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Original Article

Relaxation training during chemotherapy for breast cancer improves mental health and lessens adverse events

Qing-Hua Song[1], Rong-Mei Xu[1], Quan-Hai Zhang[2], Ming Ma[1], Xin-Ping Zhao[2]

[1]The Center of Physical Health, Henan Polytechnic University, Jiaozuo 454000, Henan Province, P. R. China; [2]The Lab of Human Body Science, Henan Polytechnic University, Jiaozuo 454000, Henan Province, P. R. China

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Abstract: Objective: Mental health issues like anxiety and depression and other adverse events often accompany chemotherapy for breast cancer and can result in reduced quality of life for patients. The present study was aimed to determine whether relaxation training intervention reduces anxiety and other adverse reactions during chemotherapy in patients with breast cancer. Methods: Using a prospective, randomized study design, patients with breast cancer were divided into a control group (n=50) and an experimental group (n=50). Patients in the control group received routine nursing care; those in the experimental group received routine nursing care plus relaxation training, which comprised controlled abdominal breathing and progressive muscle relaxation. Anxiety Inventory and Rotterdam Symptom checklists were administered to patients in both groups before and after chemotherapy to assess mental and physical health status. Mean scores were compared by ANOVA. Results: Mean baseline scores were similar between control and experimental groups before chemotherapy began. Following chemotherapy, all measures in the control group significantly increased from baseline while all measures in the experimental group were similar to baseline. After chemotherapy, mental and physical health scores in the experimental group were significantly lower than those in the control group (P<0.05). Conclusion: Relaxation training during chemotherapy can reduce anxiety and other adverse events in postoperative breast cancer patients. This should be considered a valuable complementary approach in improving patient care.

Keywords: Relaxation training, breast cancer, chemotherapy, anxiety, adverse reaction

Introduction

For patients with breast cancer, chemotherapy is used commonly to prevent tumor recurrence and metastasis following surgical resection [1]. Additionally, chemotherapy can be used in place of surgery and radiotherapy [2, 3]. However, most antineoplastic agents result in varying degrees of toxicity and a range of adverse events in patients [4]. At least 50% of cancer patients have significant psychological stress or other psychological disorders related to diagnosis [5]. Further, undergoing courses of chemotherapy can cause a range of adverse responses including bone marrow suppression, gastrointestinal reactions, hair loss, anxiety, and depression, all of which can affect patients' quality of life [5, 6]. Further, some patients cannot tolerate some of the adverse reactions to chemotherapy, leading them to discontinue the treatment, which can negatively influence treatment outcomes [7].

Depression and anxiety affect a significant proportion of breast cancer patients [8]. A reported 67% of breast cancer patients with depression seek evidence-based treatments for this mental illness. However, complementary and alternative approaches to drug therapies such as anti-depressant and anti-anxiety medication are becoming increasingly popular. A recent meta-analysis and a prospective pilot study both found that yoga provides a feasible alternative to improving both mental health and quality of life in breast cancer patients [9, 10]. Similarly, the application of relaxation techniques has been demonstrated to improve the physiological and psychological effects of chronic health conditions such as hypertension and heart failure [11, 12].

This study sought to determine whether a complementary approach of relaxation training helps alleviate mental and physical side effects during chemotherapy in patients with breast cancer. Two groups of breast cancer patients undergoing chemotherapy were recruited; one received relaxation training while the other received standard nursing care only. Patients received assessment before and after chemotherapy to determine physical and mental health characteristics. The findings of this study indicate that complementary approaches can reduce both psychological and physiological side effects in cancer patients.

Methods

Study participants

The study prospectively recruited 100 breast cancer patients, female all, undergoing treatment in the First Affiliated Hospital of Zhengzhou University (Zhengzhou, Henan Province, China), our hospital between January 2010 and January 2013. Patients ranged in age from 25 to 70 years, with a mean age of 43.6±12.7 years. All participants were breast cancer patients who were, for the first time, receiving chemotherapy as modified radical surgery. Patients were included in the study if meeting the following criteria: 1) diagnosed with breast cancer and modified radical surgery had been implemented; 2) receiving chemotherapy for the first time, using the chemotherapy scheme of cyclophosphamide + hydrochloride epirubicin injection + fluorouracil injection; 3) expected survival greater than 1 year; 4) age > 18 years; 5) having no hearing disorder; 6) able to read and fill out the questionnaire, agreed to be interviewed, and signed the informed consent form. Patients were excluded from the study if they had prior or current mental illness or had a history of neurological disorders.

Participants were assigned to one of two groups, control or experimental, according to order of admission, with 50 in each group. Groups were matched by age, educational level, and tumor stage (P>0.05). During chemotherapy, patients in the control group received conventional care, the experimental group received conventional care and relaxation training. This study was approved by the Ethics Committee of the Henan Polytechnic University, and written informed consent was obtained from the patients.

Relaxation training

Abdominal breathing: Participants in the experimental group were instructed to lie down in a supine position, with both eyes closed and both hands placed on the abdomen or chest, while resting and breathing calmly and naturally. Next, patients were to inhale air via the nose, without chest movement, while trying to lift the abdomen. Finally, patients were instructed to exhale and contract the abdomen, keeping the range of activity of the thorax at minimum. The goal was to slow down and prolong the inspiration and expiration time to a respiratory frequency of about 6 times/min, or about 15 s each breath.

Progressive muscle relaxation: Participants in the experimental group were instructed to lie down in a comfortable position and perform alternating exercises of "contraction-relaxation" of muscles systematically, from toes to head. Each muscle group was to be relaxed for 30 seconds. Meanwhile, experience tightness of the muscle carefully, so as to ease stress and anxiety of the patients.

Symptom evaluation

In the post-operative period, 1-2 days before initiation of chemotherapy and discharge, participants were instructed to fill out the symptom evaluation forms. The researcher answered any patient questions immediately.

State-Trait Anxiety Inventory: Participants were administered the State-Trait Anxiety Inventory (STAI) questionnaire [13], which consists of 20 items: 10 describing negative emotions, and 10 describing positive emotions. The questionnaire is used primarily to assess experiences or feelings about fear, tension, anxiety, and neuroticism at the immediate moment or during a particular time period or situation. The questionnaire items could each be scored from 1 through 4: 1, Not at all; 2, Mild; 3, Moderate; 4, Very obvious. Higher scores corresponded to higher severity of anxiety.

Rotterdam Symptom Scale: Participants were also administered the Rotterdam Symptom Scale [14], which consists of 30 items used to evaluate discomfort of cancer patients. The questionnaire reflects 2 aspects: 1) psychological dimensions, consisting of 8 items (irritabili-

Table 1. Comparison of scores from anxiety and Rotterdam checklists between control and experimental populations before and after chemotherapy ($\bar{x}$±SD)

Group (n)	Assessment time	Anxiety scores	Rotterdam checklist scores		Symptom questionnaire scores
			Physiological dimension	Psychological dimension	
Experimental (50)	Before chemotherapy	41.8±4.7	42.9±4.6	15.2±2.2	58.1±5.0
	After chemotherapy	39.1±4.5	42.8±4.6	15.2±2.2	58.0±5.4
Control (50)	Before chemotherapy	41.5±5.1	42.9±4.7	15.1±2.4	57.9±5.2
	After chemotherapy	46.2±6.0	54.5±5.8	18.7±3.1	73.2±6.9
F value		21.202	71.116	24.291	86.294
P value		0.001	0.001	0.001	0.001

Table 2. Incidences of adverse event symptoms reported before and after chemotherapy [*n* (%)]

Symptoms	Group	Before chemotherapy	After chemotherapy	χ^2 value	*P* value
Loss of appetite	Experimental	21 (42.0)	25 (50.0)	4.167	0.041
	Control	22 (44.0)	35 (70.0)		
Lack of energy	Experimental	21 (42.0)	24 (48.0)	6.000	0.014
	Control	20 (40.0)	36 (72.0)		
Nausea	Experimental	23 (46.0)	26 (52.0)	13.511	0.001
	Control	22 (44.0)	43 (86.0)		
Acid reflux	Experimental	12 (24.0)	14 (28.0)	5.086	0.024
	Control	13 (26.0)	25 (50.0)		
Mouth ulcers	Experimental	5 (10.0)	10 (20.0)	4.762	0.029
	Control	4 (8.0)	20 (40.0)		
Cough	Experimental	11 (22.0)	13 (26.0)	4.340	0.037
	Control	12 (24.0)	23 (46.0)		
Back pain	Experimental	20 (40.0)	13 (26.0)	5.191	0.023
	Control	21 (42.0)	24 (48.0)		

ty, worry, depression, nervousness, loss of confidence in the future, stress, anxiety, inability to concentrate); and 2) physiological dimensions, consisting of 22 items regarding physical discomfort. Each item on this questionnaire can be scored 1-5, as follows: 1, Never; 2, Occasionally; 3, Sometimes; 4, Frequently; 5, Always. Higher scores corresponded to higher severity of discomfort.

Participants were sub-divided into 2 groups according to scores for each symptom in the Rotterdam checklist: those scoring 1 or 2 for a particular symptom were considered as not having that symptom; those scoring 3-5 were considered as having the corresponding symptom.

Statistical analysis

Data were analyzed using SPSS17.0 statistical software. Enumeration data were compared with χ^2 test, and measurement data were compared by analysis of variance using repeated measures. Analyses were two-sided with an α level of 0.05, and P<0.05 was considered statistically significant.

Results

Psychological and physiological symptoms differed following chemotherapy

Patients in each group were assessed with the Anxiety Inventory and Rotterdam checklist (psychological and physiological dimensions) before beginning chemotherapy. The scores for each category were not significantly different between control and experimental groups before chemotherapy (**Table 1**; *P*>0.05). However, following chemotherapy, the scores for each category were lower in the experimental group, which received relaxation training, compared to the control group (*P*<0.05).

Incidence of symptoms reported in Rotterdam checklist differed after chemotherapy

The incidence of symptoms was tabulated from the Rotterdam checklist based on the percentage of patients scoring each symptom as 3 to 5. Before chemotherapy, there was no statistically significant difference in the incidence of loss of appetite, lack of energy, nausea, acid reflux, mouth ulcers, cough, or back pain between the control and experimental groups (**Table 2**; $P>0.05$). After treatment, the incidence of symptoms was not significantly different from the before treatment incidence in the experimental group; however, the pre- and post-chemotherapy scores were significantly different in the control group, with incidences increasing for all symptoms ($P<0.05$). Further, the incidences of these adverse events after chemotherapy were significantly lower in the experimental group than the control group ($P<0.05$).

Discussion

Mental health represents an important concern in the treatment of cancer patients. Indeed, one survey reported that nearly 60% of cancer patients may experience feelings of anxiety and depression [15]. Patients with breast cancer may experience fear, insomnia, irritability, and other psychological issues before cancer surgery, as well as having significant postoperative anxiety and depression during chemotherapy [8, 15]. Alternative and complementary therapies offer the potential to reduce these mental health symptoms, thereby aiding in the treatment and recovery process.

Relaxation training, which promotes muscle relaxation and regulates dysfunction caused by muscle tension, involves systematically repeated cycles of tension and relaxation exercises. Relaxation techniques slow heart and respiratory rates, decrease muscle tension, and can alleviate negative emotions. Previous studies found that abdominal breathing training can alleviate anxiety and adverse reactions in breast cancer patients who received adjuvant chemotherapy [16], and that progressive muscle relaxation training can reduce oxygen consumption, heart rate, respiration rate, and muscle tension, as well as normalize the blood pressure and ease anxiety [17]. Similarly, the current study showed that introducing relaxation training during chemotherapy led to less anxiety than in patients that received only standard chemotherapy without relaxation techniques. Thus, the combination of standard care and relaxation training can improve the psychological health of breast cancer patients.

Following breast cancer surgery, patients may be in a serious state of psychological and physiological stress. Subsequent chemotherapy weakens the immune system, reducing the body's resistance [18] and resulting in numerous adverse reactions. Relaxation training can counteract the negative influence caused by physiological and psychological stress and restore physical, mental, and spiritual balance, helping patients to overcome challenges with more positive approaches and to keep involuntary responses (such as heart rate, respiration rate, blood pressure, and adrenaline secretion) under autonomous control [19]. These, in turn, reduce adverse reactions occurring during chemotherapy. Indeed, this study found that the incidence of adverse physiological symptoms, like loss of appetite, lack of energy, nausea, acid reflux, mouth ulcers, and cough, increased significantly after chemotherapy in the control group, but did not change after chemotherapy in the experimental group. These findings indicate that relaxation training can reduce susceptibility to adverse physiological reactions.

Many breast cancer patients experience a decline in motion range of the involved shoulder joint and dysfunctions of the upper limbs following surgery, with accompanying pain in the back [20, 21]. As was the case for other symptoms, back pain increased in incidence after chemotherapy in the control group. However, back pain was the only symptom with lower incidence after chemotherapy than before chemotherapy in the experimental group, and was significantly lower compared to the control group after chemotherapy. Therefore, relaxation training during chemotherapy alleviated back pain that likely stemmed from the operation to remove the tumor tissue. Progressive muscle relaxation should be considered a valid approach to reducing pain in the postoperative period.

In summary, relaxation training, as a non-pharmacological intervention, can ease anxiety of breast cancer patients and reduce adverse reactions during chemotherapy. This approach

should be considered a valuable complementary approach for use improving overall health in postoperative breast cancer patients.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Rong-Mei Xu, The Center of Physical Health, Henan Polytechnic University, No. 2001 Sijidadao, Jiaozuo 454000, Henan Province, China. Tel: +86-13633915976; E-mail: rmxu2001@126.com

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