OPTIMIZATION OF MECHANICAL VENTILATION USING ELECTRICAL IMPEDANCE TOMOGRAPHY

Motivation:

Even though mechanical ventilation is a live-saving method, it is accompanied with many harmful effects on human organism. Electrical impedance tomography (EIT) is a non-invasive method that could be used for monitoring of distribution of ventilation and is therefore helpful in proper ventilator adjustment to avoid injurious impact as much as possible is EIT. Since the only possible method offering similar monitoring is considered to be X-ray, EIT is a very perspective tool to become frequent for respiratory monitoring in clinical practice. However, possibilities and evaluation of EIT monitoring are far from being sufficiently explored.

Aim:

There are many different goals in this field, especially regarding optimization of parameters in both conventional and high-frequency ventilation. Some of our aims are using EIT for monitoring of pulmonary embolism, water balance assessment, or lung monitoring during laparoscopic surgery with capnoperitoneum.

Methods:

Depending on the study, our research team performs experiments in animal models as well as human patients in cooperation with our partners from clinical practice. One of the possible evaluated characteristics is regional distribution of ventilation, analysis of which can lead to optimization of positive-end-expiratory pressure (PEEP). An example of EIT images obtained for different PEEP levels is shown in Fig. 1.

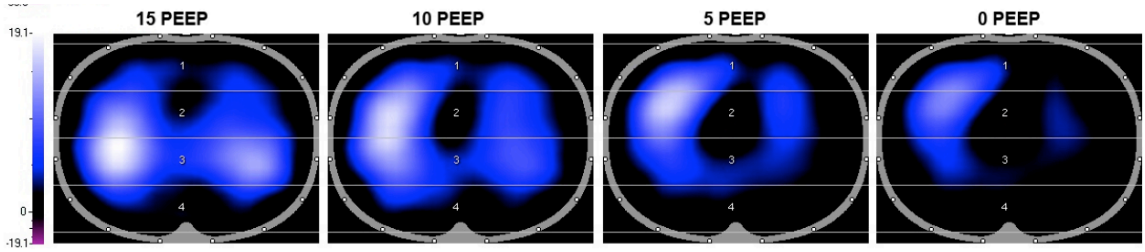

Fig. 1 - Comparison of images from EIT system (PulmoVista 500, Dräger Medical) for different PEEP levels. [BIKKER, I. et al. Electrical impedance tomography measured at two thoracic levels can visualize the ventilation distribution changes at the bedside during a decremental positive end-expiratory lung pressure trial, Critical Care 2011, 15:R193]