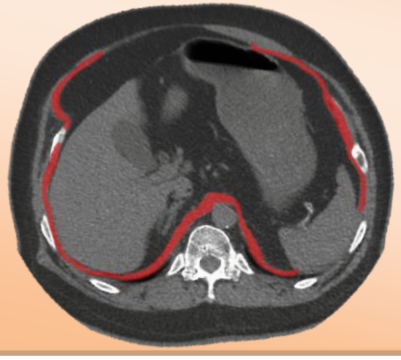

Diaphragm volume and quality in ICU patients: the new 'nutrition parameter' kid in town?

Associations with protein provision, corticosteroid and muscle relaxant use

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NESPEN 'clinical nutrition and metabolism'

Description of the initiative

Loss of skeletal muscle mass occurs rapidly in Intensive Care Unit (ICU) patients, leading to impaired survival rates and quality of life. Diaphragm atrophy in ICU patients appeared to be predominant compared to loss of psoas (skeletal) muscle mass in a previous study [1]. Dysfunction of the diaphragm is one of the main factors leading to prolonged mechanical ventilation in ICU patients, consequently worsening clinical outcomes. Protein provision and treatment with corticosteroids and muscle relaxants are amongst factors that mediate changes in muscle mass. A recent study showed, that higher vs. lower protein provision (1.70 vs. 1.06 g/kg) is associated with a reduction in diaphragm atrophy in prolonged mechanically ventilated ICU patients [2]. Treatment with corticosteroids and muscle relaxants is known to enhance muscle atrophy, but the effect of its duration and dosage on muscle mass is unknown. The primary aim of this study is to determine the association between high versus low protein provision (according to ESPEN recommendations), corticosteroid and muscle relaxant use (duration and dosage) and changes in diaphragm volume and quality (as assessed by CT-scan). Secondary, we want to study the association between changes in diaphragm volume and quality, and changes in skeletal muscle mass (also assessed by CT-scan) in ICU patients.

Planned activities & deliverables

Study design: Retrospective cohort study in 191 COVID-19 patients who were admitted to the ICU of Amsterdam UMC (2020-2022), ≥18 years and were mechanically ventilated ≥48 hours with ≥2 CT-scans available in ≥5 days.

Steps to be taken and deliverables after 12 and 24 months: Manuscripts on both aims are the concrete deliverables of the project that will be drafted within 12 months and submitted for open access route publication within 24 months. The steps to be taken are setting up the database, analysing the CT-scans, performing statistical analysis (statistical analysis plans are readily available) and writing manuscripts.

Resources & enablers

Financial needs: To perform analysis of the CT-scans, data analysis and writing manuscripts, €30.000 will be spend on 0.35 fte over 12 months for a dietitian-researcher.

Success factors: The data for answering our research questions and approval by the ethical committee is already obtained, analysis can start right away. Our research group has wide experience in studying protein provision and CT-analysis for body composition in ICU patients.

Results/outcomes & expected impact

Implementation: The results and outcomes of this research project will be published in an international open access journal (we expect to deliver 2 manuscripts).

Optimal nutritional care and innovation: The diaphragm is a unique muscle, and its dysfunction has been associated with prolonged mechanical ventilation, increased risk of readmission and higher mortality. Currently, there is no specific treatment available that mediates in loss of diaphragm volume and quality. It is unknown how optimal protein nutrition can reduce diaphragm atrophy, including counteracting iatrogenic effects. Additionally, by studying the association between corticosteroid dosages and muscle relaxant use on changes in diaphragm volume and quality, we want to investigate whether this may be a reason for reconsideration of treatment (duration and dosage) with corticosteroids and muscle relaxants.

International nutrition policy and transferability: Results are transferable to worldwide ICU's and may contribute to worldwide ICU nutrition guidelines, as current protein provision recommendations still depend on expert opinions.

☑ **Please tick to confirm the PEN letter of endorsement is attached.**
Incomplete submissions will not be considered.

[1] Jung B et al; Anesthesiology 2014 / [2] Zhang Q et al; Nutr Clin Pract 2022

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