Project Team

David Davenport – Principal Investigator
Tzu-Jen Kao, PhD – EIT Technical Lead
GE Research - Niskayuna, NY

Robert Lichoy, MD – Clinical Partner Site PI
Michael King, PhD – Clinical Data Lead
University of Massachusetts Medical School - Worcester, MA

Motivation

Ventilation/Perfusion (V/Q) matching is highly relevant to monitoring respiratory function of mechanically ventilated COVID-19 and ARDS patients. V/Q scans are performed with nuclear imaging and are rarely used for critically ill patients. There is a need for a new, continuous, bedside V/Q scan to guide respiratory therapy and improve patient outcomes.

Project Goals

- Validate SMS-EIT derived lung Ventilation/Perfusion distributions with SPECT-CT V/Q scans on 20 patients.
- Evaluate workflow efficiency using electrode textile appicator patches.
- Engage with clinicians to validate unmet needs for respiratory monitoring of mechanically ventilated patients.

Pilot Study Findings

Our data from neonate, pediatric and adult patients demonstrates the capability of our SMS-EIT to generate physiologically relevant lung ventilation and perfusion images. We have defined a novel V/Q-index parameter from these impedance images and shown agreement with lung pathophysiology observations from X-ray and CT-scans.

What is SMS-EIT?

Electrical Impedance Tomography (EIT) is a non-invasive, non-ionizing imaging technology that estimates electrical properties inside the body using measurements from surface electrodes.

GE Research developed a novel, simultaneous multi-source EIT (SMS-EIT) with 32 independent channels. Each channel consists of individual current source and voltage measurement circuits.

Advantage of SMS-EIT

Our SMS-EIT design provides uniquely greater sensitivity to image pulmonary perfusion in addition to ventilation. SMS-EIT can generate images of lung ventilation, perfusion, and V/Q ratio maps in real time — breath to breath and beat to beat — without injected contrast or prolonged breath holding.