

Approaches of Physiotherapy in Intensive Care Unit A Point of View

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Abstract

Physiotherapy is the simplest way of treatment used in all world to be applied in cardiopulmonary patients. The techniques involved to give to the patients' better conditions of life and to avoid the implications of these ills, to meliorate the physical conditions and the quality of life. This work pretends to present the utilization of physiotherapist methods and its consequences in develop better conditions through the patients. Presenting this revision guide to give a north to all physiotherapist and their patients.

Keywords: *Physiotherapy; Physical Therapy; Intensive Care Unit; Cardiorespiratory diseases; Treatment; Procedure*

Introduction

The importance of a respiratory physiotherapy in intensive care units

The physiotherapy, science that study objective is the human movement, go collaborate, launching hand of physio therapy knowledges and resources, with the goal of better understand the factors that can let to loss or diminish of the quality of life and of well-being of the people. The intensivist physiotherapist is that has it total dedication turned on the critic patient, realizing functional diagnostic and deciding the intervention by using kinesiological and instrumentals procedures, with the objective of meliorate of the patient, discussing with the multidisciplinary team of coherent way to the patient permanence in the intensive therapy. For that, is important the realization of a specific training in former centers to form professional to actuate on secure and adequate way on the Intensive Care Unit.

The Intensive Care Unit

The idea of to have specific locals to the more critic patients initiated in Denmark on poliomyelitis epidemic in 1950 decade, due to the need of ventilatory support to the patients [1]. After, it was initiated a movement to make the professionals that act in this area with determinate specific knowledges, it will be the first one the intensivist physician.

Today, these units corresponding in about of 5 to 10% of the beds of a hospital. An intensive care unit (ICU)

is a local destination to the grave or potential grave patients that need of continuous treatment during 24 hours by a multidisciplinary team formed by physician, physiotherapist, nurse between others not less important, as, by example, of sectors of clean, manutention, pharmacy and laboratory [2]. All trained and turned on to the treatment of critical patients, would be assistant or Ambiental.

These places have been for a while are considerable cold and closed, there aren't contact with relatives. Today, much ICUs are open to visit diary and some open during any hour of the day or night to the relatives.

There is a discrete confusion between nomenclature, ICU and ITC (Intensive Therapy Centre), the second is the result of the presence of more of a sector of intensive treatment.

After the recover and high of ICU, the patients could be forwarded the intermediate care units before known as semi-intensive units [3].

Each ICU bed must have the presence of fowler bed, multiparametric monitor, continuous infusion bomb, AMBU and gas networks, with exits to compress air and oxygen, aspirator, microprocesses mechanical ventilator, in addition of the possibility of special mattresses that objective help in the pression ulcers prevention.

Patients will be admitted to ICU it they require intensive care therapy and/or intensive monitoring [4].

The physiotherapy approaches inside ICU include assistance in the removal secretions, improve ventilation of all areas of the lungs, maintain mobility and good posture of the patients, and to decrease patient's hospital stay [5,6].

In the ICU the most common techniques used by physiotherapists are: postural drainage, percussion and vibrations, tracheal suctioning, lavage and coughing, mobilization techniques, breathing exercises and incentive spirometer [7].

Methods of Airway Clearance

The first method is the Ciliary action that causes the mucus blanket which covers the tracheobronchial tree epithelium to be mobilized in a continuous motion toward the hilum of the lung, and to the Larynx where the mucus is moved into the pharynx and may be coughed a swallowed. The mucous blanket moves at a reasonably rapid rate 16 mm/min and can completely clean the normal adult lung in less Than 20 minutes.

Ciliary activity may be impaired by a history of smoking; surgery anaesthesia, trauma, or pre-existing lung disease, pain and mobility accompany recovery and further impede secretion clearance and reduce lung volumes - consequently secondary techniques for airway clearance such as coughing and suctioning become increasingly important in the prevention of atelectasis and pulmonary infection [8].

The second method, Coughing is considered an extremely important mechanism for the removal of lung secretions. In addition, Coughing is a major defence against retained secretions. The cough mechanism involves some phases, initiating with an adequate inspiration followed of inspiratory pause, then the glottis must close tightly. With the glottis closed, the prime mechanism for increasing intrathoracic pressures is to increase intro-abdominal pressure will push the diaphragm upward, decreasing the volume of the thoracic cavity. After that the glottis suddenly opens and allows high-velocity airflow from the lungs. Peak flow rates may be as high as 300 litre/minute [9].

But it could occur the suppression of the cough by involuntary or voluntary suppression. The causes of involuntary cough suppression are: the decrease inspiratory effect, as in patients with quadriplegia; inability to close and then open the glottis, as in patients with having recurrent laryngeal palsy; diminished expiratory effect as in patients with quadriplegia and paraplegia. So, the causes of

voluntary cough suppression are the result of fear or pain. Fear can be minimized by instruction preoperative. The pain after surgery cannot be eliminated but can be alleviated with analgesics, and instruct the patients to compress or support the operated part [10].

The cough could be stimulated by some methods [11,12] as huffing, vibration, deep breathing exercise, external tracheal stimulation, stimulation of oropharynx with a suction catheter, and suctioning. Huffing is a forced expiratory effort is made but the glottis is remaining open and the intrathoracic pressure does not rise to such high levels as in cough, cause rapid changes in airflow may oscillate the secretions and hence mechanically stimulate a normal cough. Vibration over the chest during expiration causes increased expiratory force and may increase cough effectiveness. The increased lung volume achieved by accumulating inspiratory effect may make a more effective cough. The external tracheal stimulation achieved by applying manual pressure to the trachea above the manubrial notch. This creates partial tracheal compression, which often causes mechanical stimulation to cough mechanism. The use of the suction by catheter to do the stimulation of oropharynx must occur when none of the above methods of cough stimulation were successful.

Some complications of cough there are, as bronchoconstriction trauma [13] to airways and larynx, barotrauma, pneumothorax, interstitial emphysema, decrease venous return, arrhythmia, transient systemic hypertension and hypotension, syncope, rib fractures, urinary incontinence, rupture rectus abdominus muscles, and pulmonary emboli.

Tracheal Suction

Suctioning is performed routinely on intubated patients to aid in secretion removal and cough stimulation. The frequency of suctioning is determined by the quantity of secretions. Oropharyngeal airways are used in unconscious patients who are unable to maintain a patent airway. These airways should not be used in conscious and semiconscious patients in whom they may induce vomiting and subsequent aspiration.

The proper size of an oropharyngeal airway is estimated by placing it along the cheek and measuring the distance from the corner of the mouth to the ear. Nasopharyngeal airways are used to maintain a patent airway and for frequent nasotracheal suctioning [14]. The advantage of the

nasal airway over the oral airway is that the conscious and semiconscious patient better tolerates it. The proper distance for insertion of the nasopharyngeal airway is estimated by measuring from the tip of the nose to the ear and adding 1 inch. Before insertion, the airway should be lubricated with water - soluble lubricant.

The endotracheal tube is used to prevent airway obstruction, to facilitate suctioning, to provide mechanical ventilation and to protect the lower airway from foreign objects. The endotracheal tubes are usually constructed of polyvinyl chloride (PVC) or silicone. PVC is rigid to facilitate insertion of the tube becomes softer at body temperature. PVC does not react with tissues and is smooth to facilitate passage of suction catheters. The tube contains marking for inside diameter (ID) and outside diameter (OD) in millimetres. The cuff present in the endotracheal tube can be inflated with air using a syringe. The cuff provided fixation of the endotracheal tube prevents air leak from the trachea and produces minimal pressure on the tracheal mucosa and thus minimal ischemic injury to the tracheal wall [15].

A tracheostomy tube has several advantages over oral or nasal endotracheal tubes. Suctioning is facilitated, it is better tolerated by the conscious patient, fixation of the tube is easier, eating and even speaking is possible, and changing the tube is easier. A tracheostomy is also used when a long-term airway is needed and it is usually considered after 10 to 14 days of intubation [16].

The basic steps of the suctioning procedure are: Provide the patient with supplemental oxygen before suctioning to increase arterial oxygenation - patient receiving mechanical ventilation may not require this step; Check the amount of negative pressure produced by the suction apparatus and, if necessary, adjusts to 100 - 160 mmHg; Put a sterile glove on the dominant hand. Gloves should be worn on both hands to protect the clinician from contamination; Expose the vent end of the catheter and connect it to the suction tubing. Any part of the catheter that may contact the patient's trachea must be kept sterile; Slide the catheter out of its packaging, taking care not to cause contamination; Disconnect the patient from the ventilator or oxygen source; Gently insert the catheter into the tracheal tube. No suction is applied during insertion of the catheter; If resistance to the

catheter is present, pull the catheter back slightly and attempt to reinsert; Apply suction by placing a finger over the vent. Turn the catheter slowly while withdrawing it, so that the side holes of the catheter are exposed to a greater surface area; Reconnect the patient to the ventilator or oxygen source [14, 15].

Difficulty cannulating the main stems bronchus

It is more difficult to pass a suction catheter into the left than the right main bronchus. In adults; the right main stem bronchus usually comes off at an angle of about 20° from a midline sagittal plane, whereas the left main stem bronchus has a more marked angle of about 35° (making the left more difficult to successfully cannulate) similar angles of bifurcation are noted in the neonate (24° for the right and 44° for the left). It is suggested that turning the head to the right or tilting the body to the left increases the chances of successful cannulation of the left bronchus. Curved tip (cruet) catheters are thought to improve the chances of entering the left lung during suctioning.

Catheters are typically made of polyvinyl chloride or rubber, polyvinyl chloride catheters are preferred as: they are less likely to cause irritation; allow visualization of suctioned secretion because they are clear; easier in insertion and can be directed more easily.

Some complications of tracheal suctioning [17] are: hypoxemia during suctioning and each suctioning procedure is limited to a total of 15 seconds; arrhythmia that may occur during suctioning process from two sources, arterial hypoxemia and vagal stimulation; hypotension occur from either of two circumstances, the profound bradycardia resulting from vagal stimulation or the prolonged coughing maneuvers during the suctioning process. The hypoxemia, the arrhythmia and the hypotension are best avoided by suctioning technique by pre and intermittent oxygenation with high inspired oxygen concentrations, or by limitation of the suctioning process to 10-15 seconds or less, or by close cardiac monitoring.

The insertion of large suction catheter into a small diameter artificial airway result in inadequate space for air to present around the catheter. Thus, when a vacuum is applied the lung may collapse. This is avoided by using a catheter whose diameter is smaller than one-half the internal diameter of the tube being suctioned. The nasotracheal suctioning

complications include oxygen desaturation, hypoxia, severe cardiac arrhythmias, and laryngeal spasm or bronchospasm [18].

Other adjuncts made to coughing and suctioning are: lung wash that infusion of sterile saline into the lungs with the intent of washing out secretions or mucus plugs, it will be the use of small amount lavage (<10> The role of bronchoalveolar lavage remains experimental in most diseases and plays a more important role in diagnosis than in the therapeutic management of lung pathology [19].

Bagging is a means of providing artificial ventilation by use a manual resuscitator bag, which is usually connected to an oxygen supply. If the patient is not intubated a mask may be attached to the bag and placed over the patient's face, covering the nose and mouth. For the intubated patient, the mask is removed and the bag is connected directly to the tracheal tube. Bagging [20] is performed by squeezing the bag rhythmically, to deliver a volume of gas to the patient. Expiration is passive. Bagging is most frequently used for resuscitation, transportation of a patient requiring mechanical ventilation and conjunction with suctioning of spontaneously breathing patients.

The postural drainage is a procedure where there are positions that promote gravity-assisted drainage of secretions in lung segments that are positioned uppermost [21]. The majority of ICU treatment is for lower lobes. Some problems associated with obtaining the ideal postural drainage inside de ICU are: turning the patient with multiple injuries; turning the patient into the prone position; turning the patient with intravenous lines; turning the patient with chest tube or tracheal tube or feeding tube or sump drains; turning patients with a urinary catheter [22].

Percussion and vibration

The use of percussion and vibration in the patients require that the maneuvers used in combination with postural drainage and the facilitation large and small airway clearance by advancing secretions centrally so that it can be expectorated or suctioned.

The percussion is a rhythmic clapping with cupped hands over the involved lung segment. It aids in separation of secretions form the wall of airways [22, 23]. It is applied during inspiration and expiration, not should cause pain to the patient. It is applied over the bare area of the thorax. It was notice that obesity and bulky dressing decrease percussion effects.

In children percussion [24] must be applicated with bell end of the stethoscope, 30 mL medicine cup with padded rim, rubber nipple, and tenting hand

(overlapping of the 2nd finger on 1st and 3rd fingers). Vibration is intermittent chest wall compression applied during expiration over the affected area of the lung, in the direction of the chest motion, and used in combination with postural drainage [22, 25]. Separate secretions from the walls of large and small airways are obtained using a frequency of vibration about 12-20 Hz, gentle shaking form of vibration.

Manual vibration and percussion have the following advantages over mechanical devices as: it can be modified for cases with rib fractures not detected with x-ray; therapist can monitor patient responses by manual palpation and visual inspection; it can be adjusted to suit patient needs; many benefits can be obtained from manual techniques; there is no advantage for mechanical devices over manual techniques [26].

Methods of improving ventilation

The breathing exercises assist in removal of secretions, improve respiratory muscles strength and endurance, increasing thoracic cage mobility and expansion, and promote relaxation. They include: diaphragmatic breathing exercise, pursed lips breathing and nose exercise, upper costal breathing, lower costal breathing, apical breathing and sternal breathing exercise, exercise connected with breathing, and belt exercise.

Incentive spirometer (IS)

It is a therapeutic modality relies on the patient own effort to perform a hyperinflation manoeuvre and provides biofeedback to the patient [27]. When the patient observes his/her inspired volume he/she can be encouraged to work by inhaling more and more. It is an effective method in prevention and reversal of lung collapse and promotion of cough is postoperative cases. There are three types of IS: volume-oriented incentive spirometers (Voldyne, Volurex) [28], flow-oriented incentive spirometers (Triflow) [29], and photoelectric-oriented incentive spirometers (Spirocare) [30]. The clinical application of incentive spirometers is: evaluation and diagnosis of respiratory disorders, prevention and treatment of atelectasis and promotion of cough in postoperative cases, and improve patient exercise performance.

Immobilization and methods of mobilization inside ICU

Factors lead to immobilization inside ICU

The administration of anaesthesia, sedation and neuromuscular blockers; A skeletal traction, casting and splinting; A neurological disorders as paralysis; Pain; General weakness and malnutrition; Use of

monitoring equipment. There are existing factors to indicate immobilization inside de ICU [31].

Effects of immobilization

In the Cardiovascular system: decreasing of blood volume, plasma volume and Hb concentration; The physical deconditioning as decreasing aerobic work capacity and endurance; Postural hypotension; Venous thrombosis and pulmonary emboli. They are factors that effects the cardiovascular system [32, 33].

In the Respiratory system: Decreasing of vital capacity and total lung capacity, ante-posterior diameter and lateral diameter of the chest; secretion retention produce small airway closure leads to atelectasis (collapse) [33].

In the Metabolic system: Producing Osteoporosis, formation of kidneys and urethral stones [34].

In the Musculoskeletal system: Provokes muscle weakness, atrophy, joint contractures, and pressure ulcers [35].

In the Central nervous system: Exacerbate emotional and behavioural changes (childlike behaviour), anxiety and depression [36].

Methods of mobilization inside ICU

The patient mobility should be initiated in ICU in order to prevent complications of bed rest and immobilization. As the patient progress, activities can be modified accordingly. The passive movement is always possible inspire of numerous intravascular lines, life sustaining and monitoring equipment.

Bedridden patient

The passive movement should be done for bedridden patient [37]. Once there is active participation in the desired motions, active exercises become possible. Continuous passive motion (CPM): can be used in ICU to improve range of motion and tissue healing as well as decrease pain and edema following joint surgery. Adding resistance to movement may improve strength by the effect of gravity, manual resistance, weights and pulleys. Endurance can be improved by increasing the number of repetitions of any given exercises.

Standing and ambulation

Sitting balance is a prerequisite for standing. Standing balance is a prerequisite for walking. Walker and crutches may be used during walking. During ambulation, intravenous lines may be attached to a rolling IV pole. ECG, arterial, central venous pressure lines, chest tubes and abdominal sump can be

disconnected temporary with permission. Collection bag of the urinary catheter may be fixed to the base of the rolling pole during ambulation. Oxygen tank with added humidification can be secured to a standard walker or IV pole. Early mobilization often diminishes the need for long and vigorous chest physical therapy [38].

Equipment used for mobilization

A pulley system with overhead traction units, ropes, weights and pulleys. The use of a safety belt for patient transferring. Adjusting walker and crutches. IV rolling pole and a source of supplemental oxygen can be adjusted [39].

Conclusion

This work pretends to present the utilization of physiotherapist methods and its consequences in develop better conditions through the patients in intensive care units. Presenting this revision guide to give a north to all physiotherapist and health professionals.

Summary

This work tries to present the physiotherapy as the simplest way of treatment used in intensive care unit. The physiotherapy techniques involved are used to give to the patients' better conditions and quality of life. The utilization of physiotherapist methods and its consequences in develop better conditions through the patients presenting on this revision guide to give a way of treatment to cardiopulmonary physiotherapist and their patients that still in intensive care units.

Declarations

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