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Physiotherapy

PHYSIOTHERAPEUTIC APPROACH OF BRONCHOPULMONARY HYGIENE THERAPY

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ABSTRACT Bronchopulmonary hygiene therapy (BHT) is the mainstay therapy for most patients and is widely prescribed as a prophylactic and therapeutic intervention in ICUs. It comprises range of physical techniques that aid clearance of airway secretions. BHT treatment is beneficial in patients with COVID-19 and various other respiratory conditions.

KEYWORDS : Bronchopulmonary hygiene therapy, physiotherapy, airway clearance technique, breathing exercises, COVID-19

INTRODUCTION

Critical care is the specialised care of patients whose conditions are life-threatening and who require comprehensive care and constant monitoring, usually in intensive care units (ICUs). Critically ill patients frequently suffer long-term physical and psychological complications. Prolonged stays in the intensive care unit are also associated with impaired quality of life, functional decline and increased morbidity, mortality, cost of care and length of hospital stay.[1] Therefore, they require a multidisciplinary team in critical care who are uniquely qualified with skills and expertise to work with the assessment and management of respiratory complications, physical deconditioning, and neuromuscular and musculoskeletal conditions.

Early progressive physiotherapy with a focus on mobility and rehabilitation is essential in minimising functional decline. The Coronavirus Disease 2019 (COVID-19) has led to a global pandemic affecting a large population of the countries of the world. The physiotherapists play major role in managing issues related to the COVID-19 disease from case identification, limiting transmission in different clinical settings and treating patients with mild symptoms.[2] Physiotherapy may be beneficial in the respiratory treatment and physical rehabilitation of patients with COVID-19. Physiotherapy may be indicated if patients with COVID-19 present with airway secretions that they are unable to independently clear. Physiotherapy have a strong role in providing exercise, mobilisation and rehabilitation interventions associated with COVID-19 in order to enable a functional return to home.[2]

Bronchopulmonary Hygiene Therapy (BHT) incorporates chest physiotherapy along with breathing exercises and manual hyperventilation in an intubated patient. Bronchial hygiene involves the use of noninvasive airway clearance techniques designed to help mobilize and remove secretions and improve gas exchange.[3] It consists of variety of techniques aimed at the mobilization of pulmonary secretions and promotion of greater use of the respiratory muscles with increase in the distribution of ventilation.

This article focuses on different approaches of bronchopulmonary hygiene therapy techniques in ICU setting.

Techniques

1. Positioning

Positioning mainly comprises of postural drainage techniques. It is an effective treatment that incorporates gravity-assisted techniques to help clear secretions from specific segments of the lungs.[4] Each position consists of placing the target lung segment superior to the carina. The person lies or sits in various positions so the part of the lung to be drained is as high as possible. That part of the lung is then drained using percussion, vibration and gravity. Positions should generally be held for 3 to 15 minutes. Standard positions are modified as per the patient's condition and tolerance. Figure 1 demonstrates different postural drainage positioning.

Figure 1: Postural drainage positioning



2. Coughing

The effective cough is a must for normal airway clearance. Coughing is a forced expiratory technique performed with a closed glottis. By ridding the larger airways of excessive mucus and foreign matter, the cough assists the normal mucociliary clearance and helps ensure airway patency. There are four distinct phases to a normal cough: irritation, inspiration, compression, and expulsion.[5]

Huffing involves diaphragmatic inspiration, relaxing the scapulohumeral region and expiring forcefully from mid to low lung volumes whist maintaining an open glottis. It maximizes airflow and minimizes airway collapse. Huffing prior to coughing will optimize airway clearance by moving secretions further up the airway.

3. Breathing exercises

Diaphragmatic breathing are designed to improve the efficiency of ventilation, decrease the work of breathing, increase the excursion of the diaphragm, and improve gas exchange and oxygenation. It aids in bronchial hygiene, prevent accumulation of secretions, mobilization of these secretions and improve cough mechanism.

Costal breathing is a technique which concentrates on ventilation to specific areas of lungs. Technique can be localized to any involved segments of the lung. Mainly it consists of thoracic expansion exercises, segmental breathing exercises and lateral costal breathing exercises.

Pursed lip breathing is a strategy that involves lightly pursing

the lips together during controlled exhalation. It helps to improve ventilation and releases trapped air in the lungs. It keeps the airways open longer and prolonged exhalation slows the breathing rate.

Glossopharyngeal breathing is a means of increasing a patient's inspiratory capacity when there is a severe weakness of the respiratory muscles. It is primarily used for ventilator dependent patients due to absent or incomplete innervations of diaphragm. It is taught to patients who have difficulty in deep breathing.

4. External manipulation of thorax

Percussion: it is also referred as cupping, clapping or tapotement. The purpose is to intermittently apply kinetic energy to the chest wall and lungs accomplished by rhythmically striking the thorax with a cupped hand or mechanical devise directly over the lung segments being drained. The cupped hand curves to the chest wall and traps a cushion of air to soften the clapping. Percussion is done forcefully and with a steady beat. Each percussion also should have a hollow sound. Most of the movement is in the wrist with the arm relaxed, making percussion less tiring to do.[6]

Vibration: it involves the application of a fine tremorous action manually performed by pressing in the direction that the ribs and soft tissues of the chest move during expiration over the draining area. In this technique, a rapid vibratory impulse is transmitted through the chest wall from the flattened hands of the therapist by isometric alternate contraction of forearm flexor and extensor muscles to loosen and dislodge the airway secretions.[6]

Rib springing/shaking: it is a coarser movement in which the chest wall is rhythmically compressed. It directs secretions towards larger airways and stimulate cough.

5. Airway Clearance Techniques (ACT)

Active Cycle of Breathing Technique: its purpose is to loosen and clear excess pulmonary secretions, improve the effectiveness of a cough and to improve lung ventilation and function. It consists of a three main stages; breathing control, diaphragmatic breathing or thoracic expansion exercises and forced expiratory technique. [6,7]

Autogenic drainage: utilises breathing control to clear secretions from the airways. The air is to vary the depth, rate and location of lung volumes during respiration to move secretions from the smaller airways to the larger airways for easier expectoration.[6,7] It consists of three phases; 1. Mobilizing (unstick) phase: involves breathing as much air out of the lungs as possible and resisting the urge to cough. 2. Collecting phase: as the secretions get louder the rate and depth of the breaths change, the speed of breathing out is faster and are felt more in the middle of the chest. This assists the movement of secretions from the smaller airways to larger airways. 3. Clearing phase: as the secretions get louder the aim is now to take full, slow breath in, followed by a fast breath out to expel the secretions.

6. Airway suctioning

Suctioning is the mechanical aspiration of pulmonary secretions from patient with an artificial airway in place. Suction is used to clear retained or excessive lower respiratory tract secretions. Oropharyngeal and nasopharyngeal suction is a technique intended to stimulate a cough to remove excess secretions and/or aspirate secretions from the airways that cannot be removed from a patient's own spontaneous effort.[8] Secretions are removed by the application of sub-atmospheric pressure via wall mounted suction apparatus or portable suction unit.[8] If a patient does not have a strong, effective, spontaneous cough, several methods can be used to try and stimulate a stronger cough. These include a tracheal rub and catheter stimulation in the oropharynx.[8,9] 1. Tracheal rub: The physiotherapist uses a finger or thumb to rub using blunt pressure across the trachea above the supra-sternal notch (a flat finger/thumb is used). 2. Catheter stimulation of a cough: A cough can be stimulated by inserting the tip of a catheter along the outside of the teeth and around in to the back of the oropharynx. As the catheter is passed along the side of the teeth, a block is commonly felt when the catheter comes in contact with the mandible. Rotating the catheter gently will allow the catheter to move off the mandible and in to the back of the oropharynx where a cough may be stimulated and/or secretions suctioned.

7. Neuro Physiological Facilitation (NPF)

NPF helps in promoting or hastening the response of neuro muscular mechanism through proprioceptors. The cutaneous and proprioceptive stimulation reflexly increases the depth of breathing. Techniques of NPF include stimulation of diaphragm, perioral technique, intercostals stretch, sternal stretch, co-contraction of abdominal muscles and vertebral pressure.

8. Breathing aid/assistive devices

Incentive spirometer: The purpose of incentive spirometry is to facilitate a sustained slow deep breath. It is performed using devices which provide visual cues to the patients that the desired flow or volume has been achieved. The basis of incentive spirometry involves having the patient take a sustained, maximal inspiration (SMI). An SMI is a slow, deep inspiration from the functional residual capacity up to the total lung capacity, followed by \geq 5 seconds breath hold. A systematic review carried out by Overend et al., reviewed the evidence examining the use of incentive spirometry for the prevention of postoperative pulmonary complications.[10]

Flutter valve therapy: it is an expiratory device that creates vibration to airways as a result of oscillatory airflow and pressure which aid in the loosening of mucus.

Acapella tool: it is a new generation of vibratory PEP therapy similar to flutter but in this we can adjust frequency and resistance by simply turning dial.

High-Frequency Chest Wall Oscillation: it utilizes a mechanical device called vest. The vest applies positive pressure air pulses to the chest which causes vibrations that loosen and thin mucus. This along with an intermittent cough or huff assists with the clearance of secretions. Figure 2 enlists various breathing assistive devices.

Figure 2: Breathing assistive devices



DISCUSSION

These various techniques are used in acute and chronic conditions like chronic obstructive pulmonary disease (COPD), cystic fibrosis, pneumonia, and bronchiectasis to help remove mucus build-up from blocking the lungs. BHT prevents atelectasis, decreases pulmonary shunting, increases functional reserve capacity of lungs and prevents respiratory infections. The therapist may even use combination of techniques during a bronchopulmonary hygiene session.

CONCLUSION

Physiotherapy is beneficial in the respiratory treatments through bronchopulmonary hygiene therapy in patients with COVID-19 and various other respiratory conditions.

LIMITATIONS

No patient was included in the study. The present article enlists descriptive therapeutic approaches and does not focus on review studies.

CONFLICT OF INTEREST

There are no conflicts of interest.

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