 ± 4.77, and 9.01 ± 9.95, respectively. Perioperative anxiety levels can be influenced by various factors, and the lack of preoperative information is considered a critical factor.[11,12] Although medical staff provide patients with information about the disease, pain management techniques, dietary instructions, and surgical procedures after admission, the patient's short-term memory is affected by the uncertainty of the operation time, leading to a potential lack of preoperative information.[13] Gilmartin and Wright[14] discovered that as the waiting time increased, some patients experienced feelings of abandonment and had increased demands for specific operation time and emotional and psychological support. Anxiety can trigger cortisol secretion, even in highly stressful situations such as surgery, and in severe cases, it can result in temporary forgetfulness.[15,16]

According to the study results, patients with a preoperative waiting time of up to 4 hours exhibited similar anxiety levels in the preoperative waiting room. However, anxiety levels increased significantly after 4 hours. It is worth noting that previous studies have shown lower anxiety levels in patients undergoing their first

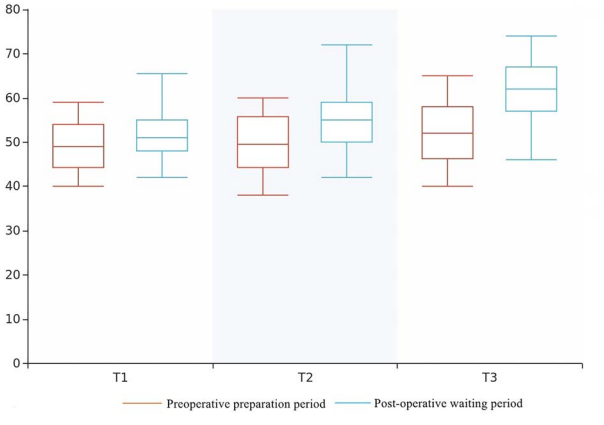

FIGURE 1. Comparison of S-AI scale scores at each time point in the T1 to T3 group.

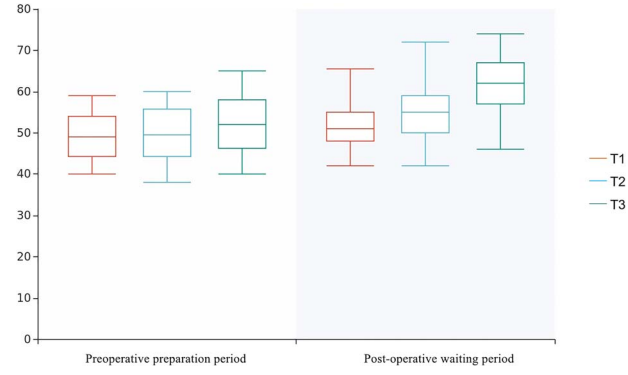

FIGURE 2. Comparison of S-AI scale scores between groups at each time point.

elective procedure compared with those receiving surgery.[17,18] The preoperative waiting time of 2 to 4 hours reported in the study may represent a threshold for anxiety changes in patients undergoing outpatient breast surgery. However, further research is needed to determine the optimal waiting time. Studies on memory curves have revealed that the peak period for short-term memory loss occurs between 2 and 4 hours, with the effective retention rate dropping to approximately 40% at 4 hours.[19] This finding aligns with the study results and suggests that one of the major contributing factors to the significant rise in patient anxiety during this time may be the forgetting of preoperative information.

Preoperative Waiting Time Has an Impact on Perioperative Pain Levels in Patients Undergoing Outpatient Breast Surgery

Our study findings indicate that patients in the T1 and T2 groups had similar postoperative SF-MPQ ratings, whereas the SF-MPQ scores in the T1 and T2 groups were lower than those in the T3 group. This indicates that postoperative pain levels increased with longer preoperative waiting times, with 4 hours being a crucial time point. Anxiety has been shown to contribute to higher postoperative pain levels, increased painkiller requirements, and a longer recovery period.[20] The research by Deng et al[21] also revealed a positive association between perioperative anxiety and pain levels in breast surgery patients. This study further supports these findings by demonstrating that changes in perioperative anxiety and pain levels were closely linked to the preoperative waiting time, specifically approximately 4 hours. This underscores the importance of considering preoperative waiting time. Miguel Romeo and Sagardoy Muniesa[22] found that providing surgery-related information and enhancing objective memory by healthcare providers 1 day before surgery, not just on the day of surgery, effectively reduced postoperative anxiety and pain. Therefore, the forgetting of preoperative information that accompanies increased preoperative waiting time may be a contributing factor to the rise in perioperative anxiety and pain in patients.

Optimization of the Outpatient Surgery Process in Breast Surgery

The Administration of Patients' Admission Times

Currently, most domestic outpatient surgery centers schedule patient admissions routinely at 8:00 A.M. to save on labor expenses and increase management efficiency. However, this practice leads to longer preoperative waiting times, exacerbating patients' perioperative anxiety and postoperative pain levels. The 2019 UK outpatient surgery guidelines recommend that patients be admitted closer to the time of their operation to minimize these negative effects.[23] To mitigate the impact on patients, scheduling 2 different admission times in the morning and afternoon, spaced 2 to 3 hours apart, is advisable. Based on the study results and considering the actual situation in China, the authors suggest implementing 2 admission time slots from 8:00 to 8:30 and 13:00 to 13:30, which would significantly reduce patients' preoperative waiting time without wasting medical resources.

TABLE 2. SNK Test Results for S-AI Scale Scores Were Compared Across Groups at Each Time

Comparison Group	*q*	No. Groups a	*P*
Preoperative preparation period			
T_1 and T_3	4.271	3	<0.05
T_1 and T_2	0.453	2	>0.05
T_2 and T_3	3.590	2	<0.05
Postoperative waiting period			
T_1 and T_3	8.026	3	<0.05
T_1 and T_2	4.433	2	<0.05
T_2 and T_3	7.173	2	<0.05

SNK, Student-Newman-Keuls.

TABLE 3. Analysis of SNK Test for SF-MPQ Scores

Comparison Group	*q*	No. Groups a	*P*
T_1 and T_3	9.596	3	<0.05
T_1 and T_2	1.827	2	>0.05
T_2 and T_3	9.612	2	<0.05

SNK, Student-Newman-Keuls.

Optimization of Preoperative Information

Many patients undergoing outpatient surgery express concerns about a lack of preoperative information.[24,25] The provision of preoperative information serves not only to inform patients about surgery-related details but also to help alleviate negative emotions and build confidence.[26] The forgetting curve model in memory research highlights the effectiveness of repetition in improving memory retention. The 2019 UK guidelines for outpatient surgery recommend providing patients with preoperative information at least 1 day in advance, including basic information about the outpatient surgery center and specific surgical details.[23] Hospitals that have the capacity may consider providing dedicated outpatient surgery rooms to familiarize patients and their families with the environment and processes.[27] By optimizing preoperative information provision, healthcare providers can better support patients and enhance their surgical experience.

However, this study also has some limitations. First, because of the limitations of the types of breast outpatient surgery performed in the hospital, the anesthesia used in the enrolled patients was local; however, general anesthesia is known to have a greater impact on patients' perioperative anxiety, and the clinical expansion of the application will result in some bias. Second, this is a single-center study, which may affect the external validity of the study and its applicability to other centers. The investigators will continue to follow up for further refinement.

CONCLUSIONS

This study highlights the significant impact of preoperative waiting time on perioperative anxiety and discomfort levels in patients undergoing outpatient breast surgery. Shorter waiting times (<4 hours) are associated with lower anxiety and discomfort. Sensible surgical procedure planning and reducing preoperative waiting time offer a cost-effective and patient-centered management strategy for optimizing outcomes.

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