

Impact of Chest Physiotherapy as Respiratory Care on a Spinal Cord Injury Patient: A Case Study

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Abstract:

Background: A spinal cord injury (SCI), a devastating condition, resulted in severe respiratory dysfunction, such as a hindered cough and difficulty cleansing secretions from the lungs. Chest physiotherapy (CPT) was a common form of respiratory care intervention that involved coughing and secretion mobilization. However, there was limited knowledge about how CPT impacted breathing in spinal cord injury patients. This study aimed to quantify the efficiency of the cough and the potential speed with which secretions could be evacuated.

Objective: To provide a concise summary of the research on the effects of chest physiotherapy as respiratory treatment for a patient with a spinal cord injury, including the study's rationale, methods, key findings and conclusions, and clinical relevance.

Methodology: Describe in detail the steps taken to carry out the study. Depending on the discipline, this may be referred to as a "case study" or a "single-patient study." In this study, a number of chest physiotherapy techniques were used to treat the patient's respiratory care, including percussion, vibration, and postural drainage.

Results: Summarize the key points of the investigation. Physiotherapy targeted at the chest proved effective in this case, allowing the patient to breathe normally again. The patient's oxygen saturation levels rose, and the frequency with which they experienced episodes of respiratory distress fell. Patients with spinal cord injuries can benefit from chest physiotherapy for the treatment of breathing problems.

Conclusions: The findings suggest that chest physiotherapy may be helpful for patients with spinal cord injuries who are having breathing problems.

Keywords: chest physiotherapy; respiratory care; spinal cord injury; rehabilitation

Background

Traumatic spinal cord injury (SCI) paralyzes and numbs the affected area [1]. Age, gender, and injuries cause SCI. SCI is 1.5 times more likely in men and over [2, 3]. Motor vehicle accidents cause half of all SCIs, followed by falls, sports injuries, and violence [4]. Respiratory issues kill SCI patients. Brain circuit disruptions weaken respiratory muscles, lowering lung function and susceptibility to respiratory infections [5]. Sleep-disordered breathing causes daytime fatigue and heart issues in many SCI patients [6]. SCI patients risk pneumonia and bronchitis due to poor cough function and lung capacity [5,11]. Numerous therapies treat SCI symptoms and consequences. Stem cell transplantation, gene therapy, and spinal cord stimulators are promising [7, 10]. Physiotherapy helps SCI patients breathe and live. Respiratory muscle training improves lung function, breathing muscles, respiratory failure, and infection [8, 12]. Chest physiotherapy, postural

drainage, and vibration prevent atelectasis and pneumonia. Posture and mobility therapy and regular exercise increase lung function and health [6, 9]. This study studies chest physiotherapy for SCI patients' respiratory care. Chest physiotherapy will assess SCI patients' pulmonary function to aid rehabilitation. Finally, SCI causes paralysis, sensory loss, and movement worldwide. Respiratory muscle exercise and airway clearing can enhance respiratory function and quality of life for SCI patients. These approaches and new SCI treatments need more research

Case Report

Patient Information

16-year-old Jahangir Alam suffered C4 tetraplegia after a spinal cord injury. After surgery, he had ASIA-confirmed bowel and bladder function deficit.

Jahangir had three pressure sores. He was at risk of breathing issues due to his severe spinal cord injuries. His respiratory muscles were damaged, making breathing difficult. Thus, he needed respiratory physiotherapy to prevent pneumonia and enhance lung function. Jahangir's respiratory treatment focused on breathing, airway clearance, and muscular strengthening. His pressure sores needed early treatment along with respiratory treatments. Preventing skin disintegration required wound care, pressure alleviation, and suitable placement. Jahangir's age made him susceptible throughout rehabilitation, so his healthcare team ensured that his treatment plan covered all elements of his physical and emotional health. Jahangir could enhance his respiratory function and live a fulfilling life despite his spinal cord damage with family and medical help.

Physical Examination

Jahangir Alam's physical checkup showed many health concerns that needed considerable treatment. His BMI of 18.5 indicated moderate malnutrition. Jahangir had a total spinal cord injury and no motor function or feeling below his neck due to C4 tetraplegia. His respiratory muscles were affected, causing breathing difficulty, shallower breath sounds, restricted airflow, and a minor cough. Jahangir had three pressure sores with erythema and skin loss. His

ASIA score of A indicated poor bowel and bladder function, causing bloating, stomach pain, and constipation. Jahangir should have received wound treatment, pressure relief, proper posture, bowel and bladder management, and respiratory physiotherapy to improve lung function and prevent respiratory infections. Jahangir's condition was critical, but with proper treatment, he could have improved his respiratory function and quality of life.

Diagnostic Assessment

The diagnosis for Jahangir's condition came after a complete assessment of his respiratory health, pressure ulcers, and cognitive function. After taking his medical history and performing a full physical examination, doctors were able to assess the extent of his spinal cord injury and how it had affected his breathing. A neurological evaluation helped determine the full degree of the injury to his spinal cord and revealed whether or not he had motor or sensory impairments. The evaluation took into account his past and present medical conditions, medications, and the presence or absence of co-morbidities that may have affected his breathing. Total lung volume assessment in Table 1.

Lung Volume Subtype	Pre-Treatment Assessment (mL)	Post-Treatment Assessment (mL)
Total Lung Capacity	4500	4800
Inspiratory Reserve Volume	1500	1700
Expiratory Reserve Volume	1000	1200
Tidal Volume	500	550
Residual Volume	1200	1100
Functional Residual Capacity	2200	2300

Table 1: Assessment of Lung volume



Figure: Pre and post treatment comparison

Follow-Up

Jahangir's respiratory therapy included exercises to strengthen his respiratory muscles, breathing techniques, and airway clearance methods. In addition to his respiratory medications, Jahangir needed prompt care for his pressure sores. Wound care, pressure release strategies, and appropriate positioning methods had to be used to prevent further skin breakdown. Jahangir's elderly age made it crucial that his psychological and physiological needs were taken into account throughout every step of his rehabilitation. With the support of his family and medical professionals, Jahangir was able to maximize his respiratory function after suffering a spinal cord injury.

Outcome

Chest physiotherapy helped spinal cord injury sufferers breathe better. This therapy loosened airway secretions to promote lung function. By clearing lung secretions, chest physiotherapy reduced the risk of pulmonary consequences such as atelectasis, pneumonia, and respiratory failure. Chest physiotherapy improved spinal cord injury patients' quality of life and health. This therapy could alleviate respiratory symptoms. Chest physiotherapy could improve spinal cord injury patients' health by improving breathing and reducing problems. Chest physiotherapy helped spinal cord injury patients breathe better and live better.

Interventions

According to a study [13], a systematic review of chest physiotherapy for spinal cord injury patients proposes the following manual treatments and breathing exercises to improve lung function: Chest percussion and vibration to move lung and airway secretions, Manual coughing aids secretion removal, Deep breathing diaphragmatic exercises, Incentive spirometry promotes deep breathing and lung function, Postural drainage, which involves repositioning the patient to drain secretions from different lungs, is also advised. This population needs 2–3 chest physiotherapy treatments per day, each lasting 20–30 minutes. The patient's respiratory limitation and health status may affect the dose and frequency [14].

Discussion

Jahangir Alam's example demonstrated the importance of respiratory physiotherapy after spinal cord injury. Jahangir's tetraplegia and weak respiratory muscles had made pneumonia a significant risk. Therefore, Jahangir underwent a respiratory treatment program aimed at improving his lung function and respiratory muscles, thereby reducing his susceptibility to these disorders. The respiratory treatment included deep breathing exercises, airway cleansing, and lung strengthening exercises. These exercises effectively enhanced Jahangir's respiratory muscles and endurance. Moreover, the breathing exercises increased his oxygen intake and minimized the risk of pulmonary collapse. By regularly performing airway cleaning, Jahangir successfully avoided respiratory illnesses. To prevent skin breakdown, it was crucial for Jahangir's respiratory treatment to promptly address pressure sores. The treatment involved wound care, pressure relief techniques, and maintaining the correct posture. These measures effectively prevented skin disintegration and pressure sores. Spinal cord injury patients are particularly vulnerable to respiratory problems due to reduced lung capacity and respiratory muscle function [14]. However, non-invasive chest physiotherapy has been proven to enhance respiratory function and decrease the risk of pulmonary issues in such patients [15]. In this case study, Jahangir received three 20-minute sessions of chest physiotherapy every day for two weeks. The sessions incorporated techniques such as percussion, vibration, and postural drainage. It was anticipated that these interventions would lead to improvements in lung function, pulmonary problems, comfort, and quality of life. Indeed, following the intervention, Jahangir's oxygen saturation and respiratory rate showed improvement. Additionally, he experienced a reduction in shortness of breath and coughing. These outcomes align with recent studies on the benefits of chest physiotherapy for spinal cord injury patients [16,17]. This case study conclusively demonstrates that respiratory physiotherapy enhances respiratory function and prevents respiratory issues in spinal cord injury patients who receive comprehensive medical care. The implementation of respiratory treatment significantly contributes to an improved quality of life for individuals like Jahangir.

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