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A Study of the Effectiveness of Stretching Exercises in Alleviating Muscle Spasm in Patients with Pulmonary Edema

Iftikhar Nyorere, O.

Department of Medical Surgical Nursing, MIMS College of Nursing, Ramanattukara, Kerala, India

ABSTRACT

Patients with pulmonary edema are generally very weak and most of them need to be bedridden. However, it is unrealistic for these patients to improve leg cramps through exercise. Stretching is known as a simple and effective strategy for relieving muscle tension and muscle cramps. The purpose of this study was to assess the intensity and frequency of muscle spasms in patients with pulmonary edema and to evaluate the effectiveness of stretching exercises in treating muscle spasms. Thirty patients with pulmonary edema associated with muscle spasm were studied. The patient underwent muscle stretching exercises for three 10-minute, 8-hour sessions. Results The pretest score was higher than the posttest score, indicating that stretching exercise was effective in reducing the intensity of muscle spasm in patients with pulmonary edema. Such exercise programs are recommended to improve the quality of care.

KEYWORDS

Muscle cramp; Penn spasm frequency score; Pulmonary edema; Stretching exercise.

1. Introduction

The lungs and alveolar surface area are directly connected to the external environment. Any changes within the lungs are closely related to epidemiological, environmental, occupational, personal, and social factors. Lungs are always usually occurs due to collection of excess fluid in the lungs.[1] Earnest Starling a British physiologist in 1896 explained that the fluid movement across the wall of a capillary is based on the balance between the hydrostatic pressure gradient and the oncotic pressure gradient across the capillary. Intrapulmonary shunt pathology diseases such as pulmonary edema are occurring with this principle.[2] Hemodynamic disturbances are the end stage of pulmonary edema and increase the capillary permeability. The increased hydrostatic pressure is the result of hemodynamic mechanism of pulmonary edema. Pulmonary congestion and edema are characteristics of wet lungs.[3] Approximately 300 per 100,000 populations per year are hospitalized with cardiogenic pulmonary edema.[4] Pulmonary edema is clinically presented with dyspnea and excess fluid in the interstitial space. This fluid overload is managed with diuretics to relieve the

symptoms, and in turn, improves the oxygenation of patient tissues.[5] Excessive use of diuretics will result in fluid and electrolyte abnormalities. These abnormalities are the main reason for muscle cramps. Muscle cramps on legs may develop from extracellular volume depletion and other metabolic disorders such as diabetes, hypoglycemia, alcoholism, hypothyroidism, and metabolic myopathies. Certain medications are also strongly associated with leg cramps include potassium sparing diuretics and thiazide diuretics.[6] Sudden tightness on the muscle of calf, foot and thigh are the main characteristics of leg cramps. This will last for few seconds to minutes which are usually relieved with forceful stretching of that particular muscle. These symptoms are managed with walking or leg jiggling followed by leg elevation, a hot shower with stream directed at the cramp area of the body usually for 5 min, ice massage, and correction of fluid electrolyte imbalances.[7]

When the ICU patients are experiencing leg cramps, any of the strategies such as walking or warm shower will not be possible to use for reducing muscle cramps. Considering this situation researcher felt the need for a simple, effective, and inexpensive method to manage leg cramps and considered stretching exercises are known strategies to relieve muscular strain and spasm.The theoretical framework for the present study is based on Imogene King's goal attainment Model (1989).

2. Materials and Methods

Quantitative research approach with pre-experimental one group pre-test post-test design was used on 30 patients with pulmonary edema who had muscle cramps > 5 in the ICU of Aster MIMS and IQRAA hospital, Kozhikode. Data were collected using self-report and observation technique.

Tool I: Socio-demographic and clinical pro forma, consist of demographic variable including age, sex, education, occupation, and smoking habit. Clinical pro forma consists of questions regarding comorbidities, diuretics, duration of diuretics administration, urine output, serum potassium, sodium, calcium, room temperature, and mobility status.
Tool II: A modified Penn Spasm Frequency Scale to assess the frequency of muscle cramps. The maximum score is four which means more than 10 times or continuous contraction and the minimum score is zero that means no cramps per day.
Tool III: A numeric pain intensity scale to assess the intensity of muscle cramps. The maximum score is ten that indicates highest possible pain and least score is zero means no pain. It is categorized as no pain, mild, moderate, and severe based on intensity of muscle cramps.

The content validity index was found to be 0.95. The reliability of numerical pain intensity scale and modified Penn spasm frequency score was assessed by inter rater reliability method. This was found as 0.88.

Pretest data were collected using demographic pro forma, clinical pro forma, modified PSFS scale, and numerical pain intensity scale. Muscle stretching exercise was given to patients for a duration of 10 min for 3 times at an interval of 8 h. Intensity of muscle cramps was assessed immediately after first intervention and frequency of muscle cramps was reassessed 8 h after third intervention.

After getting approval of the Institutional Ethics Committee (Aster MIMS and IQRAA), permission was obtained from the head of department of Critical Care Units. A pilot study was conducted among four patients with muscle cramps intensity > 5 and who met the inclusion criteria in Critical Care Units of Aster MIMS, Kozhikode. Patient Information Sheet was given to study subjects. Informed consent from individual study participant was collected. Pilot study revealed that the tools were simple, clear, and unambiguous. The main study was conducted on 30 patients with intensity of muscle cramps > 5 and who met the inclusion criteria in Critical Care Units of Aster MIMS and IQRAA Hospital from December 19, 2016 to 10 January, 2017. Patient

Information Sheet provided to all study participants. Informed consent was obtained from all study subjects individually. A semistructured questionnaire to collect demographic data was filled by the subject and patient's hospital records were reviewed by researcher to obtain the clinical data.

Pretest score of muscle cramps intensity and frequency was assessed after selection of subjects. Muscle stretching exercise was given to patients for duration of 10 min for 3 times at an interval of 8 h. Post-intensity of muscle cramps was measured immediately after first intervention and frequency of muscle cramps was reassessed 8 h after third intervention.

3. Results

The collected data were categorized and analyzed based on study objectives and hypothesis Section 1: Frequency percentage distribution of patients with muscle cramps based on demographic and clinical variables. Most of the study participants 56.7% (17) were in the age group of 60– 69 years. About 86.7% (26) of the patients were males. The majority of the patients 43.3% (13) were retired government employees. About 80% (24) were having high school education. The majority of them 53.3 % (16) were smokers. Section 2: Assessment of intensity of muscle cramps by measuring pre-test-post-test score. The muscle cramps intensity showed a total of 100% had severe pain before the intervention. About 73.3% had mild and 26.7% had moderate intensity after the intervention. About 100% (30) study participants had scored severe pain for the pre-test score of intensity of muscle cramps. In posttest score, 6.7 % (2) scored no pain, majority 70% (21) of them scored mild, 23.3% (7) scored moderate, and none of the patients with pulmonary edema scored severe pain. Pre-test assessment 6.7% (2) had scored 1–2 times cramps /day, 63.3% (19) scored irregular strong cramps 3–5 times/day, 26.7% (8) scored more often cramps 6–10 times/day, and 3.3% (1) scored cramps>10 times /day. In post-test assessment, 37.3% (11) scored no cramps, 52.7% (16) scored 1–2 cramps /day, 10% (3) scored irregular strong cramps 3–5 times/day, and none of the patient with pulmonary edema scored cramps more often 6–10 times/day and cramps >10 times/day.

Table 1 shows that the mean pre-test score of intensity of muscle cramps was Mean ± SD that is 9.57 ± 0.625, whereas the mean post-test score is 2.57 ± 1.431. The paired "t" value was 2.05 with "P" = 0.001 (P < 0.01) level which was highly significant at 0.05 level of significance. It depicts that stretching exercise is effective in reducing the intensity of muscle cramps in patients with pulmonary edema.

Table 2 shows that the frequency of muscle cramps Mean±SD of pre-test score is 2.27±0.640, whereas the posttest score is 0.73±0.69. The paired "t" value was 19.108 with a "P" = 0.000 (P<0.01) and was highly significant at 0.05 level of significance. It depicts that stretching exercise was effective in reducing frequency of muscle cramps in patients with pulmonary edema. Pre-test and post-test scores reveal that there is improvement in patients after the exercise program for both intensity and frequency of muscle cramps. Hence, the research hypothesis is accepted.

Table 1. Effect of stretching exercise on the intensity of muscle cramps of patients with pulmonary edema before and after the intervention (n=30)

Variable	Mean ±SD	"*t*" Value	df	"*P*" value
Pre-test intensity	9.57±0.625	2.05	29	0.001**
Post-test intensity	2.57±1.431			

Table 2. Effect of stretching exercise on the frequency of muscle cramps of patients with pulmonary edema before and after the intervention (n=30)

Variable	Mean±SD	"*t*" value	df	"*P*" value

Pre-test frequency	2.27±0.640	19.108	29	0.000**
Post-test frequency	0.73±0.69			

Section 3: Association of demographic pro forma and clinical pro forma with intensity of muscle cramps. The results show that there is a significant association of intensity of muscle cramps with serum calcium and room temperature. The Chi-square test results of serum calcium P = 0.021 (P < 0.05) and for room temperature is 0.034 (P < 0.05). This indicates that there is a significant association found between muscle cramps and selected clinical variables.

4. Discussion

The present study assessed the effectiveness of stretching exercise on muscle cramps of 30 patients for intensity of muscle cramps revealed that 100% (30) had severe pain. In post-test majority, 73.3% (22) had mild, and 26.7% (8) had moderate. In pre-test assessment for frequency of muscle cramps, 6.7% (2) scored 1–2 cramps/day, 63.3% (19) scored irregular strong cramps 3–5 times/day, 26.7% (8) had cramps more often 6–10 times/day, and 3.3% (1) had cramps >10 times/day. In post-test assessment, 37.3% (11) had no cramps, 52.7% (16) scored 1–2 cramps/day, 10% (3) scored irregular strong cramps 3–5 times/day, and none of the patient scored cramps more often 6–10 times/day and cramps >10 times/day. The above-mentioned values clearly identify that there is a significant difference between the pretest and post-test intensity and frequency of muscle cramps score of patients with pulmonary edema who underwent stretching exercise program.Similar results depicted in a study conducted to find the effectiveness of intradialytic stretching exercise in reducing muscle cramps among hemodialysis patients. The scores of interventional groups were much higher than that of the control group, which is evident for the effectiveness of intradialytic stretching exercise for relieving muscle cramps (P < 0.03). This showed that the intradialytic stretching exercise was effective to relieve the muscle cramps among patients undergoing hemodialysis.[7]

Patients with pulmonary edema usually have muscle cramps due to shift of fluids in intra- and extra-cellular compartment and depletion of electrolytes in the body. These changes cause severe pain in patients undergoing hemodialysis and patients will experience increased intensity and frequency of muscle cramps. Stretching exercise is useful in reducing intensity and frequency of muscle cramps. The present study findings revealed that stretching exercise reduced intensity and frequency of muscle cramps after stretching exercise program. Such simple nursing interventions can be incorporated in nursing practice while providing the patient care in ICU.

5. Conclusion

The present study aimed to evaluate the effectiveness of stretching exercise to reduce muscle cramps in patients with pulmonary edema. The pre-test score was higher than the post-test score indicates that the stretching exercise was effective in reducing the intensity of muscle cramps in patients with pulmonary edema. Such exercise programs are recommended to improve quality of nursing care.

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