

## **Physical therapy intervention in prolonged ventilatory weaning of patients with muscle dysfunction: Literature review**

**Gustavo Veloso Passos<sup>1</sup>, Pâmela Camila Pereira<sup>2</sup>.**

### **ABSTRACT**

The Intensive Care Unit (ICU) is a complex environment where patients remain bedridden, with consequences for all systems. This immobilization is often associated with pulmonary complications and the need for prolonged Invasive Mechanical Ventilation (IMV), resulting in negative factors that affect the individual globally and, consequently, predispose him to longer hospitalization time (NOGUEIRA, 2020).

**Keywords:** Intensive Care Unit, Pulmonary Complications, Invasive Mechanical Ventilation.

### **INTRODUCTION**

The Intensive Care Unit (ICU) is a complex environment where patients remain bedridden, with consequences for all systems. This immobilization is often associated with pulmonary complications and the need for prolonged Invasive Mechanical Ventilation (IMV), resulting in negative factors that affect the individual globally and, consequently, predispose him to longer hospitalization time (NOGUEIRA, 2020).

According to Shi et al. (2019), prolonged IMV leads to several complications, including the respiratory muscles being the first to be affected. Atrophy due to disuse of respiratory muscles is characterized by a decrease in muscle mass, thus, muscle protein synthesis decreases and there is an increase in protein degradation. The number of muscle fibers has a reduction in size, resulting in an imbalance compromising their functioning.

The diaphragm has one of the most important roles for the respiratory cycle, with the function of boosting alveolar ventilation, according to the applicability of IMV, the respiratory muscles are mostly relaxed, leading to respiratory complications. Muscular dysfunction, especially diaphragmatic dysfunction, affects more than 60% of patients who require IMV, and progressively 80% of patients with prolonged IMV have difficulties in weaning, significantly increasing ICU mortality of 50% in 6 months of hospitalization. Whereas, after 1 day of controlled IMV, an average loss of 1.42 cm of muscle fibers is detected (DONG et al., 2021).

Intensive care physiotherapists are of great importance to promote the reduction of sarcopenia of the respiratory muscles and promote rapid and safe weaning through techniques and maneuvers associated

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<sup>1</sup> Student of the Physiotherapy Course at Centro Universitário de Itajubá – FEPI

<sup>2</sup> Professor of the Physiotherapy Course at Centro Universitário de Itajubá – FEPI



with Inspiratory Muscle Training (IMT) and electrotherapy to stimulate muscle contractions (JESUS et al., 2019).

## **OBJECTIVE**

To describe the impact on muscle dysfunction in patients with prolonged mechanical ventilation.

## **METHODOLOGY**

This is a descriptive study and literature on Muscle Dysfunction in patients with Prolonged Mechanical Ventilation. Searches were conducted in the main electronic databases: National Library of Medicine (PubMed), Latin American and Caribbean Health Sciences Literature (LILACS), Scientific Electronic Library (SciELO) and Physiotherapy Evidence Database (PeDRO). The articles were chosen based on their contents, related to the theme proposed in this study and national and international level of evidence A and/or B, using the Health Descriptors (DEC's): Respiratory System, Muscular Atrophy, Respiratory Insufficiency, Respiratory Mechanics and Inpatients. A total of 32 articles were included in order to select scientific evidence studies, which address the most relevant prevalences in order to show how muscle dysfunction affects patients on Invasive Mechanical Ventilation, written in English and Portuguese, published in the period between 2019 and 2024 and 15 articles were excluded because they did not meet the objectives. As this is a descriptive study and a literature review, without data collection with human beings, the submission of the Ethics and Research Committee (REC) was waived.

## **DEVELOPMENT**

Invasive Mechanical Ventilation (IMV) is a ventilatory support device intended for patients with degrees of respiratory dependence, during the period of IMV use, it will work in synchrony with the patient's respiratory cycle, to discharge the inspiratory muscles effectively and safely. Thus, in order to use IMV, the patient needs to be using an orotracheal tube or using tracheostomy (ESPERANZA et al., 2020).

Like all active treatments, IMV has adverse effects, including lung injury and infection, and especially diaphragmatic dysfunction induced due to prolonged ventilatory support, aggravated by aggressions related to the hospitalization environment due to sepsis, associated physiological dysfunctions, and iatrogenesis (DONG et al., 2021).

Misuse triggers lung injury or worsening of the patient's clinical condition. It was found that 44.8% of patients admitted to an ICU with invasive ventilatory support had at least one pulmonary complication due to the improper use of IMV (CRUZ et al., 2021).

Muscle dysfunction is characterized by a decrease in the size and strength of the muscles, while the loss of muscle mass in the limbs is a very gradual process that usually develops over weeks, the atrophy of



the respiratory muscles appears more rapidly, and the thickness of the diaphragm is progressively decreased by approximately 5-6% per day in the mode of controlled-assisted ventilation (ACV) and pressure support ventilation (PSV) (SOTÁK et al., 2021).

Physical therapy is beneficial for patients, from the moment of hospitalization, physical therapists already work to avoid complications, to minimize muscular, neurological, cardiac and respiratory dysfunctions. Early rehabilitation is related to the shorter duration of MV, the physiotherapist is responsible for the physiotherapeutic diagnosis and subsequent treatment of hospitalized patients, responsible for the initial management of the adaptation to IMV, the strategies employed, continuous monitoring and early mobilization, which needs to be started preferably within 72 hours of the onset of IMV, as well as at weaning. extubation, intra-hospital transport, decannulation, among others (HENDLER et al., 2021).

The physiotherapist currently has a relevant role in the ICU, of great importance for patients on IMV, in view of this, responsible for the adjustments in the ventilator panel, in view of this, the professionals are trained and equipped with techniques and knowledge about the ventilatory support process. The maneuvers most used by physical therapists in clinical practice were: vibrocompression, hyperinflation, postural drainage, tracheal aspiration and motor mobilization, aspiration, and huffing, thus generating agreement in relation to the perception of bronchial hygiene maneuvers (GOMES, 2020).

Physical therapy proposes several benefits when early motor treatment is performed, including the reduction of the adverse effects of immobility, improving respiratory function, reducing IMV hours, reducing hospital stays, improving quality of life, and chances of hospital discharge. Sedation is a technique of great importance in the procedures performed in an ICU, however, there are complications that may or may not prevent the performance of these techniques. By placing the patient in a standing position, they propose direct repercussions on the lungs, in which the intrathoracic pressure and lung volumes during IMV, thus inducing changes in hemodynamic markers, especially in the preload and afterload of the ventricles, also promotes a reduction of gravitational forces, which minimizes the compression in the lungs on the chest wall and diaphragm. providing expandability and facilitating breathing closer to the physiological pattern (ROCHA et al., 2023).

## **FINAL THOUGHTS**

It is expected that the physical therapy intervention will be able to provide an early, safe and effective weaning in patients with Prolonged Invasive Mechanical Ventilation with muscle dysfunctions.



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