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ORIGINAL ARTICLE

The Effects of Stress Ball Use on Comfort and Anxiety Levels in Hemodialysis Patients: A Randomized Controlled Trial

Hemodiyaliz Hastalarında Stres Topunun Konfor ve Anksiyete Düzeyine Etkisi: Randomize Kontrollü Çalışma

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Abstract

Objective: The aim of this study was to evaluate the comfort and anxiety levels of patients undergoing hemodialysis using a stress ball.

Method: This was a randomized controlled trial. The patients were then told how to use the stress ball. The patients were then instructed to squeeze the stress ball for 15 minutes before the dialysis process began. During this time, the patient was emphasized to use the stress ball with the arm without a fistula or graft. The patient was then dialyzed and again instructed to squeeze the stress ball for 15 minutes. This practice was continued for nine hemodialysis sessions.

Results: A statistically significant difference was found between the experimental and control groups in the comfort levels (t=13.254, p<0.001) and the effect size was found to be very high (d=1.56). A statistically significant difference was found between the experimental and control groups in the anxiety levels (t=8.406, p<0.001), and the effect size was found to be very high (d=1.69).

Conclusion: The stress ball decreased anxiety levels and increased comfort levels in HD patients. In particular, long durations of hemodialysis treatment and dialysis durations of up to 4 hours negatively affect the quality of life of patients. According to the effect size analysis conducted in our study, the stress ball had a high-level effect on comfort and anxiety.

Keywords: Hemodialysis, comfort, anxiety, stress ball

Clinical Trials: NCT05845892

Öz

Amaç: Bu çalışmada, hemodiyaliz tedavisi gören hastalarda stres topu kullanılarak hastaların kaygı düzeylerinin ve konfor düzeylerinin belirlenmesi amaçlanmıştır.

Yöntem: Bu çalışma randomize kontrollü bir tasarımında gerçekleştirilmiştir. Hastalara stres topunun nasıl kullanılacağı anlatılmış ve gösterilmiştir. Daha sonra hastalara diyaliz süreci başlamadan önce 15 dakika boyunca stres topunu sıkmaları talimatı verilmiştir. Bu süre zarfında hastanın stres topunu fistül ve greft olmayan kolla kullanması gerektiği vurgulanmıştır. Hasta diyalize alındıktan sonra yine 15 dakika boyunca stres topunu sıkması istenmiştir. Bu uygulamaya dokuz hemodiyaliz seansı boyunca devam edilmiştir. Kategorik değişkenleri karşılaştırmak için ki-kare analizi kullanılmıştır. Grup içi karşılaştırmalar için eşleştirilmiş test ve gruplar arası karşılaştırmalar için tek örnek t-testi kullanılmıştır.

Bulgular: Deney ve kontrol grubunun ortalama konfor puanları arasında anlamlı bir fark olduğu (t=13,254, p=0,00) ve etki büyüklüğünün çok yüksek olduğu bulunmuştur (d=1,56). Deney ve kontrol grubunun anksiyete düzeyleri arasında anlamlı bir fark olduğu (t=8,406, p<0,001) ve etki büyüklüğünün çok yüksek olduğu bulunmuştur (d=1,69).

Sonuç: Çalışma sonucumuza göre stres topunun hd hastalarında anksiyete seviyesini azalttığı ve konfor seviyesini artırdığı bulunmuştur. Özellikle hemodiyaliz tedavi sürecinin uzun olması, diyaliz süresinin 4 saate kadar sürmesi hastaların hayat kalitelerini olumsuz yönde etkilemektedir. Bu nedenle hastaların konfor düzeyinde bozulmalar ve anksiyete görülmektedir. Hemşirelik bakımı bütüncül bir yaklaşımdır bu nedenle hastaların semptomlarına yönelik hemşirelik müdahalesi gerekmektedir. Çalışmamızda yapılan etki büyüklüğü analizine göre stres topunun konfor ve anksiyete üzerinde yüksek düzeyde bir etkisi olduğu bulunmuştur.

Anahtar Kelimeler: Hemodiyaliz, konfor, anksiyete, stres topu

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Introduction

Hemodialysis (HD) treatment causes various physiological, social, and psychological problems in patients (1,2). In addition to physiological problems such as changes in diet and fluid intake, fatigue, and cramps due to HD treatment, conditions such as being dependent on a treatment for a long time, changing body image, coping with treatment complications, fear of losing independence, and hopelessness increase the level of stress and anxiety and lead to psychological problems (2,3).

Complications associated with HD diminish the quality of life of patients and impair their daily comfort (4). In the existing literature, it has been reported that the comfort level of patients undergoing HD is moderate, with a reported range of 5-7 (5-7). It is of great importance to ensure patient comfort level to guarantee continuity of HD treatment (8). Therefore, nurses have important responsibilities in improving the quality of life and comfort of patients. To ensure comfort, which is an important part of nursing care, the patient's current comfort level should be determined, and necessary interventions should be made accordingly (4).

Stress is an important component that negatively affects comfort. For this reason, nursing care is important to help patients cope effectively with stressors by identifying the stressors in patients undergoing HD, thus increasing the comfort level (5). Studies have reported that the prevalence of anxiety in patients undergoing HD varies between 12% and 52% (6-8). Therefore, it is extremely important to ensure stress control and to increase the comfort level of HD patients.

Various non-pharmacological methods, such as exercise, yoga, relaxation techniques, and music therapy, are applied to control the stress and comfort levels of patients undergoing HD (9-11). Another important practice is the use of stress balls. Because the stress ball is accessible and inexpensive, it is an effective method for distracting patients. Nurdina et al. (12) reported that the application of a stress ball, which was performed in 34 HD patients for eight sessions for half an hour, significantly reduced anxiety and stress levels. Additionally, it has been noted that applying a stress ball, one of the cognitive distraction techniques, during invasive procedures including intravenous catheterization, cystoscopy, and extracorporeal shock wave lithotripsy improves pain and vital signs (18). The use of stress balls dramatically decreased the stress levels of the experimental group, according to a study by Kasar et al. (19), while the comfort levels were the same. However, Kasar et al. (19) noted that the study's limitations included the limited sample size and the patients' initial non-homogeneous stress levels. Therefore, in our study, we aimed to determine the anxiety and comfort levels of patients by using a stress ball in a larger sample group and in patients receiving HD treatment with homogeneous anxiety levels.

Main Points

- It was discovered that providing hemodialysis (HD) patients stress balls improved their degree of comfort.
- Patients undergoing HD reported feeling less anxious after using the stress ball.
- Patients receiving HD may find relief from anxiety and comfort by using stress balls as an alternative.

Material and Method

This study was conducted using a single-blind, semi-randomized controlled trial design. The aim of this study was to evaluate the comfort and anxiety levels of patients undergoing HD using a stress ball.

Hypothesis

H0-1: In patients receiving HD treatment, stress ball application for a total of 30 minutes, 15 minutes before the start of HD, and 15 minutes during HD treatment, is not effective at the comfort level.

H1-1: In patients receiving HD treatment, stress ball application for a total of 30 minutes, 15 minutes before the start of HD, and 15 minutes during HD treatment, is effective at the comfort level.

H0-2: In patients receiving HD treatment, stress ball application for a total of 30 minutes, 15 minutes before the start of HD, and 15 minutes during HD treatment, is not effective against anxiety.

H1-2: In patients receiving HD treatment, stress ball application for a total of 30 minutes, 15 minutes before the start of HD, and 15 minutes during HD treatment, is effective against anxiety.

Participants

156 patients undergoing HD treatment in a private HD facility in Turkey comprised the study population. G*Power Version 3.1.9.2 program was used to determine the sample group. The sample size for 95% power was 54 patients in the power analysis, which was based on the sample group of related research carried out in the literature. Between February and March 2023, 63 patients who met the inclusion criteria were included in the study: 32 patients were included in the control group and 31 patients were included in the intervention group.

Randomization was performed to select the study sample. The experimental and control groups were selected by lottery. As a result of the draw, individuals who received HD treatment in the morning were included in the control group and those who received HD treatment in the afternoon were included in the experimental group. The HD session times of the patients were not changed. Only patients who received treatment in the morning and afternoon were assigned to the experimental and control groups.

Inclusion and Exclusion Criteria

The study included participants who were at least 18 years old, had been on the HD program for at least six months, had been on average for four hours three times a week, could respond to written or verbal scales, had no physical disabilities, could apply the stress ball as demonstrated during the HD study, and gave their consent to participate.

Those who had a fistula in each arm, psychological issues, nerve, soft tissue, and vascular disorders in the upper extremities, as well as those who left the city while the study was underway, were excluded from participation since it was believed that they would have an impact on the study's findings.

Data Collection Process

Once the requisite permissions had been obtained, the researcher elucidated the objective of the study to the individuals comprising the intervention and control groups, prior to commencing the application. Written and verbal informed consent was obtained from all participants.

To carry out the study in a systematic and orderly manner, the researcher interviewed the healthcare team in the dialysis centers, especially the nurse who would perform the stress ball application, and informed them about the purpose and method of the study. The researcher completed the patient forms using the data obtained through face-to-face interviews and a review of the patient medical records.

Intervention Group

In the first interview, data collection forms were given to the patients, and they were asked to fill them in before the start of dialysis. The patients were then told how to use the stress ball. The patients were then instructed to squeeze the stress ball for 15 minutes before the dialysis process began. During this time, the patient was emphasized to use the stress ball with the arm without a fistula or graft. The patient was then dialyzed and again instructed to squeeze the stress ball for 15 minutes. This practice was continued for nine HD sessions. After the last session, the data collection forms were completed.

Stress Ball Usage

1. Place the stress ball in one hand.

2. You can use any hand you want in the application to start dialysis.

3. During dialysis, continue the application with your free hand, not with the needles.

4. After taking the ball, squeeze it in your hand for 2-3 seconds and then loosen it. This process is continued for 15 consecutive minutes.

5. Use the stress ball before starting HD and at any time during HD for 15 minutes each, for a total of 30 minutes.

Control Group

In addition to receiving conventional care, the control group received no interventions. The data collection forms were completed prior to the initial HD session and subsequently at the conclusion of the ninth session. By educating the patients in this group how to utilize the stress ball and its effects in the last session, they were made aware of the bias introduced during the data collection phase of the study.

Data Collection Tools

The patient information form was developed by the research team in accordance with existing literature (7,17,18) and included questions pertaining to both socio-demographic and disease-specific characteristics.

The visual analog scale (VAS) for anxiety converts some values that cannot be measured numerically into numerical form. On the two ends of a 100-mm line, the two extreme definitions of the parameter to be evaluated are written, and people are asked to indicate where their condition corresponds to on this line by drawing a line, putting a point, or pointing (13).

Hemodialysis Comfort Scale

It was developed by Şahin Orak et al. (14) to determine the comfort of HD patients. The scale is comprised of two sub-dimensions: "relaxation" (items 7-9) and "coping" (items 1-6). A minimum score of 3.00 and a maximum score of 15.00 can be obtained from the relaxation subdimension, while a minimum score of 7.00 and a maximum score of 30.00 can be obtained from the overcoming subdimension. The lowest attainable score on the hemodialysis comfort scale is 9, while the highest is 45. As the score approached 45, the level of comfort increased. The Cronbach's alpha reliability coefficient for the scale was 0.87 (14). In the present study, the Cronbach's alpha coefficient was 0.85.

Statistical Analysis

SPSS 22.0 was used to analyze the study's data (SPSS Inc., Chicago, IL, USA). The Shapiro-Wilk test was used to assess the normality of the distribution of clinical parameters. Descriptive statistics were expressed as number (n), percentage (%), mean ± standard deviation (M ± SD). Chi-square analysis was used to compare categorical variables. The paired test was used for intragroup comparison, and the sample t-test was used for intergroup comparison. Statistical significance was set as $p<0.05$.

Ethical Issue

Ethical approval was obtained from the İzmir Bakırçay University Non-interventional Clinical Research Ethics Committee (decision no: 740, date: 25.10.2022). Furthermore,

verbal and written informed agreement was obtained from the study participants once the study's goal was described, and written institutional authorization was obtained from the private HD center where the study was conducted.

Results

The demographic characteristics of the patients in the experimental and control groups were statistically homogeneous (p>0.05) (Table 1).

Comfort

While there was a statistically significant difference between the pre-test total comfort mean scores and post-test total comfort mean scores of the experimental group (t=9.662, p<0.001), there was no significant difference between the pre- and post-test total comfort mean scores of the control group (t=1.340, p=0.736). A statistically significant difference was found between the experimental and control groups in the comfort levels (t=13.254, p<0.001) and the effect size was found to be very high (d=1.56).

A statistically significant difference was found between the experimental and control groups in the coping levels (t=4.631, p=0.031), and the effect size was average (d=0.66).

A statistically significant difference was found between the experimental and control groups in the relief levels (t=18.574, p<0.001) and the effect size was found to be very high (d=1.94).

According to these results, the stress ball significantly increased the comfort level of patients receiving HD. Based on this result, H1-1 was accepted (Table 2).

Patients' VAS Anxiety Scores

There was a significant difference between the total VAS mean scores of the participants in the experimental group (t=6.873, p<0.001), but no significant difference was observed in the total VAS mean scores of the participants in the control group (t=0.372, p=0.070). A statistically significant difference was found between the experimental and control groups in the anxiety levels (t=8.406, p<0.001), and the effect size was found to be very high (d=1.69) (Table 3). In line with the results, the stress ball significantly decreased the anxiety level of patients receiving HD. Based on this result, H1-2 was supported.

Discussion

HD treatment requires patients to adapt to conditions such as medication, dialysis sessions, diet, and fluid restriction (15,16). At the same time, vascular access and prolonged dialysis treatment affect the overall quality of life of patients

Table 1.
Demographic Characteristics of the Study Population

Variables		Experimental (n=31) n(%)	Control (n=32) n(%)	x^2	p
Gender	**Female**	18(58)	20(62.5)	2.892	0.174
	Male	13(42)	12(37.5)		
Education	**Secondary education or lower**	11 (35.5)	13 (41)	0.407	0.253
	High school education or above	20 (64.5)	19 (59)		
Age		65.74±10.12	61.95±12.15	t=-410	0.989

Table 2.
Comparison of Comfort Levels between the Experimental and Control Groups

	Experimental groups		Control groups		Independent-test post-mean (p value)[b]	Effect size (Cohen's d)	95% CI	
	M ± SD	Test statistic[a]	M ± SD	Test statistic[a]			Lower limit	Upper Limit
Pre-total comfort	27.82±6.04	t=9.662 p<0.001	23.52±4.52	t=1.340 p=0.736	t=13.254 p<0.001	1.56	26.303	33.562
Post-total comfort	33.16±9.56		21.39±4.67					
Pre-coping	8.73±2.57	t=8.578 p=0.001	9.13±2.76	t=0.873 p=0.624	t=4.631 p=0.031	0.66	7.544	12.740
Post-coping	10.52±3.85		8.42±2.23					
Pre-relief	19.09±4.48	t=12.248 p=0.001	14.39±4.76	t=1.219 p=0.592	t=18.574 p<0.001	1.94	19.951	26.587
Post-relief	22.64±6.06		12.97±3.58					

[a]=Paired t-test, [b]=Independent t-test, M=mean, SD=standard deviation, CI=confidence interval

Table 3.
Comparison of Anxiety Levels between the Experimental and Control Groups

	Experimental groups		Control groups		Independent-test post-test mean (p value)[b]	Effect size (Cohen's d)	95% CI	
	M ± SD	Test statistic[a]	M ± SD	Test statistic[a]			Lower limit	Upper Limit
Pre VAS	5.23±1.45	t=6.873 p<0.001	6.42±1.83	t=0.352 p=0.070	t=8.406 p<0.001	1.69	2.756	4.489
Post VAS	3.18±1.12		5.64±1.72					

[a]=Paired t-test, [b]=İndependent t-test, M=mean, SD=standard deviation, CI=confidence interval, VAS=visual analog scale

and cause deterioration in comfort (17). Complications related to dialysis treatment, physiological changes such as fluid electrolyte imbalances and fatigue, and sociological factors such as uncertainty about the future cause stress and anxiety, which negatively affect patient comfort (18). Therefore, it is important to determine the comfort status of HD patients (17).

Comfort is an outcome of nursing care and is considered a nursing function in nursing models. In nursing care, the holistic approach prioritizes patient comfort (23). Furthermore, comfort is one of the most crucial aspects of nursing care that patients and their families require. To address patients' comfort demands and promote their comfort level, nurses should employ appropriate nursing interventions (6).

The quality of life and comfort levels of HD patients are negatively affected by the long duration of dialysis and dialysis sessions 2-3 days a week. In our study conducted to increase the comfort level, the use of stress balls significantly increased the comfort level in the experimental group of patients. According to the effect size analysis, the stress ball had a very high effect on comfort in patients undergoing HD. In contrast to our study, Kasar et al. (19) found that stress balls did not affect the comfort level of patients undergoing HD (19). This finding is attributed to the sample adequacy and effect size of our study. In the literature, no study differing from the study of Kasar et al. (19) on the effect of stress balls on the comfort level was found. Therefore, it is clear that our study is original and will contribute to literature.

Patients' personal quality of life is impacted by the fact that they must rely on the dialysis machine for two to three days a week, an average of four hours a day, and live with the assistance of their family and medical professionals while undergoing HD treatment (23). Specifically, prolonged dialysis sessions and machine alarms during the session are among the causes of their worry (24). According to previous studies, between 35% and 46% of patients undergoing HD treatment report feeling anxious upon admission (25-27). Consequently, patients with HD require therapy that addresses several elements of their condition in a comprehensive manner, in addition to the disease's obvious symptoms.

The effect of stress balls on anxiety was evaluated in patients receiving HD treatment. According to our study results, the stress ball significantly reduced the anxiety level of the experimental group. Similarly, in the studies of Kasar et al. (19) and Nurdina et al. (12), it was reported that the stress ball reduced the anxiety level in HD patients. In particular, it is stated that the stress ball alleviates symptoms thanks to its distraction feature. Squeezing the ball evokes a sense of calmness in the body and reduces the anxiety level of patients (20). According to the effect size analysis conducted in our study, the stress ball was found to be effective at reducing anxiety at a very high level.

Study Limitations

In the study design, we initially planned to assess the comfort and anxiety levels of patients every hour during their HD session. However, although the patients responded to the questionnaire because the anxiety scale was short, they did not want to fill in the comfort scale because it was too long. Therefore, only comfort and anxiety levels before and after dialysis were evaluated.

Conclusion

In this study, the effects of stress balls on anxiety and comfort were investigated in HD patients. According to our study results, the stress ball decreased anxiety levels and increased comfort levels in HD patients. In particular, long durations of HD treatment and dialysis durations of up to 4 hours negatively affect the quality of life of patients. Therefore, patients' comfort level deteriorates, leading to anxiety. Nursing care is a holistic approach; therefore, nursing intervention is required to address patient symptoms. According to the effect size analysis conducted in our study, the stress ball had a high-level effect on comfort and anxiety. In particular, the fact that effect size analysis was performed in our study strengthened our findings and provided more detailed information about our findings. Due to its strong effect, we recommend the use of stress balls as a nursing intervention to increase patients' comfort and decrease their anxiety in patients receiving HD treatment.

Ethics Committee Approval: Ethical approval was obtained from the İzmir Bakırçay University Non-interventional Clinical Research Ethics Committee (decision no: 740, date: 25.10.2022).

Informed Consent: Written and verbal informed consent was obtained from all participants.

Footnotes

Author Contributions: Surgical and Medical Practices – S.Ş.; Concept – S.Ş., S.G.; Design – S.Ş., S.G., Y.C., C.Ö.; Data Collection and/or Processing – S.Ş., Y.C., ; Analysis and/or Interpretation – S.Ş., C.Ö.;Literature Review – S.Ş., S.G., Y.C., C.Ö.; Writing – S.Ş., S.G., Y.C., C.Ö.

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