

The Effect of Range of Motion Exercises on Activity Daily Living and Quality of Life in Patients with Burn

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Abstract

Introduction: Comprehensive rehabilitation plays an important role in the care of burn. Joint motion exercises are part of the essential programs for the rehabilitation in burn injuries. This study was conducted to determine the effect of range of motion exercises on activity daily living and quality of life in patients with burn. **Methods:** The present clinical trial study was performed on 60 patients with second degree burns. Patients were randomly assigned to two groups of control and intervention, each with 30 subjects. Patients in the intervention group received scheduled range of motion exercises (Flexion- Extension, Abduction- Adduction, Internal rotation- External rotation) three times a day for 4 weeks in burn joint. The data were collected through Barthel's questionnaire and Burn Specific Health Scale. Student's t-test and SPSS version 23.0 were used for statistical analysis. **Results:** The findings of the present study showed that there was a significant difference between the two groups in terms of the average activity daily living ($P < 0.001$). Comparison of the dimensions of quality of life in the control and intervention groups based on independent t-test showed a significant difference in physical dimension ($P < 0.001$), social dimension ($P < 0.001$), and psychological dimension of quality of life ($P = 0.01$). **Conclusion:** The results of this study indicate the effective role of range of motion exercises on improving the activity daily living and quality of life of patients with burns in all aspects. Thus, it is recommended to use range of motion exercises in providing appropriate care for burn patients in hospitals and burn centers.

Keywords: Activity daily living, Quality of life, Burn.

Introduction

Burn is a risk that threatens people in different ways every day (Kumar et al., 2013). In cases burn victims are treated successfully, they will be affected by numerous complications such as hypertrophic scars, Contraction of joints, sensory disturbances, and motor limitation (Esselman, 2009). When an individual is afflicted with burning, movements of his lower and upper limbs become quite restricted. (Falder et al., 2009). The involvement of joints, has a great impact on the activities of the daily living (ADL). According to formerly conducted

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studies, more than 50% of burn victims do lose their ability to do their activities of the daily living independently (Maslauskas et al., 2005; Falder et al., 2009).

The loss of autonomy of ADL threatens the mental health and self-esteem of patients; this negative change will, in turn, disrupt social communication and damage the stream of attention the families used to provide for the individual (Besely et al., 2013). These factors can have a negative impact on the well-being and quality of life of the individual (Shojaei, 2008). According to formerly conducted studies, the primary cause of depression and poor quality of life is the physical symptoms of the disease (Smailes et al., 2013; Druery et al., 2005). Comprehensive rehabilitation plays a key role in caring for patients with burns. Rehabilitation programs should begin as soon as possible after the patient's admission. Early rehabilitation plays a key role in the care of patients with burns (Edgar & Brereton, 2004). The ultimate goal of rehabilitation is to restore the independence of burn victims. Encouraging the patients to have adequate mobility is imperative. (Esselman, 2007). Unfortunately, most patients do not pay attention to this issue and its consequences long after the appearance of deformities and functional disorder in fact, incomplete rehabilitation or delayed initiation of Rehabilitation is a major factor in the degradation of organ function and the negative consequences result from it (Cen et al., 2015).

Range of motion exercises are an essential part of rehabilitation and care programs for burn patients. In fact, ROM exercises for the patient and his family are easy to apply and do not require any special equipment and space, and they are done to maintain flexibility and mobility of the joints mobility (Kisner & Colby, 1996). These exercises cause joints mobility in their range and prevent joint stiffness and contracture (Asadullah et al., 2013). In addition, ROM exercises decrease edema by increasing intravenous and lymphatic flow (Richard & Ward, 2005). According to formerly conducted studies, passive exercise has a clear role in comparison with other therapies in reducing pain in patients (Hoffman et al., 2000). A study showed that the main benefits of range of motion exercises include reducing the pain and symptoms of depression in burn Patients (Van Deusen & Harlowe, 1987), Patients with burns may be reluctant to participate in a rehabilitation program and exercise routine because of inadequate information regarding the need for a rehabilitation program and how the effects of this program influence their quality of life (Cen et al., 2015). As part of a rehabilitation team, nurses are essential links between the patient, the family and the rehabilitation team. The role of nurses in this team as coordinator among other members of the rehabilitation team include training and improving rehabilitation knowledge, providing guidance and training to patients to carry out activity daily living, and helping patients achieve their rehabilitation goals in a limited time. On the other hand, assessing the quality of life of burn patients provides valuable information to nurses (Xia et al., 2014). Therefore, due to limited studies in the field of rehabilitation of patients with burns, this study was conducted to determine the effect of range of motion exercises on activity daily living and quality of life in burn patients.

Materials and Methods

This paper is a research project approved by (U-96060) Nursing and Midwifery Faculty of Ahvaz Jundishapur University of Medical Sciences. The present random clinical trial study (registration code: IRCT20170709034968N1) was conducted on burn patients admitted to Taleghani Hospital in Ahvaz, after obtaining the code of ethics (IR.AJUMS.REC.1396.319) of Ahvaz Jundishapur University of Medical Sciences.

The participants included all male and female subjects with less than 40% second-degree burns referring to the mentioned center. Mean comparison formula

$$n = \frac{(s_1^2 + s_2^2) \left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2}{(\bar{x}_1 - \bar{x}_2)^2}$$

was used to determine the sample size, where, based on the results of a previous study (19), $\alpha = 0.5$, $\beta = 0.2$, $X_1 = 0.85$, $X_2 = -1.01$, $S_1 = 1.72$ and $S_2 = 2.81$, and the sample size turned out to be 60 subjects. Samples were randomly divided, using 6-block method, in two groups of control and intervention, with each group containing 30 subjects.

Inclusion criteria - passed 48 hours after burn, less than 40% second degree burn, age range of 18-60 years, absence of neurological problems, no history of joint problems, no contracture and previous deformity in the joints, sustained vital signs, ability to communicate with the researcher, and absence of mental retardation or history of mental illness. Exclusion criteria - inconclusive vital signs and the need for transplant surgery.

The demographic information form contained the general profile of each patient (age, sex, degree of education, occupation, marital status, Supportive system) and information on the burn wound (location of burn, burning surface, burn depth).

The Persian version of the Burn Specific Health Scale-Brief questionnaire was used, which contains 40 questions scored within a range of high, moderate, low, and not at all ranking from 1 to 5. Each questionnaire has at least one and a maximum of five points. From 40 questions of the questionnaire, 18 questions are related to the physical dimension (total points are at least 18 and at most 200), 11 questions are related to the psychological dimension and 11 other questions are related to the social dimension of quality of life; in regard with the psychosocial dimension, the minimum score is 11 and the maximum score is 55. Based on this questionnaire, quality of life in each field is determined separately in each individual domain; The higher the mean is, the better the quality of life of the individual and vice versa. (Pishnamazi et al., 2013).

In order to evaluate the activities daily living of patients, The Persian version of Barthels'activities of daily life scale was used. This questionnaire contains 10 questions with Likert scales (0-15), the score range of which is from 0-100. The score 100 indicates complete independence and zero score indicates complete dependence of the individual in daily life activities; this scale includes questions about feeding (0-10), bathing (0-5), cleaning (0-5), dressing up (0-10), urinary excretion control (0-10), stool control (0-10), toilet use (0-10), transfer from bed to chair and vice versa (0-15), mobility on level surfaces (0-15) and using stairs (0-10). This tool sets the ability of a person to perform activity daily living at a scale of 0 to 100, with higher scores representing a better situation. Scores 0-20 are considered as complete dependency, 20-60 as severe dependency, 61-90 as moderate dependencies, grades 91-99 as partial dependency, and 100 is considered as complete independence (Tagharobi et al., 2003).

After randomly allocating the patients into two groups of intervention and control (Assigning samples to each of the groups was performed by blocking method using 6 blocks. The study population was divided into 10 groups of 6. Six people in each group received completely randomized codes of A (Intervention) and B (Control) code), the Persian version of the Barthel and Burn Specifics Health scales (BSHS) were completed by the subjects one day before the start of the intervention; the patients received required guidance about filling out the questionnaires. Patients in the control group performed routine hospital care for 4 weeks. Thus, patients in the intervention group in addition to routine hospital care, received exercise program for 4 weeks, 3 times a day, repeating the move 10 times, each time for 30 seconds in the full range of large (Shakouee, 2003) joints of the upper and lower limbs. If the patient was discharged from the hospital before completing the research process (4 weeks) he/she should continue doing the exercises at home. The patients performed these exercises with the official permission of a burn specialist; this period varied for different patients, normally ranging from 48 hours up to one week. When vital signs were stabilized, these exercises were performed on the upper extremities (wrists, elbows, shoulders) and lower extremities (thighs, knees, ankles). Movements of the intervention group were performed in the full range of the joint, with maximum flexion-extension of joint, maximum range of abducting-adducting and maximum range of spin-to-inside and spin-to-out if possible. Exercises consisted of flexion-extension in elbow joint; flexion-extension, abducting-adducting, spinning in whole range of motion in shoulder joint; flexion-extension and spinning in all directions of joint in hand joint; flexion-extension, abducting-adducting, the spin-to-inside and spin-to-out of joint in Hip joint; flexion-extension in knee joint and flexion-extension in ankle joint.

In the intervention group, the practice of exercising for the patient and his first-degree family was thoroughly explained in order to prevent any changes to the exercises to the extent possible. Just for 4 weeks, patients were asked to perform these exercises accurately and regularly. The researcher directly supervised this. After 4 weeks, Barthel questionnaire was filled out again by the intervention and control groups; BSHS questionnaire was completed three months (Quality of life in this study was considered as a three-month) after the intervention by the intervention and control groups. The researcher contacted the patient (intervention- control) as a follow-up phone in during the study period.

Student's t-test and SPSS version 23.0 were used for statistical analysis. The activities daily living and quality of life of patients were compared in two groups of intervention and control.

Results

The present study was conducted on 60 subjects categorized in two groups of intervention and control, each with 30 members. There was no significant difference between two groups in terms of demographic characteristics: age ($P = 0.3$), sex ($P = 0.6$), education level ($P = 0.8$), marital status ($P = 0.09$) (Table1) The significance level of all tests was considered to be less than 0.05%.

According to Table (2), the results showed that there was no significant difference between the two groups in terms of burn percentage ($P = 0.3$) and burn site ($P = 0.1$). In regard with the severity of burns, the highest and lowest rates were 5 and 36% in the control group and 5 and 40% in the intervention group.

According to Table 3, A non- significant difference in average of activity daily living was observed between the two groups before intervention ($P = 0.2$). Independent t-tests showed a significant difference in the activity daily living between the two groups after intervention ($P < 0.001$).

According to Table 4, A non- significant difference in average of quality of life was observed between the two groups before intervention ($P=0.77$). After intervention, independent t-tests showed a significant difference between the two groups in quality of life ($P<0.001$). The results showed that there was no significant difference between the two groups in physical domain ($P=0.48$) social domain ($P= 0.31$) Psychological domain ($P=0.5$) before intervention. After intervention, independent t-tests showed a significant difference between the two groups in all aspects of quality of life ($P<0.001$)

Discussion

The results of this study showed that Range of Motion exercises improve the activity daily living and quality of life of in three physical, psychological and social aspects patients with second degree burn.

Based on the results of Tang et al. study, rehabilitation interventions are effective in increasing the daily activities of patients with burns (Tang et al., 2006). Grisbrook et al. Showed that doing exercises can improve the daily routine of burn patients' lives (Grisbrook et al., 2012). In the Study by Calgman and Philman, exercise was effective in improving joint movements and skin mobility in burn patients (Callaghan & Flinham, 2005). The results of some studies showed the positive effect on the training of physical movement and its implementation on preventing types of deformity and, consequently, improving and maintaining normal functioning. Although our study does not deal with the development of any kind of deformity that can affect the performance of a person, Petronik et al., in a prospective three-year study, emphasize the importance of the impact of early physical movements on the prevention of contractures, scars and colloids in second-degree burn patients (Petronic et al., 2000). In all of the above studies, the best way to perform motion-based movements is to educate the correct movements of the patients and monitor the correct and effective implementation of the movement, both of which are considered in the current study. The positive impact of exercises on the range of motion of joints in non-burn patients has, also, been evaluated. For example, Valentin et al. have studied the importance of joint motion exercises on improving the daily life of elderly women (Seng et al., 2007).

The training of sports movements improves physical health and quality of life in patients with burns. In the Study by Lean et al, rehabilitation nursing interventions improved the physical dimension of quality of life in patients with burns (Lin et al., 2017).

The findings of this study showed that the rehabilitation program improves the psychological function of patients. It seems that upgrading the patient's ability to do his or her daily routine helps the individual's feelings about his or her future, and it increases self-esteem and psychological and emotional recovery, reduces anxiety, alleviates fear, and ultimately improves the quality of life. Wright et al considered the effect of rehab to be quite positive on the mood status of patients with cerebrovascular disease (Wright & Gronfein, 200).

Concerning social performance, research findings showed that rehabilitation measures improve social performance. The social dimension of quality of life is linked to the ability of the individual to communicate with family members, neighbors, and other social groups. Regarding the effects of rehabilitation on social performance, it can be stated that recovery of physical performance following rehabilitation programs has a positive impact on the understanding of people with burns in terms of health and social functioning of individuals, which will ultimately lead to improved social performance of individuals. Consistent with the findings of the present research, Lean Lee et al study, which was conducted to examine the impact of nursing rehabilitation interventions on the health status of burn patients, indicated that rehabilitation measures improve the quality of life of patients in the social dimension (Lin et al., 2017).

Since this study was conducted in a limited time period (3 months) and given the limited scope of the research community, it is recommended that this study be conducted on patients with at least six months to one year follow-up after burn. It is, also, recommended to conduct the same interventions of the present study in higher degree burns.

Conclusion

To put in a nutshell, the results of this study and other mentioned studies indicated that rehabilitation training plays an important role in providing appropriate care for burn patients, and range of motion exercises, as an essential part of rehabilitation programs, are easily accessible. These types of exercises do not need special equipment and space; additionally, doing these exercises in a planned way can have a positive effect on increasing the autonomy of burn patients in performing activities daily living and improving their quality of life. The results of the present study are used in planning useful care for burn patients in hospitals and burn centers by clinical nurses and physiotherapists as well as occupational therapists. On the other hand, this study can be a guide for providing useful training for nurses to enable them conduct medical duties and rehabilitation plans in a more focused and fruitful manner.

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Table 1: Comparison of demographic information of two groups of control and intervention

Variable		Control groups (30)	Intervention group (30)	Pvalue
Age		32.33±10	35±10	p=0.3
sex	Male	(12=40%)	14 (47%)	P=0.6
	Female	(18=60%)	16(53%)	
Education	Illiterate	(3=10%)	2 (7%)	P=0.8
	Primary	(5=17%)	7 (23%)	
	Diplom	(15=50%)	16(54%)	
	Bachelor	(7= 23%)	5 (16%)	
Marital status	Married	(22=73%)	27 (90%)	P=0.09
	Single	(8=27%)	3 (10%)	

Table 2: Comparison of the characteristics of the wounds of burn patients in two groups of control and intervention

variable		Control group (30 subjects)	Intervention group (30 subjects)	P value
Burn percentage	0-10	2 (7%)	6 (20%)	p=0.2
	10-20	22 (73%)	12 (40%)	
	20-30	4 (12%)	8 (27%)	
	30-40	2 (7%)	4 (13%)	
Burn site	Upper limbs	11 (37%)	15 (50%)	P=0.1
	Lower limbs	8 (26%)	8 (27%)	
	Upper and lower limbs	11 (37%)	7 (23%)	

Table 3: Comparison of mean activities daily living in3 two groups of control and intervention before and after the intervention

Activity daily living	Before intervention Mean ±SD	After intervention Mean ±SD	P-Value
Intervention group	65.23±11.56	87.30±8.61	P<0.001
Control group	68.53±11.67	75.30±10.79	P<0.001
	P=0.2	P<0.001	

Table 4: Comparison of mean and standard deviation of quality of life dimensions in burn patients in two groups of control and intervention

Variable		Before intervention Mean ±SD	After intervention Mean ±SD	Paired t-test
Physical dimension	Control group	20.07±6.54	33.8±5.40	P<0.001 P<0.001
	Intervention group	21.27±6.6	24.13±6.06	
		P=0.48	P<0.001	
Psychological dimension	Control group	40.9±12.18	64.4±13.18	P<0.001 P=0.01
	Intervention group	41.9±5.86	45.9±8.33	
		P=0.5	P=0.01	
Social dimension	Control group	31.17±6.54	43.6±1.3	P=0.06 P<0.001
	Intervention group	30.13±5.4	32.6±0.9	
		P=0.31	P<0.001	
Total quality of life	Control group	92.23±15.72	141.70±22.7	P<0.001 P<0.001
	Intervention group	93.20±9.94	102.56±12.72	
		P=0.77	P<0.001	