

Original Article

Comparative study of the effects of muscle relaxation and mental imagery techniques on pain intensity in patients with the second-degree burn wounds

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ARTICLE INFO

Received 30 November 2015
Revised 19 February 2016
Accepted 1 March 2016
Published 30 March 2016

Available online at:
<http://npt.tums.ac.ir>

Key words:

muscle relaxation;
mental imagery;
pain intensity;
second-degree burn

ABSTRACT

Background & Aim: Pain is a major problem after burn injury. Therapeutic practices do not provide sufficient pain relief for patients with burn. Therefore, non-pharmacological interventions such as muscle relaxation and mental imagery can be effective in reducing pain. This study aimed to compare the effects of muscle relaxation and mental imagery techniques on pain intensity in patients with second-degree burn.

Methods & Materials: This was a clinical trial study using convenience-sampling method of 135 patients with burn assigned into two groups of experiment, and control group. Pain intensity was measured in the control group on the first and second day after burn injury before and after dressing besides routine practices without any interventions. When the patients in control group were discharged, the patients in the men wards 1 and 2 were trained in Benson's muscle relaxation technique and the mental imagery technique, respectively, and patients' pain intensity was measured. Then, the mean scores of pain intensity were compared between three groups.

Results: There was no significant difference between three groups in the mean scores of pain intensity before and after dressing on the first day of burn injury and before dressing on the second day of burn injury ($P > 0.05$). A significant difference was observed in the mean score of pain intensity after dressing on the second day of burn ($P < 0.05$). There was no significant difference in the mean score of pain intensity between the two experimental groups.

Conclusion: Both techniques reduced burn patients' pain, and mental imagery had more reducing effect on pain intensity.

Introduction

Burn injuries occur in all age groups and across all socio-economic levels. From 2010 to March 2014, 15810 people were hospitalized in Shahid Motahari Burn Center, Tehran, Iran, and in this time interval, 970 of those hospitalized have died. According to statistics of the American Burn Association, 45000 patients are annually hospitalized for burn injuries and require medical treatment, and approximately 25000 of these patients are admitted to the burn intensive care units (1). Burn injuries are

often painful and debilitating. The burn pain is caused by skin damage and therapeutic interventions including wound debridement, physiotherapy, skin grafting and surgery (2, 3).

Burn recovery is a long and difficult process comprised of painful therapeutic practices, prolonged hospital stays, physical disfigurement and psychological issues. Following burn injury, a wide range of psychological problems can be observed in patients, which results in health and appearance concerns, anxiety, depression, emotional exhaustion, decreased quality of life and sleep disorder. Severe physical pain should be added to all above cases, which continues during therapeutic procedures and hospital stay (4, 5). Burn-injury-associated pain is most likely to be experienced dur-

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ing dressing change, which leads to some complications such as peptic ulcer, hypotension, urine and fecal incontinence and shock (6, 7). Opioids do not sufficiently provide pain control and may include side effects such as substance abuse, exacerbation of pain stimuli, nausea and vomiting, respiratory depression and constipation (8). The lack of appropriate pain relief can result in chronic pain, post-traumatic stress disorder (PTSD), movement defect, loss of appetite, low interaction with others, lack of patient's cooperation with treatment and a delay in the recovery process. Therefore, appropriate pain control for patients with burn should be a priority of care decisions (9-12).

Pain management techniques are tailored to fluctuations of burn pain intensity. Pharmacological treatment for control of burn-injury-associated pain includes opioid analgesics along with antianxiety drugs (benzodiazepines) (5, 11). These patients experience severe pain and anxiety during burn-related medical procedures, which do not reduce using pharmacological practices. Thus, the use of non-pharmacological approaches should not be ignored in the comprehensive care of patients. Non-pharmacological interventions can modify patient's perception and response to pain (5, 13).

Non-pharmacological interventions to manage burn pain include art therapy and play therapy, hypnosis, distraction, biofeedback, music therapy, and mental imagery and relaxation techniques such as muscle relaxation. These interventions have been known to be effective in reducing anxiety and pain perception (2, 11, 14). Muscle relaxation dramatically alters the autonomic nervous system activity resulting in patient's physiological response to stress. Thus, it reduces oxygen consumption and carbon dioxide emissions, decreases respiration rate and heart rate and leads to increase pleasant and delightful feelings and improve mental concentration (15). Mental imagery technique, another approach of pain relief, is an effective method to reduce anxiety and pain perception, based on the mind-body technique believing that mind and body are linked together and can also affect and reinforce each other in the treatment of disease. During imagination, activation occurs in the same brain areas that will be activated in times when an event is really experienced. It means that person creates a stream of thought that enables one to see, hear,

smell or feel what tends to imagine at that moment. Using the mental imagery method can cause pain control, sleeping comfort and relaxation in patients and also help to improve their relationships with others (2).

In general, patients with burn, especially second-degree burn, suffer from severe pain during care procedures such as dressing change that may be associated with many physical and mental effects, if it remains unrelieved. In addition, using opioid analgesics (morphine, etc.) for pain management is associated with side effects and does not provide sufficient pain relief for patients. Considering the burn-related problems and limited number of studies to assess the effect of non-pharmacological methods on pain intensity in patients with burn, the present study aimed to examine the effects of the Benson's muscle relaxation and mental imagery techniques on pain intensity in the patients with second-degree burn.

Methods

This was a quasi-experimental study which conducted on 135 patients admitted to the men wards 1 and 2 at Shahid Motahari teaching hospital, Tehran, Iran. Using convenience sampling method, the patients were assigned into two experimental groups (muscle relaxation and mental imagery) and one control group. Considering the 95% confidence level, 80% power and sample attrition, sample size was considered to be 45 in each group.

Inclusion criteria consisted of being male, with second-degree burn, with full consciousness (being able to cooperate), in age range of 20 to 45 years, with non-inhalation and unintentional burns, with 40-60% of total body surface area affected, at acute phase of burn (the first 48 hours of burn injury), without underlying diseases such as neurological disorders and numbness in the extremities, psychological disorders including Alzheimer's and distraction, muscular disorders, electrolyte disorders including hyponatremia and hypocalcemia, and pathological anxiety disorders.

Exclusion criteria were consisted of lack of patient's cooperation throughout the intervention process, duration of treatment more of than a month a, using neuromuscular blockers (baclofen, dantrolene, etc.), excessive use of opioids and sedatives before entering the dressing room (morphine should be

injected based on patient's weight and at intervals of 4-6 hours, otherwise the patient was excluded from the sampling frame), need for surgery (early excision and grafting), escharotomy or fasciotomy at the acute phase of burn injury.

Visual analog scale (VAS) instrument is a 100-mm line with a certain range, which 0 represents "no pain" and 10 indicates "the worst pain imaginable". This tool is extensively used to measure acute pain and its validity and reliability is confirmed. The participants were asked to mark the point on the line representing their pain intensity or report its number to the researcher. Relaxation steps were as follow: 1. choosing a short phrase or word that reflects individual's basic belief system, 2. choosing a comfortable position, 3. closing eyes, 4. relaxing the muscles, 5. focusing on breathing and using selective word and concentrating on it, 6. not having mental preoccupation, and 7. keeping on this process for a period of time.

Mental imagery technique was trained as follow: feel that you are in a beautiful and calm place especially where you have already been and felt this sense there. Imagine that you are there really. Focus on all the details, colors, sounds, shapes and creatures. Hear sounds and smell scents. All these details make this scene more realistic and the effect of this practice becomes more on you. Whenever you feel that you are full of energy and vitality, the time has come to end your practice. At this time, let the image get gradually faded and erased; stay a little relaxed with closed eyes and then, return to the reality of the outside world. Slowly open your eyes and stretch your muscles.

How to perform the intervention was as follow: patients with acute burns (in the first 48 hours after burn injury) hospitalized in the men wards 1 and 2 and had the inclusion criteria, were allocated to the control group after obtaining informed consent. Then, in the control group, pain intensity was measured during the acute period of burn (within the first 48 hours following burn injury), before and after dressing. No intervention was performed in this group and they just received routine cares (receiving weight-based morphine). When the last patient in the control group was discharged, sampling of the experimental groups was carried out and patients in the men wards 1 and 2 were assigned into the muscle relaxation and the mental imagery groups, re-

spectively. After the patients were trained in the Benson's muscle relaxation technique and mental imagery technique, pain intensity was measured in the experimental groups during the acute phase of burn (within the first 48 hours after burn injury), before and after dressing beside routine practices (receiving weight-based morphine).

Procedure was performed in the experimental and control groups as follow: two hours before dressing in the first 24 hours of burn (the first day of sampling), patients were trained in the techniques several times to ensure to do technique properly. The principal researcher did training orally and individually. In the muscle relaxation group, the patients listened to a tape recorded Benson's muscle relaxation training through earphone and headphone for twenty minutes (in order to facilitate the procedure, avoid forgetting and overcome ambient noise). The mental imagery group was given a written guide. At the start of procedure (before dressing), 30 minutes before entering the dressing room, patients' pain intensity was measured using VAS. Then, the trained techniques were employed by the patients for 20 minutes and after injection of weight-based morphine, the patients were transferred to the dressing room for changing the dressing. During the change, the principal researcher again stressed that patients do the technique and ensured that the patients perform this technique in the dressing room. Fifteen minutes after changing the dressing, when the patient returned to his bed, pain intensity was again measured. The practices done on the first day of sampling were repeated on the second 24 hours of burn (on the second day of sampling).

It should be noted that to ensure properly performing the techniques by the patients during the procedure, muscle relaxation and mental imagery techniques were trained two hours before dressing change, and pain intensity was measured before and after dressing change because burn patients most commonly experience pain during dressing change.

This study was approved by the ethics committee of the research deputy of Tehran University of Medical Sciences (IR.TUMS.REC.1394.1040) and was registered in Iranian Registry of Clinical Trial Database (Code: IRCT201512194443N20). In addition, before data were collected, an informed consent was taken from all the participants. During the

process, ethical considerations were considered; participation in the study was voluntary for the participants; the informed consent was obtained from the research participants; permission for conducting the research was obtained from the research deputy of Tehran University of Medical Sciences; the principal researcher introduced herself to the participants and explained the purpose of research; the study results were made available to participants and authorities; the confidentiality of data and the anonymity of participants were ensured; and nurses were notified for conducting muscle relaxation and mental imagery techniques for patients.

The collected data were analyzed through SPSS software version 16 (SPSS Inc., Chicago, IL, United States). One-way analysis of variance (ANOVA) was used to analyze variables of age, pain intensity, and the burn percentage. Chi-square test was applied to analyze variables of economic status, marital status, and the level of education. The normality of variables was confirmed using one sample Kolmogorov-Smirnov test ($P > 0.05$).

Results

There was no significant difference in the demographic characteristics and disease data including age ($P = 0.99$), marital status ($P = 0.91$), economic status ($P = 0.95$), level of education ($P = 0.74$), and the burn percentage ($P = 0.97$) between experimental groups and control group, and the three groups were homogeneous in terms of underlying variables (table 1).

The results also showed no significant difference

between the study groups in pain intensity on the first day of burn injury, before and after dressing, and on the second day of burn before dressing; but there was a significant difference between the groups in pain intensity on the second day of burn injury and after dressing (table 2). In the control group, the mean score of pain intensity changed from 90.5% on the first day of burn to 89.5% on the second day of burn. In the muscle relaxation group, the mean score of pain intensity reduced from 90.05% on the first day of burn to 86.1% on the second day of burn and in the mental imagery group, the mean score of pain intensity decreased from 89.2% on the first day of burn to 84.9% on the second day of burn.

Table 2, based on the results of ANOVA test indicates that there was no significant difference in the mean score of pain intensity on the first day of burn, before and after dressing and the mean score of pain intensity on the second day of burn, before dressing between the experimental groups and the control group ($P > 0.05$). However, there was a significant difference in the mean score of pain intensity after dressing on the second day of burn between the control and the relaxation groups ($P = 0.02$), and between the control and the mental imagery groups ($P < 0.01$). This table shows no significant difference between the muscle relaxation and mental imagery groups ($P = 0.80$).

Discussion

The results of the study demonstrate that both interventions (muscle relaxation and mental imagery)

Table 1. The frequency distribution of demographic characteristics and disease data among the three study groups

Demographic characteristic		Groups [n (%)]			P-value
		Mental imagery	Muscle relaxation	Control	
Age (Year)	20-29	14 (31.1)	15 (33.3)	16 (35.6)	0.99
	30-39	15 (33.3)	15 (33.3)	15 (33.3)	
	40-45	16 (35.6)	15 (33.3)	14 (31.1)	
Marital status	Single	25 (55.6)	23 (51.1)	24 (53.1)	0.91
	Married	20 (44.4)	22 (48.9)	21 (46.7)	
Economic status	High	8 (17.8)	6 (13.3)	5 (11.1)	0.95
	Moderate	30 (66.7)	31 (68.9)	32 (71.1)	
	Low	7 (15.5)	8 (17.8)	8 (17.8)	
Level of education	Under diploma	13 (28.8)	15 (33.3)	16 (35.6)	0.74
	Diploma	21 (46.7)	16 (35.6)	15 (33.3)	
	Academic	11 (24.5)	14 (31.1)	14 (31.1)	
Burn percentage (%)	40-49	25 (55.6)	26 (57.8)	26 (57.8)	0.97
	50-60	20 (44.4)	19 (42.2)	19 (42.2)	

Table 2. Comparison of the mean score of pain intensity on the first and second days of burn injury between the experimental and control groups

Time	Pain intensity	Group			P-value
		Mental imagery	Muscle relaxation	Control	
First day of burn before dressing		90.4 ± 8.7	90.7 ± 8.6	90.0 ± 9.2	0.92
First day of burn after dressing		88.0 ± 8.6	89.0 ± 8.6	91.0 ± 8.1	0.24
Second day of burn before dressing		87.0 ± 9.3	88.2 ± 8.9	90.0 ± 8.2	0.27
Second day of burn after dressing		82.8 ± 9.3	84.1 ± 8.6	89.0 ± 8.1	< 0.01

The findings are the results of ANOVA test.

could significantly reduce pain intensity in the patients with the second-degree burn wound. Lack of use of non-pharmacological interventions can lead to increased pain or inadequate pain control, indicating the need for the use of non-pharmacological interventions to reduce pain. Similarly, in a study, muscle relaxation and mental imagery techniques could reduce the pain and distress caused by the disease in the women with breast cancer (15).

In the current study, muscle relaxation technique reduced pain intensity in patients with burn injury, and patients in control group experienced more pain than the experimental groups. In a similar study, muscle relaxation technique was effective in relieving pain, pruritus and vital signs in the patients with burn injury, especially second-degree burn, and it was suggested that complementary methods should be used in reducing pain in the patients with second-degree burn (11).

In the current study, in the patients of the mental imagery group, pain intensity after dressing on the second day of burn was less than the control group. A similar study found that the mental imagery technique significantly reduced headache and its related disability in the patients with migraine (16).

In this study, after applying muscle relaxation and mental imagery interventions, pain intensity significantly reduced; while in control group, pain intensity did not reduced despite receiving routine practices. Findings of this study is consistent with Pourhajari et al. study conducted to assess the effect of hand massage therapy, foot massage therapy and foot and hand massage therapy on pain intensity in patients with burn injury (17).

In a study carried out to examine the impact of guided imagery on pain and anxiety in the patients undergoing coronary angiography, results indicated that guided imagery intervention reduced the level of pain and anxiety before surgery in the patients waiting for angiography (18). In a study on the effect of music on pain threshold, anxiety, behavioral

responses to pain and hemodynamic parameters during dressing change in patients with burn, results showed that music, especially a familiar type, can have a positive impact on reducing anxiety, pain and controlling some vital signs (19).

Results of the current study revealed that both muscle relaxation and mental imagery interventions significantly reduced pain intensity after dressing on the second day of burn injury. Therefore, it is suggested that beside pharmacological practices (sedatives and opioids), non-pharmacological interventions such as mental imagery can be used to relieve pain in patients. The following items were outside the control of the investigator that may have affected the quality of muscle relaxation, mental imagery and the study results: the study participants were different in terms of physiological, emotional, psychosocial and cognitive factors; the researcher and participants had not a separate and quiet room for conducting research and intervention, and confounding environmental factors may have had effect on the quality of muscle relaxation and mental imagery. Furthermore, the lack of random assignment of subjects to the study groups may have provided the confounding effect for unknown variables.

Muscle relaxation and mental imagery interventions can reduce pain intensity in patients with the second-degree burn wounds. This reflects the benefits of non-pharmacological interventions for pain relief. Considering that using these methods does not cost much and their applications are very easy and practical, these methods can be used to relieve pain in patients with second-degree burn.

Acknowledgments

This article is part of MSc thesis/research project in 2015 supported by Tehran University of Medical Sciences. The authors acknowledge the cooperation of all the staff of Shahid Motahari hospital and patients participated in the study.

Conflict of interest

The authors declare no conflict of interest.

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