

Impact of Active and Passive Range of Motion Exercises on Contracture Severity among Burn Patients



Mohammed Mohsen Mohammed 1, Wafaa Ismaiel Sherif 2, Mohga Abdelaziz ElRefai3, & Hanan Abo Bakr Mohammed4

1Assistant Lecturer - Medical Surgical Nursing Department, Faculty of Nursing – Kafrelsheikh University

2Professor of Medical Surgical Nursing Department, Faculty of Nursing – Mansoura University.

3Professor of Medical Surgical Nursing Department, Faculty of Nursing – Kafrelsheikh University

4Assistant professor of Medical Surgical Nursing Department, Faculty of Nursing – Mansoura University

Corresponding author email: dr.m_mohsen2012@yahoo.com

1.ABSTRACT

Contractures are a common complication following sever burn injury, and are characterized by a reduction in joint mobility. **Aim:** was to evaluate the impact of active verses passive range of motion exercises on contracture severity among burn patients. **Method:** Quasi-experimental pre-test, posttest research design was utilized. The study was conducted in Burn Unit at General Kafrelsheikh Hospital- Kafrelsheikh City- Kafrelsheikh Governorate; affiliated to Ministry of Health, Egypt. A purposive sample of 60 patients was the study sample. The actual time of data collection started from beginning of October 2018 to the May of 2019. Patients were received the routine hospital treatment regimen plus range of motion exercise for each patient at least for one time daily. **Tools:** Two Tools were used for data collection; *tool I*; Assessment questionnaire sheet, and *Tool II* Joint motion measurement scale. **Results:** A highly statistically significant correlation was found between following active range of motion exercises and joint contractures among the study group ($r= 0.624$; $P = 0.000$). Compared with a highly statistically significant correlation between following passive range of motion and joint contracture among the study group ($r = 0.811$, p -value = .000). **Conclusion:** Despite the frequency of contractures at time of hospital discharge, very few contractures were severe, and this may be emphasized the importance of practicing range of motion exercises during acute hospitalization **Recommendations.** Early application of range of motion exercise is an important intervention for minimizing contracture in sever burn patients.

Key words: Active Range of Motion, Burns, Contracture, Passive Range of Motion.

2.Introduction

The survival rates among patients with serious burn have been safely improved in the past few decades (Smolle et al., 2017). Therefore, the regard for burn care is moving from maintaining life to issues of recovery, like function, and social joining. During rehabilitation for patients with burn, contracture is the major clinical problem in those with significant dermal and full-thickness burns which can initiate loss of joint mobility and impairment during ambulation and moves, fine motor duties, and practicing exercises of daily living (Herndon, 2018)

Contractures represent, a significant source of disability for patients recovering from burn injury. Post-burn contractures frequently devastating have the quality of life and one's capacity to perform activities of daily living. As Contractures bring about diminished joint range of motion and may likewise result in disabled joint capacity and inability, distortion, and cosmetic and mental impairment. Even at the top burn centers

and despite extensive, early physical and occupational therapy, an enormous level of burn survivors will get functionally restricting post-burn contractures (Goverman, et al., 2017)

The management of burn contracture is not confined to any specialty and indeed not only to the medical profession, but must be practiced by specialized nurses; whereas proper and timely rehabilitation services can minimize medical costs and improve quality of burn patient life through proper positioning of burned body areas, early active exercises, and appropriate splinting. The nurse guides the patient to demonstrate understanding; of how he can again be active constructive member of the society (Söderback, 2015)

Therefore, prevention of developing burn contracture is a common link throughout providing good quality nursing care. However, the objective of burn rehabilitation is achieved through prevention of soft tissue deformity, maintaining

musculoskeletal functions; as well as; rapid returning to independency; back to practice self-care; pre- burn life style functions. Where; these goals are achieved through specific rehabilitation procedures as - anti-deformity position (Polychronopoulou, Herndon, Porter, 2018

II. Significance of the Study

The researcher of the current study had been observed that during clinical encounter at burn unit that most of the patients who are admitted to the said center are suffering from post- burn joint contracture. Which in turn, these joint contractures had a bad reflect and impact on the patient's physically, psychologically and economically and consequently increases the patient's hospital stay adding to the hospital cost. These emphasizes the crucial role of the nurse of assuming the responsibility for minimizing of contracture through maintaining proper early active range of motion exercise.

Aim of the study:

The aim of this study was to evaluate the impact of active verses passive range of motion exercises on contracture severity among burn patients.

Research hypothesis:

There would be no differences on contracture severity between those patients who followed active exercises verses those who followed passive exercises.

3. Methods

Research Design;

A Quasi-experimental: pre-test –posttest research design was utilized in this study.

Study Setting:

The study was carried out in Burn Unit at General Kafrelsheikh Hospital- Kafrelsheikh City- Kafrelsheikh Governorate) which affiliated to Ministry of Health, Egypt. This hospital is composed of four floors with 403 patient's bed. The burn unit is located in the third floor, and consists of eleven rooms, with capacity of twenty-one beds. Three out of the eleven rooms are occupied with three patents' beds. The other six rooms each one occupied by two beds; and the last two rooms are assigned for wound dressing. Burn unit used to receive the burn patients through the emergency department & and the outpatient clinics.

Study Subjects:

A purposive sample of 60 patients was the study sample. The actual time of data collection started from beginning of October 2018 to the May of 2019. Patients were received the routine hospital treatment regimen plus range of motion exercise for each patient at least for one time daily under supervision from the physiotherapist.

Inclusion criteria: Adult male and female conscious patients aged from ≥ 21 years to 60 years or more; hospitalized patients diagnosed with second or third degree burn injury at shoulder, elbow, hip, or knee joint and admitted immediately to hospital i.e. at early stage of getting the burn injury. **Exclusion criteria:** Patient with pre-existing physical disability at joints. Patient admitted to hospital after 48 hours of burn injury.

Tools:

For collection of data to achieve the aim of the study; two tools were utilized as the following:

Tool I: Assessment questionnaire sheet: *demographic data of study subjects*; it included data related to age, gender, level of education, occupation, and place of residence, items 1 to 6). **Tool II:** Joint motion measurement scale by (Norkin & White, 2016). This scale was modified by the study's researcher, and utilized to assess patient's ability of performing passive and active range of motion exercises of each joint using a goniometer as standardized technique. Multiple plans of motion (i.e., flexion/extension) were assessed at each selected purposeful joint. For each impaired joint muscle action (active range of motion) is assigned a severity rating' scale; these ratings are determined by dividing the normal range of motion value equally into three levels; mild, moderate, and severe. A limitation in the range of motion in at least one plan of motion at a specified joint was considered to be a contracture at that joint.

Validity and reliability:

The content validity of the program and the developed tools were reviewed by a panel of five expertise (two professors in medical surgical nursing, one assistant professor of physical therapy, Director of surgical and burn unit & the head nurse of burn unit). The aim of reviewing the content validity was to check its feasibility, clarity, relevance, comprehensiveness; and its applicability. Modifications were done accordingly.

Reliability to check tools' reliability; a test was done using split half methods; and Cronbach's alpha that measures the degree of reliability for the entire form. Both techniques showed high

reliability of the final version of the tools. (Alpha=.85).

Pilot study:

A pilot study was conducted on 10% of the total sample (6) patients. This aimed to ensure clarity, objectivity, relevance, and feasibility of tools. Modifications were done accordingly. Pilot study subjects were excluded from the study.

Ethical considerations:

Verbal consent was acquired from each participant before to his / her inclusion into the study after explanation of the nature and aim of the study. Each participant has been instructed that participation is absolutely voluntary; and confidential. Anonymity, privacy, rights and safety of participation would be assured from the beginning of the study through coding the data; also, each patient has been informed that she/he has the right to withdraw from the study at any time without giving any justifications and will not affected his/her treatment regimen.

Procedure:

The study was implemented through the following phases:

Phase 1: preparatory phase

It includes reviewing related literature of the various aspects to the study' problem.

phase2: Data collection and implementing phase:

The actual field work started from October 2018 up to May 2019. It started by interviewing the participants; who met the inclusion criteria individually by the researcher at the study setting. The researcher started by introducing himself for each study subject, clarification of the nature and purpose of the study were done. Verbal consent was taken to participate in the study, the researcher confirmed that the willingness of the patient to participate before implementing the program.

Assessment phase: was related to assess the patient's demographic data and his/her current condition for burn injury e.g., "types of burn injury, depth of burn, total body surface area; also, to assess factors that can lead to burn joint contracture during hospitalization". It was completed within (20- 30 minutes) according to patient's level of education and understanding and completed patient sheet.

Planning phase, in this phase an extensive literature review for range of motion exercises for patients with partial thickness burn or full thickness burn at shoulder, elbow, hip, or knee joints. Apply

early active / passive range of motion exercise according to the assessment patient's needs.

Implementation phase; Each patient of study's sample was interviewed individually within 48 hours of his/her admission by the current study. An oral or written informed consent for the patients who were willing and accepted to participate in the study was obtained.

Keep up with passive and/or active range of motion exercise of intact and involved joints at least once a day was emphasized until wound healing occurs. During the treatment regimen, duration, range and strength of individual treatment were adjusted to a safe limit according to changes of vital signs; in addition, an encouragement of the patient to participate in active movements. To minimize patient's suffering of pain i.e., exercises were practiced during wound dressing changes where possible.

acclimated to a protected limit as indicated by changes of indispensable signs; also, a support of the patient to partake in dynamic developments. To limit patient's enduring of agony i.e., practices were worked on during wound dressing changes where conceivable.

Evaluation phase: each was evaluated twice; *first evaluation;* was done immediately when patient was admitted to the burn unit, then examination of the patient either active and passive range of motion using designed tool was carried out. *Second evaluation;* was done after the burn wound healing take its place. Consequently, the active and passive range of motion of each impaired joint was assessed using the goniometer (tool II).

Statistical analysis:

Data entry and data analysis were done through "SPSS" version 21.0. Qualitative data were introduced as numbers and percentages. Descriptive statistics were created for all variables, for nominal data frequencies and percentages were computed. For numerical data mean, standard deviation and the range were developed. Correlation of the various variables under review was done utilizing the following test measurements: t- test for variables with continuous data. Chi-square (X²) test was utilized. P-value of 0.05 was pre-set as level of significance.

Limitations of the study:

- Data was collected from one burn sitting.

4. Results

As shown in Table 1, illustrates Frequency distribution of the study subjects according to their demographic characteristics. It represents that more than 2/3 of the study subjects were males (71.7%); with mean age (37.93±11.9). As regarding their marital status almost 3/4 (73.3%) were married. The results also clarified that nearly 2/3 of the study subjects (73.3%) have work. As regards; their level of education (33.3%) has secondary school education; and before college enrollment education. Table (1) also shows that (76.7%) of the study groups are living in rural areas.

As shown in Table 2, in relation to affected joint, more than one thirds of the subject (35.6%) had burn injury at elbow followed by near to one quarter (22%) at shoulder joint.

Fig (1) represents contracture incidence with active and passive range of motion exercise. As figure clarifies that more than two thirds (71.3%) of the study subjects were suffering from contracture with active range of motion. Compared with one can notice that nearly half of the study subjects

(49.2%) have contracture with passive range of motion.

As shown in Table 3, Shows contracture severity and frequency of the study subjects with active and passive range of motion exercises, more than two thirds (70.6%) of the study sample had mild contracture with active range of motion compared to most of the subjects (79.2%) had mild contractures with passive range of motion. While, less than ¼ (21.1%) had moderate contracture with active ROM compared to (10.4%) with passive ROM. Highly statistically significant difference was found regarding contracture' severity and frequency with active and passive range of motion ($X^2 = 28.31$; $P = 0.003$).

As shown in Table 4, the correlation between active and passive range of motion and joint contracture in the study group. A highly statistically significant correlation was found between active range of motion and joint contractures in the study group ($r = 0.624$; $P = 0.000$). Compared with a highly statistically significant correlation between passive range of motion and joint contracture among the study group ($r = 0.811$ and $p\text{-value} = .000$).

Table 1. Frequency distribution of the study sample according to their demographic characteristics (total N=60)

Variables	Study group(n=60)	
	N	%
Gender		
Male	43	71.7%
Female	17	28.3%
Age		
21 > 30 years	15	25%
30 > 40 years	20	33.3%
40 > 50 years	13	21.7%
50 – 60 years	12	20%
M±SD	37.93 ± 11.84	
Marital status		
Single	13	21.7%
Married	44	73.3%
Widowed	3	5%
Occupation		
Work	44	73.3%
Not work	16	26.7%
Level of education		
Cannot read and write	9	15%
Read and write	15	25%
Secondary & before college	20	33.3%
College and above	16	26.7%
Place of residence		
Urban	14	23.3%
Rural	46	76.7%

Table 2. Frequency distribution of the study the study subject according the site of affected joint.

Variables	Study group (n=60)	
	N	%
Site of affected joint		
Shoulder	13	22%
Elbow	21	35.6%
Hip	1	1.7%
Knee	9	15.3%
Both shoulder and elbow	12	20.3%
Both elbow and knee	3	5.1%

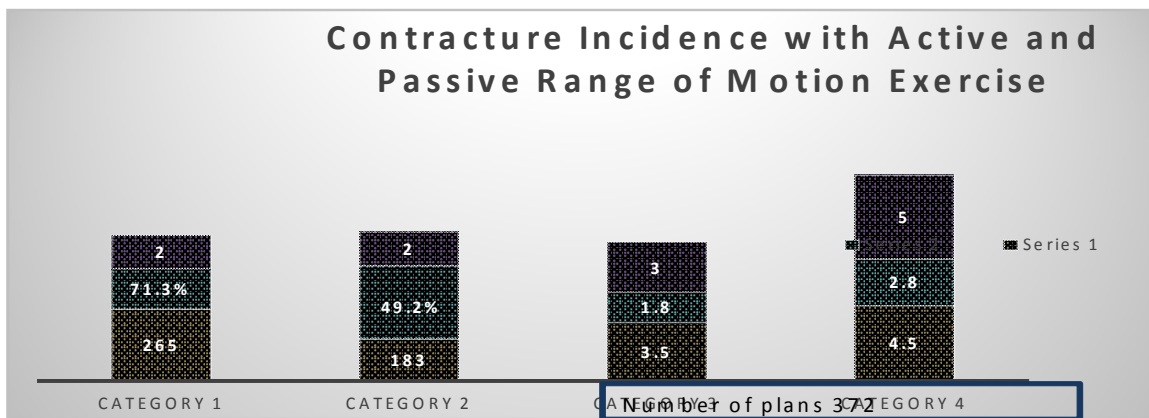


Fig. 1. Contracture Incidence with Active and Passive Range of Motion Exercise

Table 3. Contracture' Severity & Frequency of the Study Subjects with Active and Passive Range of Motion Exercise- ROM)

Affected joints	Contracture' severity						X ²	P-Value
	Study group/total number of contractures with active ROM (265)			Study group/total number of contractures with passive ROM (183)				
	Mild	Moderate	Sever	Mild	Moderate	Sever		
Shoulder	73	28	4	61	11	2	28.31	0.003
Elbow	96	21	17	69	6	17		
Hip	4	0	0	2	0	0		
Knee	14	7	1	13	2	0		
Total	187 (70.6%)	56 (21.1%)	22 (8.3%)	145 (79.2%)	19 (10.4%)	19 (10.4%)		

Table 4. Correlation between Active and Passive Range of Motion and Joint Contracture among the Study Group

		Active range of motion	Passive range of motion
joint contracture	R	0.811	0.624
	P	0.000**	0.000**

5. Discussion

Joint contracture is the major clinical problem after burn injury. Particularly, the extreme burns. The true rate of post-burn contractures and their related danger factors stays unknown. Contracture is the major clinical problem in those

with significant dermal and full-thickness burns that can initiate the deficiency of joint mobility and disability in ambulation and moves, fine motor duties, and exercises of daily living. Regardless of the progression of clinical consideration treatment, scar contracture in burn patients becomes a

challenge, and the effect of specific danger factors is ineffectively perceived. In this way, the underlying treatment with patients getting best of care having least number and seriousness of developing these complications (Tan et al., 2019).

Severe burn injuries offer many unique challenges for nurses. The main aim is to prevent such contractures which lead to disfigurements, disabilities, and affect patient's quality of life. One of the crucial roles for nurses especially those nurses working at burn units is to prevent joint contracture after getting burn injuries: the current study was carried to assess the contracture severity and frequency following active and passive range of motion. This hypothesis was rejected, where the results showed that significant differences on contracture severity between those patients who followed active range of motion exercises versus those who followed passive range of motion exercises.

The results of the current study had shown that about one third of subjects had burn injury in elbow joint, being the most frequently involved joints with burn injury followed by shoulder joint. Also, the findings of the current study represented that the elbow was the most often contracted joint, followed by the shoulder. This is related that more than half of the studied subjects were had burn injury in the upper segment of body as most exercises of daily living, instrumental activities, and occupational duties are more implied by upper extremities. The findings of the present study are in line with Frontera, Silver and Rizzo (2018) who studied essentials of physical medicine and rehabilitation. The same authors stressed that contractures are most common at the shoulder, elbow, hip and knee. Also; this is consistent with Goverman et al., 2017 who studied adult contractures in burn injury. Using A Burn Model System National Database Study; they found that the hand, elbow, and shoulder are the most often implicated joints; and suggested that the shoulder was the most commonly contracted joint, followed by the elbow, wrist, ankle, and knee.

the hand, elbow, and shoulder are the most often elaborate joints; and suggested that the shoulder was the most often contracted joint, trailed by the elbow, wrist, lower leg, and knee.

Regarding contracture incidence and severity, the results of the current study showed that the frequency of contractures in severe burn patients were mild or moderate, more than two thirds had contracture with active range of motion. While, only, nearly half of the subject had contracture with passive range of motion exercise.

Also, the results of the current study showed that the frequency of contractures in extreme burn patients were mild or moderate, more than two thirds of the subject were mildly limited followed by about nearly one quarter had moderate limitation with active range of motion. Compared to most of the subject had mild limitation and less than one quarter had moderate limitation with passive range of motion. From the researcher point of view, despite of the recurrence of maturing contractures; very few contractures were severe. This may be seen as the effect of physical exercise that considered the first line of avoiding such complication; and one of the best ways to prevent contractures and dysfunctions. In addition, practicing physical exercises; especially active exercises and patients' participation in functional activities play an important active role in minimizing post- burn contractures.

These findings also are likewise with Tan et al., (2019) who concentrated on joint contractures in extreme burns with early rehabilitation intervention in one of the biggest burn intensive care units in China. Viewed that as, one hundred; and one of 108 patients with burn injury complained at least one joint contracture. The ROM in around two thirds of the impacted joints was mildly restricted. Where; the most of contractures in severe patients with burn injury were mild or moderate. Besides; Schneider, Holavanahalli, Helm, Goldstein & Kowalske (2006) studied Contractures in Burn Injury: defining the problem of the 985 studied patients, and indicated that more than one third of their studied patients with significant burn injury created contracture before hospital discharge.

6. Conclusion

Despite the high prevalence of contractures, only a few of them were severe. It can be inferred that the incidence and severity of contracture emphasize the necessity for and importance of performing range of motion exercises during intense hospitalization, which challenges burn care to find new and better methods to avoid contracture after a burn injury.

7. Recommendations

In the light of the current study results, the following recommendations are suggested:

- Early application of range of motion exercises as an important intervention for minimizing contracture in severe burn patients.
- Distribution available booklet for range of motion exercises regarding burned patients.

- Apply future research on Assessment of factors that contributing to joint contractures with severe burn injury.

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