

## EXPERIENCE OF PHYSIOTHERAPY USING THE ELMO HELMET IN THE HOSPITAL EMERGENCY OF REFERENCE IN FORTALEZA-CE

VIVÊNCIA DA FISIOTERAPIA COM UTILIZAÇÃO DO CAPACETE ELMO NA EMERGÊNCIA DE UM HOSPITAL DE REFERÊNCIA EM FORTALEZA - CE

EXPERIENCIA DE FISIOTERAPIA UTILIZANDO EL CASCO ELMO EN EL HOSPITAL DE EMERGENCIA DE REFERENCIA EN FORTALEZA - CE

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### ABSTRACT

The aim of this report was to describe our experience in using the ELMO-CPAP helmet in patients affected by COVID-19 and admitted to the Emergency Department of a reference hospital in Fortaleza, Ceará. descriptive study, carried out during the SARS-COV-2 pandemic within the Emergency, in which the ELMO-CPAP was used as a non-invasive ventilation resource, seeking to avoid the risk of intubation. This experience was from March to July 2021. Patients with mild to moderate symptoms of hypoxemia and who were indicated to wear a helmet had a more evident clinical and hemodynamic improvement than individuals with severe symptoms. Other authors highlight the benefit of this therapy in cases of acute respiratory distress syndrome, demonstrating a reduction in intubation and mortality rates. The use of this therapy in emergency patients can help in the treatment, when used at the time and with adequate parameters.

**Descriptors:** Covid-19; Emergencies; Physiotherapy; Continuous Positive Airway Pressure.

### RESUMO

O objetivo deste relato foi descrever nossa experiência na utilização do capacete ELMO-CPAP em pacientes acometidos pela COVID-19 e admitidos na Emergência de um hospital de referência em Fortaleza, Ceará. Estudo descritivo, realizado durante a pandemia da SARS-COV-2 dentro da Emergência, em que foi utilizado o ELMO-CPAP como recurso de ventilação não invasiva, buscando evitar o risco de intubação. Essa experiência foi vivenciada no período de março a julho de 2021. Pacientes com sintomas leves a moderados de hipoxemia e que foram indicados ao uso do capacete tiveram uma melhora clínica e hemodinâmica mais evidente que os indivíduos apresentando sintomas graves. Outros autores destacam o benefício dessa terapia em casos de síndrome do desconforto respiratório agudo, demonstrando uma redução das taxas de intubação e mortalidade. A utilização dessa terapia em pacientes na emergência pode auxiliar no tratamento, quando empregado no momento e com parâmetros adequados.

**Descritores:** Covid-19; Emergências; Fisioterapia; Pressão Positiva Contínua nas Vias Aéreas.

### RESUMEN

El objetivo de este informe fue describir nuestra experiencia en el uso del casco ELMO-CPAP en pacientes afectados por COVID-19 e ingresados en el Servicio de Urgencias de un hospital de referencia en Fortaleza, Ceará. Estudio descriptivo, realizado durante la pandemia SARS-COV-2 dentro de la Emergencia, en el que se utilizó el ELMO-CPAP como recurso ventilatorio no invasivo, buscando evitar el riesgo de intubación. Esta experiencia se vivió de marzo a julio de 2021. Los pacientes con síntomas leves a moderados de hipoxemia y a los que se les indicó el uso de casco tuvieron una mejoría clínica y hemodinámica más evidente que las personas con síntomas graves. Otros autores destacan el beneficio de esta terapia en casos de síndrome de dificultad respiratoria aguda, demostrando una reducción de las tasas de intubación y mortalidad. El uso de esta terapia en pacientes urgentes puede ayudar en el tratamiento, cuando se utiliza en el momento y con los parámetros adecuados.

**Descritores:** Covid-19; Emergencias; Fisioterapia; Presión Positiva Continua en la Vía Aérea.



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## INTRODUCTION

In 2020, the World Health Organization (WHO) declared the transmission of the coronavirus a global health emergency, because its transmissibility occurs quickly, spreading to several countries and becoming a pandemic<sup>1</sup>. Patients with COVID-19 may not present symptoms in some cases, however, others develop hypoxemic acute respiratory failure, requiring emergency medical attention<sup>2</sup>.

The emergency is a sector of the hospital unit in which individuals seek immediate care to resolve acute problems. Faced with the growing demand for cases of people infected by SARS-COV-2, highly complex technological services needed to adapt to a new reality to provide quality care to patients with acute respiratory diseases. In addition, many professionals who are part of the multidisciplinary team had a great challenge in sharing knowledge, as well as in joint decision-making, aiming at a more assertive therapeutic approach for the clinical improvement of patients<sup>3</sup>.

The physiotherapist from the multidisciplinary team of these urgent and emergency hospital units seeks to provide rapid support, aiming to improve the clinical condition of the patient with cardiorespiratory dysfunction, as well as to reduce the length of stay. For this purpose, non-invasive ventilation techniques that provide oxygen are used to prevent the progression of the disease, orotracheal intubation and admission to an Intensive Care Unit<sup>4</sup>.

Among the oxygen therapy methods, the ELMO-CPAP allows a positive airway pressure to be offered during the respiratory cycle, enabling alveolar recruitment, which results in an increase in functional residual capacity and improved oxygenation<sup>5</sup>. This helmet-type device provides oxygen and compressed air comfortably during therapy with minimal adverse effects, not allowing air leakage and droplet dispersion, and can be used in patients affected by SARS-COV-2, without bringing any risk to health professionals<sup>6</sup>.

The few theoretical references related to the topic of COVID-19 and ELMO-CPAP helmet therapy motivated the authors to write this experience report. The knowledge associated with practice regarding the use of this equipment is relevant, in order to highlight the possible results of this therapy in patients suffering from hypoxemic respiratory diseases.

The aim of our report was to describe our experience in using the Elmo-cpap helmet in patients affected by COVID-19, who were admitted to the Emergency Department of a reference hospital in the city of Fortaleza, state of Ceará.

## METHODS

This is a descriptive study, of the experience report type, developed in the context of the COVID-19 pandemic within the Emergency of a reference hospital in the city of Fortaleza/CE, in which ELMO-CPAP helmet therapy was used as resource of non-invasive ventilation, with indication criteria for the newly admitted patient in the covid sector, seeking to improve the clinical and hemodynamics of this individual, as well as to avoid the risk of intubation (IOT). This experience was experienced from March to July 2021.

The assistance provided in the emergency service included approximately 130 adults and elderly individuals, of both genders, aged between 25 and 70 years, with symptoms of mild to moderate dyspnea, fever, myalgia and others, with a suspected diagnosis of COVID. 19, which would be confirmed with complementary exams such as computed tomography (CT) and a positive swab test. It is important to emphasize that this sampling is not reliable, as a survey was not carried out on the date described for the quantitative real, but only an estimate, making this a limitation of our experience report.

As a criterion for using a non-invasive assisted breathing helmet with continuous positive airway pressure, we had: adult patients > 18 years, conscious, oriented and cooperative, with mild to moderate hypoxemia, who needed oxygen therapy to maintain saturation > 92- 96% at least in 4h and respiratory rate > 25 bpm, who have presented blood gas results up to one hour before with pH > 7.35, paO<sub>2</sub> > 60 mmHg, pCO<sub>2</sub> between 30 and 45 mmHg, with PaO<sub>2</sub>/FiO<sub>2</sub> < or = 250 and > 120, and chest x-ray or CT with the presence of bilateral parenchymal opacities in the last 24 hours. Patients who presented drowsiness, claustrophobia, vomiting or nausea, hemodynamic instability and previous respiratory pathologies resulting in hypercapnia or respiratory acidemia were contraindicated for the use of the therapy.

The patient's neck was measured, the exact size ELMO-CPAP helmet was requested at the hospital's equipment center, fitted, the individual was instructed on how to use it, ear protectors and helmet were placed on the patient. The adjustments of the values of the supplied gases (oxygen and compressed air) were carried out according to the flow and thread<sup>2</sup> that one wishes to supply, following a table. The pressure inside the helmet, on the other hand, was measured using a cafometer, allowing us to know the pressure being offered by the PEEP valve (Positive End Expiratory Pressure) installed in the expiratory branch.

During the entire period of use of the equipment, the physiotherapist monitored the following parameters: dyspnea, respiratory rate, heart rate, saturation, breathing pattern, behavioral signs of the individual and blood gas parameters. Blood gases were requested by the medical team and collected by the laboratory assistant at the beginning and at the end of therapy, with all values being recorded in the evolution form.

Monitoring makes it possible to identify the success of elmotherapy, with a progressive decrease in dyspnea, progressive reduction in  $\text{FIO}_2$  and flow offered maintaining an  $\text{SpO}_2 > 92\text{-}93\%$ , tolerance for permanence in the device ( $>4\text{h}$ ), sleeping using the helmet, arterial blood gases showing stable  $\text{PaO}_2/\text{FiO}_2$ , pH and  $\text{PaCO}_2$  values and no worsening of arterial lactate. Failure to improve these indicators is considered a failure of ELMO-CPAP helmet therapy, requiring the medical team to make a decision regarding the conduct of orotracheal intubation (OTI).

## RESULTS

Based on what was experienced, it was found that patients who sought the emergency room at the hospital early with mild symptoms of COVID-19 and who were indicated to use the ELMO-CPAP helmet had a more evident clinical and hemodynamic improvement.

Some of the patients who arrived at the sector presenting moderate symptoms of the disease, such as respiratory discomfort, use of accessory muscles, tachydyspnea, using a mask with reservoir and with borderline saturation (88-91%), also benefited from the use of breathing therapy non-invasive assistance, showing a satisfactory evolution after the first hours of treatment.

Individuals who were unable to benefit from therapy after 12 hours and those who arrived at the unit late, with severe symptoms and who were not indicated for the use of ELMO-CPAP helmet therapy, had a worsening prognosis, with hypoxemic and acute respiratory failure. , consequently, evolving into an Acute Respiratory Distress Syndrome (ARDS) and orotracheal intubation (OTI). These needed invasive ventilatory support, being later transferred to an Intensive Care Unit (ICU), according to the demand for vacancies in each sector.

## DISCUSSION

In this report, we found satisfactory results when using the ELMO-CPAP helmet in patients with mild to moderate hypoxemic respiratory failure due to complications from COVID-19. Non-invasive oxygenation through the helmet in patients with hypoxic

respiratory failure corroborates what has been seen in our experience, in which many individuals have shown increased tissue oxygenation after the use of therapy<sup>7</sup>.

Many patients with acute respiratory distress syndrome, who were indicated for the use of a non-invasive assisted breathing helmet, benefited from this therapy and demonstrated a reduction in intubation and mortality rates, in addition to having shown a significant improvement in functional independence<sup>8</sup>.

The therapy with the use of the ELMO-CPAP helmet provided greater safety as it is a non-invasive ventilation interface that mixes compressed air and oxygen flows, allowing a  $\text{FiO}_2$  of up to 100% and a continuous positive airway pressure of approximately 20  $\text{cmH}_2\text{O}$ , within a sealed system around the neck, thus minimizing the dispersion of aerosols in the environment and the risk to the health of the multidisciplinary team or other patients<sup>9</sup>.

Given what was experienced in practice in the emergency, patients who sought care late were unable to avoid orotracheal intubation (OTI), even with the application of the ELMO-CPAP helmet. Studies have shown that patients with hypoxemic respiratory failure resulting from complications of COVID-19 have a pathophysiological process similar to the Acute Respiratory Distress Syndrome, characterized by the most severe stage of the disease, in which many individuals require the use of invasive ventilatory support<sup>10</sup>.

## FINAL CONSIDERATIONS

We conclude that patients with respiratory failure, mild and moderate hypoxemia benefited from the use of a non-invasive assisted breathing helmet, with an improvement in their clinical and hemodynamic condition. In more severe cases, which had associated comorbidities, the improvement was not as significant, as the lung injury was more extensive, which may have favored failure in therapy with the ELMO-CPAP helmet and possible evolution to intubation orotracheal. New studies on the use of this unique therapy or compared to other therapies could further enrich the literature and the work of professionals in the multidisciplinary team.

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