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EFFECT OF VIRTUAL REALITY GLASSES ON PAIN DURING BURN DRESSING

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Abstract

Objective: The study was conducted as a randomized controlled experimental study in order to determine the effect of virtual reality glasses on pain during burn dressing in inpatients and outpatients in the burn unit.

Methods: The research was carried out in the Burn Unit of Izmir Bozyaka Training and Research Hospital between July and August 2021. The sample size was 60 patients who were selected by random sampling and consented to take part in the study. The cohort was divided into 30 in the experimental group and 30 controls. The patients in the experimental group wore virtual reality glasses with vision and sound before the dressing started. The patients in the control group underwent routine burn dressing. Sociodemographic Data Questionnaire and Numerical Pain Scale were used to collect data.

Results: The pain scale mean score of the experimental group (4.17±1.60) was significantly lower than the mean score of the control group (6.17±1.58) (p=0.000).

Conclusion: The use of virtual reality glasses during burn dressing, which is usually a very painful procedure, reduced patient perception of pain. It is recommended that the application be started to be used on a regular basis in the burn unit.

Keywords: *Virtual reality, pain, burn, nursing.*

Introduction

Burns are one of the worst types of physical, psychological and social trauma that an individual can encounter.[1] Procedures such as dressing changes and debridement of dead tissues included in the burn treatment process are often unbearably painful. Relieving the pain of burn patients is one of the essential points in treatment, and pharmacological methods are widely used for this purpose. However, every pharmacological agent has a dose range in which it can be used safely, and use above this can cause toxic effects. Therefore, non-drug methods in pain control are becoming increasingly important and widespread. Distracting the patient through watching movies and listening to music is an effective and widely used non-pharmacological analgesia method.[2] Virtual reality (VR) technologies can also control pain similarly. [3.4]

VR glasses can be used with various parts of the videos, such as forests or oceans, and specifically appeal to the senses of hearing and vision through the human-machine interface. VR is a tool that allows them to experience the feeling of being in another environment. Experiencing a VR environment can significantly reduce the experienced pain by affecting the patient cognitively and behaviorally. [5-7]

Studies are reporting the effectiveness of VR use in different clinical situations, such as injection applications, arteriovenous fistula cannulation, wound care, dental treatment, endoscopy, and colonoscopy, and the method is frequently preferred in routine nursing care abroad. [6, 8-16] The rapid technological developments in recent years have also been reflected in the field of VR, and products with different features and costs have found their place in the market. Studies investigating the effect of VR glasses on controlling pain experienced during burn dressing reveal different results. While some studies reveal a significant decrease in patients' pain intensity, some studies state that VR use is not clinically effective.[12,24-28] The study was planned and implemented to determine the impact of VR glasses during burn dressing on patients' pain levels.

The hypotheses investigated for the study were as follows: i) applying virtual reality glasses during burn dressing has no effect on pain level or ii) application of virtual reality glasses during burn dressing reduces the level of pain.

Methods

Study Design

The study was carried out as a prospective randomized controlled experiment to investigate the effect of using VR glasses during burn dressing on patients' pain levels. The study was conducted in the burn treatment unit of a training and research hospital in Izmir between July and August 2021.

Ethical Consideration

Ethics committee approval of the study was received from Izmir Bakırçay University Non-Interventional Clinical Research Ethics Committee on 20.05.2021 (decision no: 283, research no: 263). In addition, research permission was obtained from the hospital where the research would be conducted, with the decision of TUEK numbered E15345988-799. In addition, verbal and written consent was obtained from each patient before inclusion in the study.

Population and Sampling

The study population consisted of all patients who received outpatient treatment in the burn unit and inpatient treatment in the ward between July 2021 and August 2021. Power analysis was performed to determine the number of study samples. The power of the test was calculated with the G*Power 3.1 program. For the power of the work to exceed 80%, 5% significance level, and 0.25 effect level, It was determined that a total of 56 people, 28 people in the groups, should be recruited (t=1.404; Effect size d=0.25). Considering there may be losses during the study process, it was decided to include at least 30 people in each group. Patients were assigned to the study groups using the computer-assisted randomization method. Inclusion criteria were: burn patients who were over 18 years old; did not have any psychiatric disease, did not have vision, hearing, and perception problems; and without a previously identified chronic pain problem.

Data Collection Tools

In the collection of research data, a Descriptive Information Form was used to determine the socio-demographic and burn-related characteristics of all volunteers in the experimental and control groups, and a Numerical Pain Scale was used to assess their pain levels.

Descriptive Information Form: The researcher created this form per the literature [8-14] and reviewed it with two specialist nurses. In addition to the socio-demographic information of the patients (age, gender, and marital status), it consists of 11 questions in ordert to to determine the disease process, such as burn agent, burn area, and percentage.

Numerical Pain Scale: The pain scale that determines patients' pain severity includes numbers between 0 and 10. A "0" on the scale indicates the absence of pain, and a "10" means the most severe pain experienced.

Interventions

The steps followed in the research process with burn dressing patients are as follows.

- Informed consent was obtained from all patients, a socio-demographic information form was filled out before the procedure, and the numerical pain scale to be used after the process was introduced.
- Randomization was performed, and the patients were included in either the experimental or control groups.
- The use of virtual reality glasses was explained to the patients in the experimental group.
- Burn dressing was carried out by physicians and nurses in the clinic. Meanwhile, routine clinical treatment and care procedures were applied to the patients in the control group. In addition to standard treatment and care, the patients in the experimental group were allowed to watch a video with virtual reality glasses, starting just before the procedure and continuing during the process.
- The numerical pain scale was applied to the patients in both groups immediately after the dressing. The pain levels they felt during the procedure were determined, and the study was completed.

G04e Vr Shinecon 3d virtual reality glasses were used in the research (Picture 1). The internet video "Relaxation Project 1" contained various nature images and was watched through these glasses. (https://www.youtube.com/watch?v=B9xn0UUyMj0&t=656s access date: 11.05.2021). The selection was chosen among

videos lasting approximately 1 hour so as not to interrupt the burn dressing. Two expert opinions were obtained before using the selected video.

Statistical Analysis

The data were analyzed with the Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, New York, USA). The chi-square test was used to compare the descriptive and burn-related characteristics of the patients in the experimental and control groups, and the frequency and percentage distributions were indicated. Frequency and percentage distributions of responses regarding using virtual glasses during burn dressing are presented. Normal distributions of quantitative variables were tested with the Shapiro-Wilk test. The Independent Sample t-test was used to compare normally distributed quantitative data, and the Mann-Whitney U test was used to compare the non-normally distributed quantitative data. Data were tested with a 95% confidence interval and 5% margin of error.

Results

When the descriptive characteristics of the patients were analyzed (Table 1), it was found that there was no significant difference between the socio-demographic characteristics of the patients in the experimental and control groups (p<0.05).

The most common cause of burn in both patient groups was "Hot Liquids." Similarly, most patients in the experimental and control groups were receiving treatment for second-degree burns. When the average burn areas were evaluated, the experimental group's surface burned percentage was 7.2±8.97%. This value was 7.9±11.48% in the control group (p>0.05). The three most common burn areas in the experimental group were the left arm (26.7% n=8), right leg (26,7% n=8), and left leg (26.7% n=8). In the control group, the most common three regions were the right leg (30% n=9), left leg (26.7% n=8) and right and left arm (20% n=6). Regions affected by burns did not differ between the two groups (p>0.05).

Patients were evaluated in terms of dressing days. It was determined that the patients in the experimental groups were included in the study on the 24.7±44.33 days, and the patients in the control groups were included in the study on the 12.17±12.44 days (p>0.05).

When the patients receiving analgesics before burn dressing were evaluated, it was determined that more than 80% of the patients in both groups did not receive any analgesic before dressing (p>0.05) (Table 2).

The mean pain score reported by the experimental group was 4.17±1.6, and this was 6.17±1.58 in the control group (p<0.001) (Table 3). Patients age, number of burn dressing days and burn perten on the body did not differ significantly between the experimental and control groups (p>0.05).

Table 1. Sociodemographic characteristics of the patients (n=60)

		Experimental		Control		χ^2	p
		n	%	n	%		
Gender	Female	17	56.7	11	36.7	2.411	0.121[a]
	Male	13	43.3	19	63.3		
Marital Status	Married	24	80	17	56.7	3.774	0.052[a]
	Singel	6	20	13	43.3		
Education Status	Literate	2	6.7	1	3.3		0.150[b]
	Primary school	12	40	5	16.7		
	High School	10	33.3	17	56.7		
	University	6	20	7	23.3		
Smoking	Yes	14	46.7	23	76.7	5.711	0.017[a]
	No	16	53.3	7	23.3		
Alcohol Use	Yes	8	26.7	18	60	6.787	0.009[a]
	No	22	73.3	12	40		
		Mean	**Sd.**	**Mean**	**Sd.**	**t/Z**	***p***
Age		46.23	14.22	39.33	14.17	t=1.883	0.065[C]

a: Pearson Chi-square, b: Fisher-Freeman-Halton test c:Independent Sample t test

Table 2. Burn characteristics of the patients (n=60)

		Experimental		**Control**		χ^2	***p***
		n	**%**	**n**	**%**		
Burn Source	Hot liquids	21	70	13	43.3		0.072[a]
	Flame/explosion	5	16.7	7	23.3		
	Hot surface	0	0	5	16.7		
	Electric	2	6.7	1	3.3		
	Chemical	2	6.7	4	13.3		
Pre-dressing analgesic use	Yes	3	10	5	16.7		0.706[b]
	No	27	90	25	83.3		
Burn degree	1. Degree	0	0	3	10		0.276[a]
	2. Degree	22	73.3	21	70		
	3. Degree	8	26.7	6	20		
		Mean	**Sd**	**Mean**	**Sd**	**t / Z**	***p***
Burn Percentage		7.20	8.97	7.90	11.48	Z=-0.037	0.970[c]
Dressing Day		24.70	44.33	12.17	12.44	Z=-1.208	0.227[c]

a: Fisher-Freeman-Halton test b: Fisher Exact test c: Mann Whitney U test

Table 3. Mean pain severity score of the patients during dressing

	Experimental Group		Control Group		t / Z *	*p*
	Mean	Sd.	Mean	Sd.		
Pain Score	4.17	1.60	6.17	1.58	t=-4.877	**<0.001**

* t: Independent Sample t test

Discussion

It is known that virtual reality applications change the way the patient interprets pain signals and reduce the brain's pain-related activity. In the study of Hoffman et al.[16], virtual reality was applied to healthy adults during pain created by the thermal stimulus. The brain functions of individuals were evaluated with the functional magnetic resonance imaging technique, and it was reported that the activities of the pain-related parts were significantly reduced. Using VR in short-term interventional procedures such as breast biopsy, arteriovenous fistula cannulation, phlebotomy, and episiotomy can reduce the pain experienced. [8, 18-23] The use of non-drug methods, as well as analgesic drugs, in controlling pain during a burn dressing change, has been reported to be essential in ensuring patient comfort. [24] In two different studies conducted by Hoffman et al. in adolescent and pediatric patients, it was revealed that VR application during dressing change significantly decreased pain scores. [25,26]
In the systematic review published by Scapin et al., it was reported that the use of VR in burn patients reduced the stress and anxiety levels of the patients, made the dressing change and physical rehabilitation process more stress-free, and shortened the dressing change period, in addition to making the patients experience less pain. It was also concluded that VR increased wound epithelialization as it decreased the stress level of the patients. [27] Similar results were obtained in the meta-analysis concerning pediatric burns. [28] In a meta-analysis published in recent years, the effects of VR vary according to the type of glasses used. It has been reported that interactive VR applications reduce patients' pain intensity, but passive VR applications do not have the same effect. [29]
Although ordinary VR glasses were used in our study and patients passively experienced the VR, the pain scale mean score was significantly lower in the experimental group. There are studies stating that there is no significant decrease in the severity of pain in patients using interactive VR tools. [30,31] Other studies have found an effect with interactive but not passive VR, while the present study found an effect even with passive VR. There is a need for further large-scale prospective studies to examine the effect of interactive and passive VR and the specific experience type in pain control. The sources of pain and the patient groups should be large enough that types of pain and patient demographics can be investigated, too.

Adverse Effects
There were no side effects, but one patient stated that glasses hurt their eyes.

Limitations
The researcher had to hold the glasses because the burn dressing was done in washing tubs. Since only one researcher was involved in the data collection phase, the blinding method could not be used.

Conclusion
The technique of distracting attention with a passive VR experience helped reduce the severity of pain experienced by burn patients during dressing changes. There is a need for much more research into this field to determine when and in whom VR distractions occur and what sort of VR experience is most effective in reducing the perception of pain.

Conflict of interest
The authors have no conflicts of interest to disclose.

Compliance with Ethical Statement
Ethics committee approval of the study was received from Izmir Bakırçay University Non-Interventional Clinical Research Ethics Committee on 20.05.2021 (decision no: 283, research no: 263). In addition, research permission was obtained from the hospital where the research would be conducted, with the decision of TUEK numbered E15345988-799. In addition, verbal and written consent was obtained from each patient before inclusion in the study.

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Author's Contributions
Ç.G., A.G.: Study idea/Hypothesis; Ç.G., A.G.: Design; Ç.G.: Data Collection; Ç.G., A.G.: Analysis; Ç.G.: Literature review; Ç.G.: Writing; A.G.: Critical review.

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