

The Effects of Progressive Muscle Relaxation on Preoperative Anxiety and Blood Pressure in Patients with Aneurysm

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ABSTRACT

This study, conducted on diagnosed aneurysm patients, in order to test the effects of progressive muscle relaxation on blood pressure and anxiety levels in the preoperative period, was carried out in a quasi-experimental study with a pre-test and post-test application. The data of this study were collected between January 2022-September 2022 at the neurosurgery clinic on 38 patients (twenty women and eighteen men) who've been diagnosed with cerebral aneurysm, awaiting a surgical operation, and have other criteria to be taken into the study. Pre- and post-exercise vital signs and anxiety levels of patients receiving progressive muscle relaxation exercises for twenty minutes in the preoperative period were measured with the Visual Analogue Scale (VAS) and Beck Anxiety Inventory (BAI). Frequency analysis for descriptive statistics, and t-test analysis for blood pressure, pulse, respiration, BAI, and VAS scores in a single group were utilized. Progressive muscle relaxation exercises in the preoperative period for neurosurgery patients diagnosed with aneurysm have statistically significant effects in reducing the patients' anxiety and blood pressure ($p < 0.001$). It is recommended that progressive muscle relaxation exercises be used in the clinic during the preoperative period. A clinically important finding is the positive effect of progressive muscle relaxation exercises on patients' vital signs and anxiety.

Keywords: aneurysm; anxiety; blood pressure; progressive relaxation

INTRODUCTION

Aneurysm is a regional, irreversible enlargement of body vessels due to weakness in the vessel wall. It is most common in the branching points of the cerebral vessels. They can occur in various parts of the body, including the brain (intracranial aneurysms) and the aorta (aortic aneurysms). This is due to the pressure on the branching region caused by the angle change of the hemodynamic flow in this region (Özdemir & Belet, 2020; Vurallı & Bolay, 2018; Kaminogo et al., 2003). Unless the aneurysm ruptures, it usually does not cause clinical symptoms, but if it does rupture, it can cause subarachnoid hemorrhage (SAH), which poses a high risk of death from the simplest tissue damage (Özdemir & Belet, 2020; Vogelsang et al., 2015; Abdillan et al. 2022). According to the data obtained as a result of angiography and autopsies performed for different purposes, the incidence of intracranial aneurysm in the normal population is determined to be 0.5-6% (Çiftçi & Çakır, 2018). In the United States, the number of annual subarachnoid hemorrhage incidents in this country is estimated to be around 30,000. In these patients, total brain damage and the death rate were 45% (Dinç, 2018).

The presence of aneurysm in at least one or more of the first-degree relatives of the patient, the diagnosis of connective tissue diseases such as Ehlers-Danlos syndrome, and polycystic ovary in the patients indicate a high risk for aneurysm (Vurallı & Bolay, 2018). Aneurysmal subarachnoid hemorrhage risks include both preventable and unavoidable factors. Unavoidable risk factors include advanced age, family history of SAH, and female gender; preventable risk factors include excessive use of alcohol and stimulants, tobacco use, high blood pressure – doubling the risk of bleed (Dinç, 2018). There are two main treatment options: open microsurgery and endovascular treatment (Özdemir & Belet, 2020). All kinds of surgical interventions naturally cause anxiety pre-intervention (Arı & Yılmaz, 2016). Anxiety is an uncomfortable feeling in the presence of a life threat, whether it is real or not, causes fear and worry in the individual (Kaya et al., 2007). It is observed that the anxiety intensity of patients before surgery varies greatly depending on the type of surgery, gender, and the general anxiety rate in that population (this rate can reach up to 97% in some countries) (Abate

et al., 2020). After aneurysm-induced SAH, the anxiety level of patients remains high and stable for two years (Vogelsang et al., 2015). Anxiety developing in the preoperative period causes pathophysiological reactions such as hypertension and cardiac arrhythmia and may lead to patients refusing pre-planned operations (Jlala et al., 2010). Also, it is reported that the level of anxiety affects the level of postoperative pain related to incision wound, positional disturbance (Abidin et al., 2022). In patients with aneurysm, high blood pressure causes rupture, and therefore, SAH and rebleeding before or during treatment, should be controlled. Anxiety experienced in the preoperative period affects parameters like blood pressure and pulse (Jlala et al, 2010; Erdem, 2005). In this context, it is important to reduce the anxiety experienced in the preoperative period in aneurysm patients. In hypertensive patients, progressive muscle relaxation exercise (PMRE) has a significant effect on blood pressure and pulse rate. In particular, it is recommended that this practice be utilized in the nursing care of patients with hypertension (Manoppo & Anderson, 2019).

Within the scope of this research, the aim is to teach the progressive relaxation technique to patients and to examine its effect on anxiety and blood pressure – in order to control preoperative anxiety and high blood pressure that results from this anxiety in patients with aneurysm with minimum use or without the use of pharmacological agents. As a result of the literature review, no study directed toward reducing anxiety in aneurysm patients was found. The results of this study, thus, aimed to contribute to the literature.

METHOD

Study Design

The study was conducted in a quasi-experimental design to investigate the effect of progressive muscle relaxation exercises on anxiety and blood pressure levels in the preoperative period in aneurysm patients. Ethics committee approval was obtained from xxx University before beginning the study, which was conducted within the scope of clinical research. Institutional permission from the hospital was then obtained before the study began. By the Declaration of Helsinki, participants were informed about the study's aim. The study included participants who gave written, informed consent and was informed that they could leave the study at any time.

Participants and Sample Size

The population of the study consisted of patients in the preoperative period who were diagnosed with Aneurysm and received inpatient treatment in the Neurosurgery service of a training and research hospital in Istanbul. In the sample calculation, it is recommended that the effect size, determined by Cohen for the t-tests, be based on the 0.5 moderate effect size in standard calculations. When the significance level (p value) is taken as the standard 0.05 and the research power as 0.80, at least 34 patients need to be reached (Cohen, 1992). The study was carried out with 38 people diagnosed with aneurysm who were hospitalized in the neurosurgery ward of a hospital in Istanbul and selected by random sequencing method.

The inclusion criteria

1. Being able to speak Turkish (as the audio recording in Turkish)
2. Being conscious when brought to the hospital (before the operation can be able to listen the audio)
3. Being above the age of 18 years
4. Being in a low-risk patient group that the responsible doctor deems appropriate for progressive muscle relaxation exercise.

The exclusion criteria

1. Having a diagnosed psychiatric disorder
2. Being mentally confused (Delirium etc.)
3. Have hearing problems

Data Collection Tools

In data collection, following a literature review by the researcher, four forms were utilized: 1) an information form containing 12 questions aimed to collect socio-demographic, descriptive, and aneurysm-patient-specific information (Dinç, 2018; Vuralı & Bolay, 2018; Evliyaoğlu, 2012; Clarke, 2008), 2) Visual Analogue Scale (VAS), in which the patient is asked to measure feelings on a scale with two to three points like 'none' to 'very severely' at two ends of a 100 mm horizontal line, in order to convert subjective emotions into a numerical form that the researcher can measure (Yüşün et al., 2019; Cline et al., 1992), 3) Beck Anxiety Inventory (BAI), accepted as the gold standard, developed by Beck and introduced in Turkish by Ulusoy, Şahin and Erkmén, consisting of 21 items (4 items anxiety mood, 3 items specific fears, 14 items autonomic hyper reactivity and motor anxiety related to anxiety symptoms, generalized anxiety and panic attack

symptoms) containing short, simple and clear questions in the measure of anxiety (Peker, 2020; Alçı et al., 2019; Ulusoy et al., 1998), and 4) the vital signs follow up table-type form, which was created by the researchers to monitor blood pressure and related vital signs.

Interventions

In the first stage of the study, individuals who met the criteria for inclusion were informed about the application process and data collection forms. Informed voluntary consent was obtained from the individuals who accepted to participate, and a form containing introductory information about the patients were asked to be completed by the patients themselves. In the second stage, determined scales (Beck Anxiety Scale, Visual Analog Scale) were applied to the participants; blood pressure, pulse, and respiratory rate were measured by monitors present in the patient's room, or by mobile monitors in service being brought into the patient's room, and recorded in the vital signs monitoring form. Data was collected face-to-face. Then, information was provided about the 20-minute progressive muscle relaxation exercises CD recording, prepared by the Turkish Psychological Association (TPA, 2002). The steps of the relaxation exercises were shown and explained to the patient by the researcher. When starting the PMRE application, the stimuli coming from the external environment were minimized (turning off the television in the patient's room, asking the patient to be silent and mute phones until the end of the exercise, performing the exercises when there is no staff entry or exit, or asking the staff not to enter the room during the exercises). Before starting PMRE, the patient was instructed to wear their most comfortable clothes and to empty their bowel and bladder if needed. At the beginning of the exercise, the patient was asked to lie on his back, and the height of the head and feet was adjusted via the bedside control to provide the position that the patient identified as the most comfortable. The patient was instructed to close his eyes and concentrate on the muscle groups indicated in the recording. Using a wireless headset, the Turkish Psychologists Association Relaxation Exercises CD recording was played through a smart device, and the patients were asked to perform the PMRE instructions in the recording that they had been given prior training on. Meanwhile, the researcher remained silent in the patient's room without any interventions, waiting for the recording to end and the patient to open his eyes. After the exercise ended, the patient's blood pressure, pulse, and respiratory rate were measured again and recorded on the vital signs follow-up form. Then, Beck Anxiety Scale and Visual Analogue Scale have applied once again. Although the total procedure time varied from patient to patient, it took approximately 50 minutes. The patients were prepared for surgery following the determination of before-PMRE and after-PMRE scores for blood pressure, pulse, respiration, BAI, and VAS.

Hypotheses

- H₀: Progressive muscle relaxation exercise applied to aneurysm patients has no effect on anxiety and blood pressure in the preoperative period.
- H₁: Progressive muscle relaxation exercise applied to aneurysm patients has an effect on anxiety and blood pressure in the preoperative period.

Analysis

Data obtained in the research was uploaded into the SPSS program for evaluation. BAI and VAS scores were subjected to the Kolmogorov-Smirnov test to determine the statistical test used and concluded to fit normal distribution. Frequency analysis for descriptive statistics and t-test analysis (two dependent means) were utilized for blood pressure, pulse, respiration, BAS, and VAS scores. The level of statistical significance was taken at $p < 0.05$.

Ethical approval

The study was approved by xxxx University Social and register code 221735 at Human Sciences Research Ethics Committee. The hospital permission also was taken by xxx Hospital with 558 register code.

RESULT

A total of 38 patients have included in the study, the mean age of the participants was 49.23 ± 1.32 years (min:21 max:75), 52.6% (n=20) were female, 50% (n=19) were primary school graduates, 73.7% (n=28) were married, 55.3% (n=21) were not working, 26.3% (n=10) were housewives, 84.2% (n=32) had social security, 57.9% (n=22) smoked, 84.2% (n=32) had no alcohol use, 57.9% (n=22) did not have any chronic illnesses, 92.1% (n=35) did not have a family member diagnosed with aneurysm, 100% (n=38) did not have any prior knowledge of PMRE, and 36.8% (n=14) coped with anxiety through rest (Table 1.).

Table 1. Demographic Data of Participants

Variable	n	%	
Gender			
Female	20	52.6	
Male	18	47.4	
Education			
Primary school	19	50.0	
Middle school	3	7.9	
High school and above	16	42.1	
Marital status			
Married	28	73.7	
Single	10	26.3	
Employment status			
Employed	17	44.7	
Unemployed	21	55.3	
Occupational			
Office holder	3	7.9	
Self-employed	7	18.4	
Retired	8	21.1	
Housewife	10	26.3	
Unemployed	3	7.9	
Other	7	18.4	
Social Security			
Have	32	84.2	
Have not	6	15.8	
Smoking			
Yes	22	57.9	
No	16	42.1	
Alcohol Use			
Yes	6	15.8	
No	32	84.2	
Chronic Illness			
Yes	16	42.1	
No	22	57.9	
History of the aneurysm family member			
Yes	3	7.9	
No	35	92.1	
Knowledge about PME*			
Have	0	0	
Have not	38	100	
Coping with anxiety			
Smoking	2	5.3	
Drinking Coffee	1	2.6	
Working in garden	1	2.6	
Socializing with family	1	2.6	
Aggressive behaviour	6	15.8	
Walking	6	15.8	
Doing housework	6	15.8	
Resting	14	36.8	
Praying	1	2.6	
Total	38	100	
	Mean	SS	Min-Max
Age	49.23	1.32	21-75

The table shows that the mean VAS scoring was 5.26 before PMRE and decreased to 2.97 after PMRE. While the mean BAI score was 11.21 before PMRE, it decreased to 3.76 after PMRE. Similarly, systolic blood pressure decreased from an average of 136.05 to 123, diastolic blood pressure decreased from an average of 81.15 to an average of 72.68,

pulse decreased from an average of 93.55 to an average of 84.36, and respiration decreased from an average of 13.44 to an average of 12.34. All results were statistically significant, with a p-value of less than 0.001 (Table 2).

Table 2. Comparison of Progressive Muscle Relaxation Exercises on Anxiety, Blood Pressure, Pulse, and Respiration Rate Levels in the Preoperative Period in Aneurysm Patients

Variable	Before Progressive Muscle Relaxation		After Progressive Muscle Relaxation		t	p
	Mean	SS	Mean	SS		
VAS	5.26	1.85	2.97	1.66	11.92	0.00
BAI	11.21	8.36	3.76	5.83	6.74	0.00
BP Systolic	136.05	12.81	123.00	13.50	8.79	0.00
BP Diastolic	81.15	9.92	72.68	10.34	7.93	0.00
Pulse Rate	93.55	9.84	84.36	8.24	9.69	0.00
Respiration Rate	13.44	1.13	12.34	0.93	8.92	0.00

DISCUSSION

According to result, significant decreases were found on VAS, BAI, Systolic/Diastolic BP, pulse and respiration rate (Table 2). No study was found to explore the reduction of blood pressure and anxiety using PMRE in cranial aneurysm patients. There are combine and separate studies on anxiety, blood pressure, pulse and respiration in different patient groups. PMRE application to the patient in the preoperative period reduces muscle tension and creates a relaxation effect, thereby causing reductions in the blood pressure parameter. Preoperative anxiety causes negative physiological symptoms such as increases in patients' serum cortisol levels, blood pressures, and pulse rate (Uğraş et al.,2018). No applications have been found to research the effectiveness of preoperative PMRE in reducing the anxiety level of aneurysm patients. In fact, most studies in the literature exploring the reduction of preoperative anxiety were conducted on different patient groups (Ertuğ et al., 2017) conducted a study to determine and compare the effectiveness of nature sounds and relaxation exercises to reduce anxiety in the preoperative period. Dividing the patients into three groups – those made to listen to nature sounds, those instructed to participate in relaxation exercises, and the control group– in the preoperative period, the study displayed that both experimental groups were effective in reducing preoperative anxiety compared to the control group. There was no significant difference between the two experimental groups. Applying the PMRE to COVID-19 patients found positive results for anxiety reduction and sleep quality improvement (Liu et al., 2020). Aristiani and Susanti (2022) found that progressive muscle relaxation exercises performed for three consecutive days in patients with preoperative anxiety significantly reduced preoperative anxiety. PMRE had also a significantly positive effect on anxiety and sleep quality compared to the control group in patients receiving burn treatment (Harorani et al.,2020). In the meta-analysis conducted by Kim and Kim (2018) in 16 studies that met the study criteria, it was shown that relaxation therapies had a significantly reducing effect on anxieties like phobia and depression. As a result of the meta-analysis, based on 27 studies with control groups published between 1997 and 2007, it was shown that anxiety decreased to varying degrees in all patients to whom relaxation exercises were applied: the decrease in anxiety in patients who participated in exercise combinations was less than the decrease in anxiety in patients who participated in a single type of relaxation exercise, portraying that a single exercise method had better results compared to the combined treatment (Manzoni et al., 2008). In another meta-analysis results showed that anxiety decreased especially in adult patients who were participating in yoga, utilizing progressive relaxation exercises, and listening to music. Moreover, it has been reported that anxiety reduction continued for 14-24 weeks in some of these patients (Klainin-Yobas et al., 2015).

In secondary results of the study, PMRE's effect on pulse and respiratory parameters was also examined, and positive changes were detected. Decreased respiration and pulse rate after progressive muscle relaxation were observed, remaining within normal limits. In the study of Ibrahimoglu and Kanan (2017), the effect of PMRE on anxiety and vital signs developed after endotracheal extubation in patients who had open heart surgery was shown to be positive. In the study of Manoppo and Anderson (2019) in hypertension patients, it was seen that progressive muscle relaxation had significant positive effects on pulse rate. Ko and Lin (2012) played a CD containing relaxation exercises to inpatients in the surgery clinic a day before surgery. The study's results indicated that progressive muscle relaxation exercises decreased respiration and pulse rates (Ko & Lin, 2012).

There is evidence that the PMRE significantly reduced the need for anxiolytics before surgery to reduce anxiety and blood pressure in all patients in the hospital for elective general surgery and gynecology operations in the pre-

anesthesia period (Tanna et al., 2022). Similar to our study, Ko and Lin (2012) had patients hospitalized in the surgery clinic listen to a CD with progressive relaxation exercise instructions a day before their surgery. It was concluded that relaxation exercises reduce respiration, pulse rate and blood pressure. While in some studies, progressive muscle relaxation used to reduce blood pressure has been shown to reduce only systolic pressure (Astuti et al., 2019), studies are showing that it affects both systolic and diastolic pressure (Kusnanto et al., 2019; Rosdiana & Cahyati, 2019). A study conducted by cancer patients showed that PMRE significantly affects diastolic blood pressure (Loh et al., 2022). It was reported that some relaxing methods decreases the systolic and diastolic blood pressure levels such as effleurage massage was found to provide relaxing and reduce the blood pressure (Astuti et al., 2022). In the study of Manoppo and Anderson (2019), it was seen that progressive muscle relaxation had significant positive effects on blood pressure in hypertension patients. On patients with borderline hypertension, it was shown that diaphragmatic breathing was utilized alongside PMRE, parametrically improving cardiopulmonary functions (Roshan et al., 2021). In a meta-analysis study, on 13 selected randomized control group studies between 1996 and 2012, mind-body exercises –including progressive muscle relaxation exercises–had considerable positive effects on quality of life, anxiety, and blood pressure in patients with heart disease (Younge et al., 2015). However, due to the quality of the studies, it has been suggested that further research of higher standards that allow for further generalizations is needed.

A clinically significant finding is the positive effect of progressive muscle relaxation exercises on patients' vital signs and anxiety. Progressive muscle relaxation, being cost-effective, is an appropriate method to reduce preoperative and daily stress in patients with cranial aneurysms.

CONCLUSION

According to the results of this study, in which the effect of PMRE on blood pressure and anxiety in the preoperative period in aneurysm patients was examined, it was observed that patients whose anxiety levels were high before the preoperative period decreased as a result of the progressive relaxation exercise. Similarly, 20 minutes of progressive relaxation exercise performed in the preoperative period was observed to decrease both systolic and diastolic blood pressure by 10mmHg. Since this 10 mmHg decrease in aneurysm patients is an important result in terms of bleeding risk, it was concluded that progressive muscle relaxation is a technique that can be applied to patients in neurosurgical clinics.

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