

Effectiveness of yoga intervention enhanced by progressive muscular relaxation on pain in women after breast cancer surgery

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Abstract

Introduction. The aim of the study was to evaluate the effectiveness of yoga intervention enhanced by progressive muscular relaxation on pain in women after breast cancer surgery.

Methods. Overall, 84 patients after Madden mastectomy were eligible for this study. After the exclusion of 7 women, 77 participants were randomly allocated to group A ($n = 38$), receiving progressive muscular relaxation and visualization exercises in addition to yoga intervention, and group B ($n = 39$), receiving yoga intervention only. McGill Pain Questionnaire and visual analogue scale were used to evaluate pain at baseline and after the 4-week intervention.

Results. Most of the investigated pain characteristics in both studied groups steadily improved during the 4-week rehabilitation. However, the 4-week monitoring indicated that using progressive muscular relaxation and visualization exercises in addition to the yoga intervention was more effective for reducing self-reported pain in women after Madden mastectomy. The post-intervention level of pain reported in the visual analogue scale and present pain intensity were statistically lower in group A compared with group B by 0.99 points ($p < 0.05$) and 1.68 points ($p < 0.05$), respectively.

Conclusions. Performing progressive muscular relaxation and visualization exercises in addition to yoga intervention helped reduce pain in women after Madden mastectomy.

Key words: mastectomy, visualization exercises, pain, physical intervention

Introduction

Most women after surgical and radiation breast cancer treatment suffer from post-mastectomy pain [1–3]. The patients experience treatment side effects and have various rehabilitation needs, which means that individualization is fundamental for optimal rehabilitation. Unfortunately, pain and functional disorders are common problems among these women and have numerous negative consequences; they may contribute to sleep disturbances, anxiety, fatigue, depression, and negative physical and psychosocial impact on patients' lives [4–7].

Many studies have been conducted on methods to improve psychological and physical well-being in women after breast cancer surgery, including water exercises [8], Pilates intervention [9], and yoga exercises [10], which had a great impact on patients' life quality.

Numerous recent studies have presented that postmastectomy pain is often experienced by patients after breast cancer surgery. It has a considerable influence on patients' quality of life [11–13].

There is a growing body of research that emphasizes the important role of different interventions in reducing postmastectomy pain: healing touch [14, 15], hypnosis [7], yoga exercises [16–20], integrative therapies [21, 22] for treating breast cancer-related pain and lymphoedema.

More and more studies demonstrate the benefits of yoga as an effective tool for cancer symptom management and

reducing post-treatment disturbances in sleep and cognition, anxiety and depression. Various randomized controlled trials have considered yoga exercises for improving psycho-emotional state, as well as reducing anxiety and depression in patients with breast cancer [16, 23, 24].

Numerous studies have shown that progressive relaxation exercises and music therapy address a lot of physical and social needs in breast cancer survivors [25–29]. Meditation, relaxation, and massage are useful tools for reducing mood disorders [30–32].

Despite the available publications, there are no studies in the literature in which progressive muscle relaxation and visualization exercises would be used for the treatment of pain in women after breast cancer surgery.

The hypothesis of the study was that progressive muscular relaxation and visualization exercises might have a great impact on pain reduction in women after breast cancer surgery. The goal of the current research was to evaluate the effectiveness of yoga intervention enhanced by progressive muscular relaxation on pain in this group of women.

Subjects and methods

The study was conducted at the Zaporizhzhya Regional Cancer Centre, Ukraine, between December 2017 and March 2019. Comprehensive sociodemographic characteristics of the patients are shown in Table 1. The inclusion criteria were the following: age of 50–60 years, tumour stages 1–2, aver-

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age time after breast cancer surgery (Madden mastectomy) of 2–3 weeks. The exclusion criteria involved bilateral mastectomy, metastases, stage 3 tumour, and any contraindications limiting activity. A total of 84 patients after Madden mastectomy were eligible for the study. After the exclusion of 7 women, 77 participants were randomly allocated to group A ($n = 38$), receiving progressive muscular relaxation and visualization exercises in addition to yoga intervention, and group B ($n = 39$), receiving yoga intervention only. The primary reasons for ineligibility were diagnosis of stage 3 breast cancer ($n = 4$) and lack of consent to participate ($n = 3$). The McGill Pain Questionnaire and visual analogue scale (VAS) were used to evaluate pain at baseline and after the 4-week intervention. A total of 77 women completed the study and were involved in the final analysis.

The 2 groups performed relevant programs 5 times per week for 1 month and received 20 rehabilitation sessions. Each intervention session lasted 60 minutes. The sessions were held at the Zaporizhzhya Regional Cancer Centre.

The groups received yoga exercises based on the hatha yoga approach, 5 sessions per week for 1 month. The yoga classes were conducted by a physiotherapist who had a high school diploma and 2 years of experience as a yoga teacher. The yoga exercise sessions included a warm-up (10 minutes), exercising (40 minutes), and cooling down (10 minutes of slow movement). Each session began with dynamic exercises for different joints that allowed to increase the range of motion and to prepare the joints for static loading. The emphasis on the specific duration of the respiratory cycle was to regulate the activity of the autonomic nervous system. Prolonged non-forced exhalation, delayed exhalation, and asymmetric breathing through the left nostril were performed to increase the activity of the parasympathetic nervous system; forced inhalation and exhalation through the right nostril served sympathetic activation. The breathing exercises were implemented with an emphasis on long exhalation, well coordinated with movements. The women performed the following asanas to improve the lymphatic drainage: Tadasana, Svastikasana, Greeva Sanchalana, Gomukhasana, Manibandha, KehuniNamana, Scanda Chakra, Makarasana. Patients with the 3rd and 4th degree of lymphostasis did not perform

asanas with prolonged retention of static tension, but increased the number of asanas with arms raised to provide better conditions for lymph outflow.

The intensity of yoga exercise varied from low to moderate. The women constantly concentrated on their own feelings while doing the exercises. Group A additionally performed progressive muscular relaxation and visualization exercises 5 days a week for 4 weeks. All interventions were conducted by the same physiotherapist.

Progressive muscular relaxation is used in order to improve the mental state of women and decrease breast cancer-related pain. It focused on muscle groups of the upper and lower limbs, abdomen, back, and neck. Relaxation sessions were performed on a comfortable relaxation mat in lying position and lasted 20–30 minutes. The aim of progressive muscular relaxation is to achieve an arbitrary relaxation of muscles and to relieve pain in different part of the body. Women are taught the basic techniques of muscle relaxation and self-regulation of breathing. The beginning of the progressive muscular relaxation is accompanied by a brief conversation about its essence, physiological bases and effects on the body, as well as the women’s ability of self-suggestion.

Visualization exercises were run by a physiotherapist. During the visualization, it is necessary to provide a proper atmosphere (appropriate musical accompaniment; pleasant, calm tone of the leader; access to fresh air; etc.). Creating mental images contributes to the formation of positive expectations, reducing pain, strengthening the patients’ belief in the possibility of recovery. Women need to realize the negative impacts on their somatic state, as well as the healing power of positive attitudes to overcome negative emotions and breast cancer-related pain. Then the physiotherapist began to switch the woman’s attention to the fingertips of the right and left hands, to the tingling sensation and warmth that passed along the upper limb. When switching attention from hand to foot, it is essential to focus on breathing and a heartbeat. Next, the attention gradually switched to the legs. An idea was created that pleasant heat spread to the solar plexus, which promoted enjoyable muscle relaxation in the neck, abdominals, and back. After complete relaxation, the whole picture was presented as if the whole body was filled

Table 1. Sociodemographic and treatment-related characteristics of study participants

Characteristics	Groups		p	
	A (n = 38)	B (n = 39)		
Age (M ± SD)	57.10 ± 1.37	57.40 ± 1.24	> 0.05	
Race	White, n (%)	37 (97%)	37 (95%)	> 0.05
	Black, n (%)	1 (3%)	2 (5%)	> 0.05
Married/committed relationship, n (%)	28 (74%)	28 (72%)	> 0.05	
High school graduate, n (%)	25 (65)	25 (64%)	> 0.05	
College graduate, n (%)	12 (32%)	13 (33%)	> 0.05	
Post-graduate, n (%)	1 (3%)	1 (3%)	> 0.05	
Body mass index, kg/m ² , (M ± SD)	24.31 ± 0.38	24.29 ± 0.43	> 0.05	
Surgery type (Madden mastectomy), n (%)	38 (100%)	39 (100%)	> 0.05	
Time since surgery treatment completion, weeks (M ± SD)	2.13 ± 1.47	2.23 ± 1.39	> 0.05	
Cancer stage	1, n (%)	9 (24%)	10 (26%)	> 0.05
	2, n (%)	29 (76%)	29 (74%)	> 0.05

M – mean, SD – standard deviation

with a pleasant sensation of freshness, peace, and positive energy. The women remained in this relaxed state for 10–15 minutes.

The McGill Pain Questionnaire [33] and VAS [34] were applied to evaluate breast cancer-related pain in women. VAS is a useful tool to assess qualitative and quantitative pain characteristics in patients with breast cancer. The respondent should mark a point on a 10-cm horizontal line that corresponds to their subjective severity of pain. The results are interpreted as follows: 0–1 cm stood for almost no symptoms; 1.0–1.9 cm indicated a very slight level of symptoms; 2.0–4.0 cm represented a mild level of symptoms; 4.1–6.0 cm attested to a moderate level of symptoms; 6.1–8.0 cm denoted a severe level of symptoms; and 8.1–10 cm implied a very severe level of symptoms [34].

The McGill Pain Questionnaire gave a complete picture of the qualitative characteristics of pain by 78 descriptors in 20 subclasses. Sensory pain quality was assessed by the word groups 1–10, 17–19; affective pain quality was evaluated by the word groups 11–15, 20; and cognitive pain quality – by the word groups 16, 20 [33].

The recorded data were analysed with the Statistica software, version 8.00. The Shapiro-Wilk test was completed to verify the normal distribution of data. The paired t-test was used to compare pre- and post-treatment pain changes for each group. Independent sample t-tests served to compare post-intervention pain parameters between the patients of the 2 groups.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Khortytsia National Academy review committee.

Informed consent

Informed consent has been obtained from all individuals included in this study.

Results

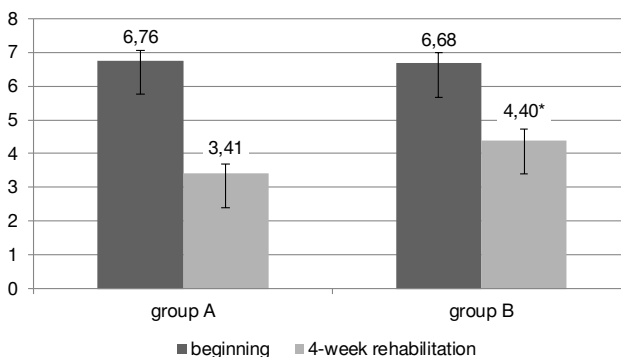
The pain characteristics in patients of the studied groups assessed during the intervention by the McGill Pain Questionnaire are presented in Table 2. The initial survey results indicated that the women predominantly used words from the sensory subcategory to describe their feelings in comparison with the affective quality. About 77% of the respondents from both groups felt constricting pain in the affected breast and 87% noted cramping pain from the affected upper extremity after Madden mastectomy.

The results of pain assessment by VAS (Figure 1) indicated the presence of a severe level of pain, whose average baseline values were 6.76 ± 0.15 points in patients from group A and 6.68 ± 0.14 points in those from group B. A detailed analysis of the participants' responses by the cognitive subcategory showed that in group A, mild pain was experienced by only 8% of women, moderate pain by 27%, and severe pain by 65%; the respective values reported for group B were 9%, 30%, and 61%.

The findings suggested that performing progressive muscular relaxation and visualization exercises in addition to yoga intervention had a positive impact on reducing pain in the affected breast and upper extremity in women from group A. The results of the 4-week rehabilitation revealed a gradual decrease in the indicators of sensory, affective, and cognitive qualities of pain by 1.16 points ($p < 0.001$), 0.40 points ($p < 0.05$), and 3.76 points ($p < 0.001$), respectively, in group A (Table 2).

Applying only yoga intervention in group B resulted in a decrease of sensory quality by 0.92 points ($p < 0.01$), affective quality by 0.04 points ($p > 0.05$) and cognitive quality by 1.96 points ($p < 0.05$). The present pain intensity steadily decreased during the 4-week rehabilitation in women of both groups. The comparison of present pain intensity between the patients of the studied groups showed a significant difference at the end of the 4-week rehabilitation. The parameter was significantly lower in women from group A compared with group B, by 1.68 points ($p < 0.05$). The indicator of cognitive quality was also lower in group A than in group B, by 1.36 points ($p < 0.05$).

The results of the repeated VAS analysis depicted the presence of mild level pain symptoms in women of group A and moderate level pain symptoms in group B (Figure 1). The comparison of VAS scores showed lower values in group A compared with group B, by 0.99 points ($p < 0.05$).



* $p < 0.05$ compared with the data between group A and group B

Figure 1. Pain dynamics assessed by visual analogue scale in women of the studied groups during the intervention

Table 2. The evolution of pain characteristics (mean \pm error of mean) assessed with the McGill Pain Questionnaire in patients of the studied groups during the intervention

Pain quality indicator	Group A (n = 38)			Group B (n = 39)		
	Beginning	4-week rehabilitation	p	Beginning	4-week rehabilitation	p
Sensory quality	2.68 \pm 0.16	1.52 \pm 0.10	< 0.001	2.76 \pm 0.16	1.84 \pm 0.19	< 0.01
Affective quality	1.96 \pm 0.14	1.56 \pm 0.10	< 0.05	1.72 \pm 0.13	1.68 \pm 0.19	> 0.05
Cognitive quality	6.88 \pm 0.38	3.12 \pm 0.13*	< 0.001	6.44 \pm 0.23	4.48 \pm 0.33	< 0.05
Present pain intensity	13.56 \pm 0.66	5.92 \pm 0.35*	< 0.001	14.88 \pm 0.90	7.60 \pm 0.71	< 0.001

* $p < 0.05$ for the comparison between group A and group B

Discussion

The present study was performed to evaluate the effectiveness of yoga intervention enhanced by progressive muscular relaxation on pain in women after breast cancer surgery. Unique to this study, we considered the current level of the functional state of the cardiovascular system in our participants in the proposed yoga exercise program. The prescribed yoga program for the women with breast cancer also varied in the duration and intensity of the sessions and the number of exercise repetitions.

Our study supports the findings that progressive muscle relaxation is an effective tool to reduce pain [35] and yoga is really important for women's health [36]. The majority of previous studies focused on the effects of yoga on reducing fatigue, depression, sleep disturbances, and poor quality of life in patients with breast cancer [16, 18–20, 24]. Our data agree with the considerable body of research that recommends regular physical exercises as an effective tool for reducing breast cancer treatment-related pain complications, fatigue, stress, and depression, as well as improving life quality in patients with breast cancer [16, 17, 21]. The results from this study indicate that special yoga exercises enhanced by progressive muscular relaxation and visualization exercises are effective on pain in women after breast cancer surgery. There was a decrease in the pain intensity evaluation by the McGill Pain Questionnaire and VAS in women from group A.

The strengths of the current research involved providing a rational combination of breathing exercises, progressive muscular relaxation, visualization exercises, resistance and stretching yoga practices based on patients' preferences and their physical and psychological conditions. Breathing exercises and visualization exercises helped women to focus their attention on the present moment and to cope successfully with pain.

A positive, friendly atmosphere during the training sessions and obtaining positive effects from the exercises were motivating factors for the patients to systematically attend the interventions throughout the month. The possibility to create an atmosphere of unity in the group, to share personal feelings at the end of classes among women, to discuss the impressions received from the lesson constituted excellent prerequisites for effective pain reduction. Our data confirmed the results of a previous study [37] in the context of the importance of group support among women who experienced mastectomy. No harms or unintended effects were observed in the studied groups.

Future research should be aimed at determining the effectiveness of the yoga intervention on improving the respiratory function in women after breast cancer surgery.

Limitations

Despite these strengths, the weak side of the current study is that various pain characteristics in women after Madden mastectomy were evaluated by using a questionnaire and thus differences in the emotional condition of the participants could have an impact on the obtained results. Further studies are needed to investigate the effectiveness of yoga on pain parameters in a heterogeneous population.

Conclusions

The results of the 4-week rehabilitation imply that using progressive muscular relaxation and visualization exercises in addition to the yoga intervention improved effectiveness

and had a favourable impact on pain in women after Madden mastectomy.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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