

LS14-069 - Novel approach to individualized mechanical ventilation of critically ill patients through Computed Tomography-enhanced bedside Electrical Impedance Tomography Imaging

Abstract

Mechanical ventilation of the acutely injured lung promotes secondary lung damage, and setting the ventilator to the patient's individual needs remains a major challenge. Dynamic bedside pulmonary imaging has been proposed to optimally adjust the ventilator. This project addresses this issue by using a novel imaging approach: Computed Tomography (CT) enhanced Electrical Impedance Tomography (EIT). We hypothesize that using CT-enhanced non-invasive dynamic EIT to guide ventilator settings improves outcomes in patients at risk for ventilator associated lung injury (VALI). To reach this goal, we will first establish and validate novel methodological approaches to improve non-invasive visualization of the lungs by CT-enhanced EIT in an experimental setting. To overcome the current limitations of EIT imaging, we will then use the anatomical information provided by CT-scans and integrate them into EIT image reconstruction algorithms and subsequent analysis. In addition, we aim to precisely map the regional functional behavior of lung tissue using a novel approach of data analysis by complex curve progression, to distinguish - within each EIT pixel - between lung tissue that is either hyperinflated, normally aerated, cyclically recruiting and derecruiting, or non-aerated. In a second step, we will translate these results to clinically applicable software solutions and finally evaluate the approach of "CT-enhanced EIT" in critically ill patients at risk of VALI.

Scientific disciplines:

Anaesthesiology (40%) | Biomedical engineering (30%) | Radiology (30%)

Keywords:

ventilation associated lung injury, lung-imaging, Electrical Impedance Tomography, Computed Tomography

Principal Investigator: Klaus Markstaller
Institution: Medical University of Vienna
Co-Principal Investigator(s): Eugenijus Kaniusas (TU Wien)



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Further links to the persons involved and to the project can be found under

<https://www.wwtf.at/jpeto2.brunner.at/funding/programmes/ls/LS14-069/>