Research Article

Effectiveness of stretching exercise to reduce muscle cramps in patients with pulmonary edema

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ABSTRACT

Introduction: Patients with pulmonary edema are restricted to bed and usually are very weak. When such patients are experiencing leg cramps, strategies such as walking or warm shower are impracticable. Stretching exercises are known strategies used for relieving muscular strain and muscle spasm. Objectives: The objectives of the study were to assess the intensity and frequency of muscle cramps in patients with pulmonary edema and to evaluate the effectiveness of stretching exercise on muscle cramps. Materials and Methods: Quantitative research approach with pre-experimental one group pre-test post-test design on 30 patients with pulmonary edema who had muscle cramps > 5 was selected purposively. Data were collected using demographic pro forma, clinical pro forma, modified PSFS scale, and numerical pain intensity scale. Muscle stretching exercise was given for duration of 10 min 8th hourly for 3 times. Intensity of muscle cramp was assessed immediately after the first intervention and the frequency of muscle cramp was reassessed 8 h after third intervention. Results: The muscle cramp 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. The paired ‘t’ value was 2.05 with \( P = 0.001 \) which was highly significant at 0.05 level after undergoing stretching exercise. Conclusion: The findings concluded that stretching exercise was effective in reducing the muscle cramp. Patients in ICUs are experiencing pain and cramp. Simple and cost effective exercises will be useful in reducing pain and improve the quality of nursing care.

Keywords: Muscle cramp, Penn spasm frequency score, Pulmonary edema, Stretching exercise

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 affected with multisystem diseases. Pulmonary edema 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

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managed with diuretics to relieve the symptoms, and in turn, improves the oxygenation of patient tissues. 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.

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. 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).

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.

Description of tool

**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.

**Schematic representation of the study - O₁ – X₁ - O₂ – X₂ – X₃ - O₃**

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.

Data collection process

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 semi-structured 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.

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 post-test 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 post-score test is 0.73±0.69. The paired “t” value was 19.108 with “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.

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.

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.

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ±SD</th>
<th>“t” Value</th>
<th>df</th>
<th>“P” value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test intensity</td>
<td>9.57±0.625</td>
<td>2.05</td>
<td>29</td>
<td>0.001**</td>
</tr>
<tr>
<td>Post-test intensity</td>
<td>2.57±1.431</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at P < 0.05 level, **Significant at P < 0.01 level.

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean±SD</th>
<th>“t” Value</th>
<th>df</th>
<th>“P” value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test frequency</td>
<td>2.27±0.640</td>
<td>19.108</td>
<td>29</td>
<td>0.000**</td>
</tr>
<tr>
<td>Post-test frequency</td>
<td>0.73±0.69</td>
<td></td>
<td></td>
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</tbody>
</table>

*Significant at P<0.05 level, **Significant at P<0.01 level

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.
Conflicts of Interest

The authors have no conflicts of interest

References