Int J Clin Exp Med 2020;13(8):5831-5837
www.ijcem.com /ISSN:1940-5901/IJCEM0112178

Original Article

Effect of progressive muscle relaxation (PMR) on mental health, sleep quality and quality of life in patients who underwent thyroid cancer surgery

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Received April 9, 2020; Accepted May 22, 2020; Epub August 15, 2020; Published August 30, 2020

Abstract: Objective: To analyze the effect of Progressive Muscle Relaxation (PMR) on patients with thyroid cancer undergoing surgery. Methods: A total of 79 patients with thyroid cancer who underwent surgery were enrolled. There were 39 patients who received conventional nursing that were regarded as the control group (CG), and 40 patients who were provided with PMR and conventional nursing were included in the observation group (OG). Emotional health, sleep quality, and quality of life between the two groups were compared. Results: (1) The systolic blood pressure, diastolic blood pressure, and heart rate after surgery in the OG were lower than those in the CG ($P < 0.05$). (2) The SDS and SAS scores in the OG were lower than those in the CG after the surgery ($P < 0.05$). (3) PSQI scores in the OG at discharge and 1, 2, and 3 months after discharge were lower than those in the CG ($P < 0.05$). (4) Quality of Life, including PH, PS, EN, and SR scores were higher than those in the CG ($P < 0.05$). (5) The nursing satisfaction of patients in the OG and CG was 95.00% and 79.49%, respectively. Conclusion: PMR can help reduce adverse emotions and improve the sleep quality and quality of life in the treatment of patients with thyroid cancer undergoing surgery.

Keywords: Progressive muscle relaxation, thyroid cancer, surgery, nursing, emotional health, quality of life

Introduction

Thyroid cancer which starts in the thyroid gland shows a high incidence among all head and neck malignancies. Its incidence is significantly higher in women than in men [1]. In recent years, the advancement of testing technology and the increased awareness have resulted in higher detection rate of thyroid cancer [2].

For patients diagnosed in the early stage, surgery is the best option. Although surgery can effectively remove tumor tissue, it will leave obvious traumas, and the cancer itself is a strong stressor for the patient. Patients are likely to experience a variety of adverse emotions due to low psychological tolerance resulting from pain [3]. The persistence of anxiety, depression, resistance, and fear will affect patients' daily life and sleep quality, and the long-term impact of sleep quality will further affect the quality of life, eventually forming a vicious circle [4].

In order to reduce the stress caused by disease and surgery as well as the impact on patients' emotions, sleep and quality of life, it is necessary to implement corresponding nursing interventions. This study is aimed to analyze the effects of Progressive Muscle Relaxation (PMR) during thyroid cancer surgery. During training, the muscle system is consciously and systematically relaxed, so that the stress levels are lowered and adverse effects on the body and mind are alleviated [5]. This study included 79 patients with thyroid cancer in our hospital from which we explored more useful methods for the nursing of patients with thyroid cancer.

Materials and methods

Baseline data

In all, 79 patients with thyroid cancer in our hospital from July 2018 to June 2019 were enrolled. There were 39 patients who were included in the control group (CG) and 40 patients were

enrolled as the observation group (OG). All patients signed an informed consent and this study was approved by the Ethics Committee of our Hosptital. (1) Inclusion criteria: Patients who meet the diagnostic criteria for thyroid cancer [6] and were confirmed by imaging examination; Patients who were to undergo surgery; Patients who have normal communication skills; Patients with stable signs, without severe accompanying symptoms. (2) Exclusion criteria: Patients who have contraindications to surgery or anesthesia; Patients who have distant metastasis; Expected life duration of time < 3 months; Postoperative chemotherapy and other treatments are expected; Anxiety and insomnia are confirmed before surgery.

Methods

The CG received conventional nursing after surgery. During the preoperative care, the nursing staff informed the patients of disease-related knowledge, explained the necessary and expected results of surgery, surgery methods, procedures, and medical team qualifications, and successful cases of the same type. Nursing staff instructed the patients to practice the posture during surgery in advance to ensure that the patient can cooperate with the surgery. The hair behind the patient's ears was shaved before surgery to ensure a smooth lymphadenectomy during the surgery. Sedatives could be administrated to improve sleep quality on the day before surgery. During postoperative care, the nursing staff guided patients' body posture, monitored vital signs, and closely observed changes in the patient's condition, and rationally used analgesics in patients with severe pain.

The OG was additionally provided with PMR training. PMR training was performed twice a day starting from the patient's admission. The training was performed after treatment, at noon or in the evening. The training environment was kept comfortable and quiet, and appropriate room temperature and humidity was maintained. The bladder was emptied in advance. Patient clothing is loose and can be easily removed. All jewelry was removed and the mobile phone was turned off to keep the mind calm and concentrated. After 10 minutes of close-up eye work, the PMR training was officially conducted. The training was performed in accordance with the Operational Tutorial of Progressive Muscle Relaxation published by the Chinese Medical Association Audiovisual Press [7]. Maintaining continuous tension in the muscles for 10 seconds was necessary. This step involves quickly relaxing the tensed muscles. After about 10 seconds, then let all the tightness flow out of the tensed muscles.

It is important to very deliberately focus on and notice the difference between the tension and relaxation. The training order for muscle groups are right hand, right forearm, right upper arm, left hand, left forearm, left upper arm, chest, neck, shoulder muscle, back, abdominal, left and right thigh, and calf muscle. The first 2 training sessions were conducted under the guidance of the nursing staff. During the training, the nursing staff checked to ensure that each posture was accurate. Starting from the 3rd training session, it is carried out by the patient or with the help of family members. Each training lasts for half an hour. After discharge, the patient still needs to perform training once a day, which lasts for one month after discharge. Patients in both groups were followed up for 3 months, and the nursing effects were compared after the follow-up.

Outcome measurement

Vital Signs: Systolic blood pressure, diastolic blood pressure, and heart rate were measured before and after surgery.

Depression: The self-rating depression scale (SDS) [8] is used for evaluation of depression. It contains 20 items. Each item is scored on a Likert scale ranging from 1 to 4. A total score is derived by summing the individual item scores, and ranges from 20 to 80. Most people with depression score between 50 and 69, while a score of 70 and above indicates severe depression. Evaluations were performed before surgery, after entering the operating room, and after surgery.

Anxiety: It was assessed by the Self-Rating Anxiety Scale (SAS) [9], containing 20 items, each item being a grade of 1-4. One means a little of the time; 2 indicated some of the time; 3 means good part of the time and 4 means most of the time. The cut-off value of the SAS scores is 50, less than 50 is no anxiety, 50 to 59 is mild anxiety, 60 to 69 is moderate anxiety, and more than 70 is severe anxiety. SAS

Table 1. Comparison of baseline data between observation group and control group ($\bar{x} \pm s$)/[n (%)]

Data		Observation (n=40)	Control (n=39)	t/X^2	*P*
Gender	Male	13 (32.50)	11 (28.21)	0.172	0.678
	Female	27 (67.50)	28 (71.79)		
Age (years)		53.62±5.49	55.37±6.12	1.339	0.185
Type	Papillary adenocarcinoma	16 (40.00)	14 (35.90)	1.321	0.185
	Follicular carcinoma	14 (35.00)	14 (35.90)		
	Medullary carcinoma	10 (25.00)	11 (28.21)		
TNM stage	I	18 (45.00)	16 (41.03)	0.965	0.423
	II	13 (32.50)	14 (35.90)		
	III	9 (22.50)	9 (23.08)		
Education level	Middle school	15 (37.50)	16 (41.03)	1.374	0.271
	High school	17 (42.50)	15 (38.46)		
	University	8 (20.00)	8 (20.51)		

was evaluated before surgery, after entering the operating room, and after surgery

Sleep quality: The Pittsburgh sleep quality index (PSQI) [10] was selected for evaluation. The component scores consist of subjective sleep quality, sleep latency (i.e., how long it takes to fall asleep), sleep duration, habitual sleep efficiency (i.e., the percentage of time in bed that one is asleep), sleep disturbances, use of sleeping medication, and daytime dysfunction. Each item is weighted on a 0-3 interval scale. Assessments were performed before surgery, at discharge, 1 month, 2 months, and 3 months after discharge.

Quality of life: The Whoqol-bref World Health Organization quality of life scale (WHOQOL-BREF) was adopted [11] for evaluation. It contains 26 questions ranked according to a five-point Likert scale and measures four domains: physical health, psychological health, social relations and environment. Assessments were performed at discharge and 3 months after discharge.

Nursing satisfaction: When the patient is discharged from the hospital, the self-made satisfaction questionnaire is used for evaluation. The survey items include nurse's attitude, patient's recognition of nursing, nurse-patient relationship, and effectiveness of nursing. A score of 90 or above indicates complete satisfaction, a score of 70-90 indicates general satisfaction, and a score below 70 indicates dissatisfaction. Nursing satisfaction = (number of fully satisfied cases + number of generally satisfied cases)/total number of cases * 100%.

Statistical methods

Statistical analysis was performed using SPSS 22.0. Measurement data were expressed as mean ± standard deviation. Comparison between groups was performed using independent sample t test. Count data were expressed using [n (%)] and examined using chi-squared test. Multi-point comparison was analyzed by ANVOA with post hoc F test. $P < 0.05$ indicated that the difference was statistically significant.

Results

Baseline data

There was no significant difference in the male to female ratio between the OG and the CG ($P > 0.05$). The average age and proportion of each pathological type in the OG was not significantly different from the CG ($P > 0.05$). There was no significant difference in the TNM stages between the OG and the CG ($P > 0.05$). There was no significant difference in the level of education between the OG and the CG ($P > 0.05$) (**Table 1**).

PMR improves vital signs

The postoperative systolic blood pressure, diastolic blood pressure, and heart rate in the CG were higher than those before surgery ($P < 0.05$). The OG had lower postoperative systolic blood pressure, diastolic blood pressure, and heart rate than the CG ($P < 0.05$) (**Table 2**).

Table 2. Comparison of vital signs before and after surgery between the two groups ($\bar{x} \pm s$)

Grouping	Systolic pressure (mmHg)		Diastolic pressure (mmHg)		Heart rate (time/min)	
	Before surgery	After surgery	Before surgery	After surgery	Before surgery	After surgery
Observation (n=40)	140.13±5.39	138.45±6.12	87.15±5.13	90.65±6.38	88.13±4.18	90.34±5.85
Control (n=39)	139.82±6.13	155.42±4.19*	86.95±5.32	102.34±8.46*	86.95±5.42	98.45±6.42*
t	0.239	14.345	0.170	6.946	1.085	5.871
P	0.812	0.000	0.865	0.000	0.281	0.000

Compared with before surgery, $*P < 0.05$.

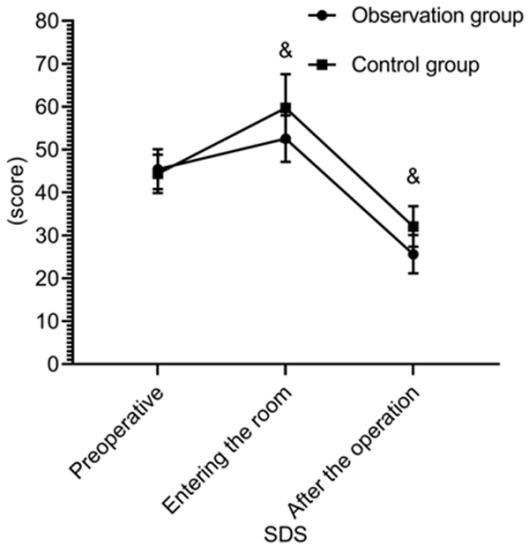

Figure 1. Comparison of SDS scores between the two groups. There was no significant difference the observation group and control group before surgery (P > 0.05). Compared with the control group, the SDS score in the observation group was significantly lower (P < 0.05). The SDS scores after surgery was significantly lower in the observation group than in the control group (P < 0.05) & indicates P < 0.05.

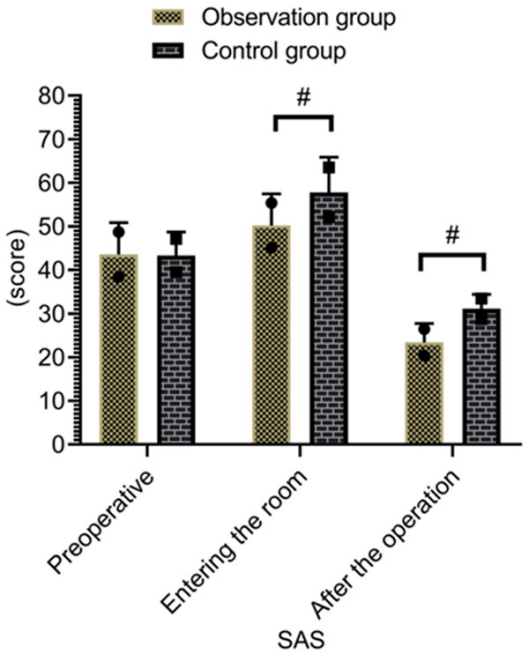

Figure 2. Comparison of SAS scores o between the two groups. There was no significant difference in SAS scores the observation group and control group before surgery (P >0.05). Compared with the control group during surgery, the observation group was significantly lower (P < 0.05). The SAS scores after surgery in the observation group was significantly lower than that in the control group (P < 0.05). # indicates comparison between two groups P < 0.05.

PMR reduce SDS score

There was no significant difference in SDS score in the OG and CG before surgery (P > 0.05). The SDS scores of the two groups increased significantly after entering the operation room, showing significant difference within the group in comparison with before surgery (P < 0.05). The SDS scores of the two groups decreased significantly after surgery, showing a significant difference within the group in comparison with before surgery and after entering the operation room (P < 0.05). It was significantly lower in the OG than the CG (P < 0.05) (**Figure 1**).

PMR reduces SAS score

There was no significant difference in SAS score in the OG and CG before surgery (P > 0.05). The SAS scores of the two groups increased significantly after entering the operation room, showing significant difference within the group in comparison with before surgery (P < 0.05). The SAS scores of the two groups decreased significantly after surgery, showing significant difference within the group in comparison with before surgery and after entering the operation room (P <0.05). SAS scores were significantly lower in the OG than the CG (P <0.05) (**Figure 2**).

PMR improves sleep quality

There was no significant difference in PSQI score in the OG and CG before surgery (P >

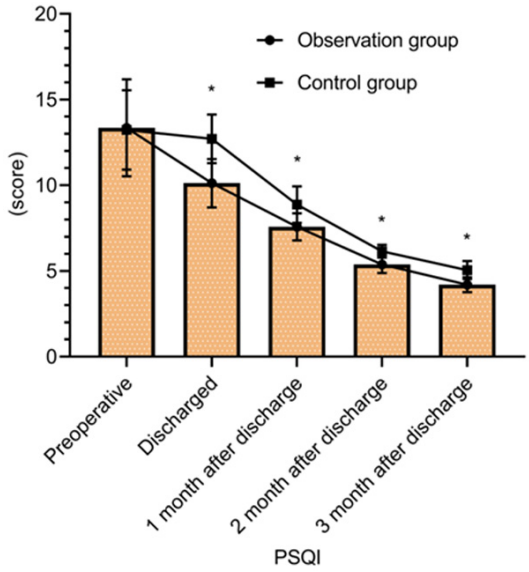

Figure 3. Comparison of sleep quality scores between the two groups. There was no significant difference in PSQI scores between the observation group and control group before surgery ($P > 0.05$). Compared with the PSQI scores of the control group at discharge, the observation group was significantly lower ($P < 0.05$). The PSQI score of the observation group was significantly lower at 1 month, 2 months and 3 months after discharge than the control group ($P < 0.05$). * indicates $P < 0.05$.

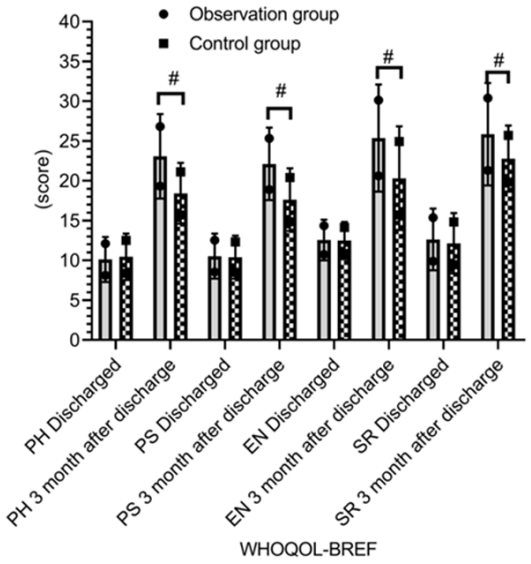

Figure 4. Comparison of quality of life between the two groups. Compared with quality of life at the time of discharge from the control group, it is not significantly different from the observation group ($P > 0.05$). Compared with scores at 3 months after discharge, the observation group was higher ($P < 0.05$). # indicates $P < 0.05$.

0.05). At discharge, 1 month, 2 months, and 3 months after discharge, the PSQI scores in the OG were significantly lower than those before surgery ($P < 0.05$). There was no significant difference in PSQI score in the CG at discharge and before surgery ($P > 0.05$), whereas 1 month, 2 months and 3 months after discharge, the PSQI score in the CG was lower than that before surgery and at discharge ($P < 0.05$). At discharge, 1 month, 2 months, and 3 months after discharge, the PSQI scores in the OG were significantly lower than those in the CG ($P < 0.05$) (**Figure 3**).

PMR improves quality of life

There was no significant difference in the PH, PS, EN and SR in both groups at discharge ($P > 0.05$). The PH, PS, EN, and SR scores of the OG and CG at three months after discharge were higher than those within the group at discharge ($P < 0.05$). The PH, PS, EN, and SR scores of the OG were higher than those of the CG at three months after discharge ($P < 0.05$) (**Figure 4**).

PMR improves nursing satisfaction

Of the 40 patients in the OG, 16 were completely satisfied with the nursing and care, 22 were generally satisfied, 2 were dissatisfied. To sum up, in the OG 95% were satisfied. Of the 39 patients in the CG, 12 were fully satisfied with the nursing and care; 19 were generally satisfied There were 8 cases of dissatisfaction, the nursing satisfaction rate was 79.49%, and the difference with the OG was statistically significant ($P < 0.05$) (**Table 3**).

Discussion

The thyroid tissue plays an important role in metabolic regulation, which can directly affect the autonomic nervous system. Insufficient or excessive secretion of thyroid hormones will cause emotional disorders, among which anxiety and depression occur with the highest incidence [12, 13]. When the mood continues to be unstable or there are negative emotions, patients will experience a variety of physiological changes, including increased cardiac output, heart rate as well as blood pressure, and accelerated metabolism. Patients often fail to fall asleep at night, their sleep quality declines,

Table 3. Comparison of patient satisfaction between the two groups [n (%)]

	Fully satisfied	Generally satisfied	Dissatisfaction	Satisfaction rate
Observation (n=40)	16 (40.00)	22 (55.00)	2 (5.00)	38 (95.00)
Control (n=39)	12 (30.77)	19 (48.72)	8 (20.51)	31 (79.49)
X^2				4.298
P				0.038

and their life of quality decreased over time [14].

In order to maximize the value of surgical treatment of thyroid cancer, and reduce as much as possible the patient's adverse emotions, sleep disorders, and reduce the impact on patients' quality of life, this study chose to carry out PMR training in addition to surgery in the OG. After implementation of PMR training, the patients 'heart rate and blood pressure did not change significantly. The patients' heart rate and blood pressure levels were significantly lower than those of the CG receiving only conventional nursing ($P < 0.05$). The application of PMR helps to stabilize the perioperative physical condition of patients, narrow the fluctuation range of physical indicators, and ensure the smoothness and safety of the surgery. In this study, the SAS and SDS scores of the OG after entering the operation room and after the operation were lower than those of the CG ($P < 0.05$), suggesting that the application of PMR training in surgical care can significantly reduce the adverse emotions of patients with thyroid cancer, which is important for a smooth operation.

PMR training can effectively alleviate anxiety and depression. Its effects lied in the theory of reciprocal inhibition. The theory proposes that emotional states and muscle activities can interact with each other via nervous system [15, 16]. Park ES et al. [17] conducted a controlled study of PMR training in cancer patients, and the results showed that the anxiety of patients receiving PMR training was significantly lower. In addition, Ikemata S et al. [18] showed that the application of PMR training in surgery can significantly reduce the anxiety of patients before surgery.

In this study, the PSQI scores of the OG at discharge and at 1, 2 and 3 months after discharge were lower than those of the CG ($P < 0.05$), and the scores of the quality of life were higher than those of the CG at 3 months after discharge, suggesting that PMR training could significantly improve the postoperative sleep quality of patients with thyroid cancer and improve their quality of life. Hassanpour-Dehkordi A et al. [19] showed that patients receiving PMR training had significantly higher sleep quality than patients receiving breath guidance. Akmeşe ZB et al. [20] showed that compared with patients who did not receive PMR training, the sleep quality of patients receiving PMR training were improved significantly. The sleep quality of thyroid cancer is affected by various factors such as disease stress, surgical stress, postoperative incision stress, and psychological condition and patients will also experience swallowing disorders, and in the meantime, thyroid function will decrease, causing chills and fatigue, abdominal distension and other symptoms, patients' sleep quality will also be greatly affected [21, 22].

Through PMR training, patients can consciously keep stress-muscle-tension cycle going, and the muscles can be in a relaxed state. Various functions that are disturbed due to tension stimulation can be adjusted to reduce the arousal of cerebral cortex and help patients fall asleep faster and achieve improved sleep quality [23, 24]. A controlled study of Kraus D [25] using synchronized brainwave therapy combined with PMR showed that the quality of life of patients who received combined progressive muscle relaxation therapy was improved significantly compared to those who didn't receive therapy.

However, only a small number of subjects were included in this study. The short postoperative follow-up time may bias the results. Therefore, a larger sample size and more in-depth study will be carried out in the future to provide more guidance for the surgical nursing of patients with thyroid cancer.

In summary, PMR training can help reduce bad moods and improve the quality of life and sleep quality in the treatment of patients with thyroid cancer undergoing surgical treatment.

Disclosure of conflict of interest

None.

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