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The development of clinical data on COVID-19 has been very rapid, resulting in a large amount of data being generated in a very short time. However, hard evidence still appears to be scarce. This article has been written to the best of our knowledge based on selected literature and opinions of clinical experts. It does not represent a summary of all available literature and therefore does not claim to be exhaustive. As COVID-19 is a very complex disease, you should always refer to the original literature mentioned in this article, other relevant literature and the circumstances of the individual case when deciding on the right ventilation strategy for your patients. It is also strongly advised to follow your national/local guidelines and standards.

Lung imaging, specifically CT, is the gold standard to assess the status of the lung, i.e. extent of lung damage as well as ventilation and aeration in ARDS. However, transportation is unfavorable in these critically ill patients. Furthermore, CT is associated with radiation exposure and provides only static images.

EIT is a bedside technology providing dynamic insights into the aeration of the lung. It is used in ARDS patients to optimize mechanical ventilation settings and might help to evaluate lung recruitability and success of prone positioning. It therefore seems sensible to conclude that this technology may be of use in establishing individualized ventilation strategies in complex patients such as those suffering from CARDS.

In CARDS patients with their diverse states of lung conditions alongside significant hypoxemia, EIT could assist in determining the characteristics of individual patients. Tomasino and colleagues have described using EIT for their decisions regarding the appropriate PEEP level and whether or not to put patients into prone position.²⁵ Morais and colleagues introduced three patient cases of similar level of oxygenation and variable respiratory system compliance with differences in regional ventilation, in which EIT helped to understand hypoxemia at the bedside.²⁶

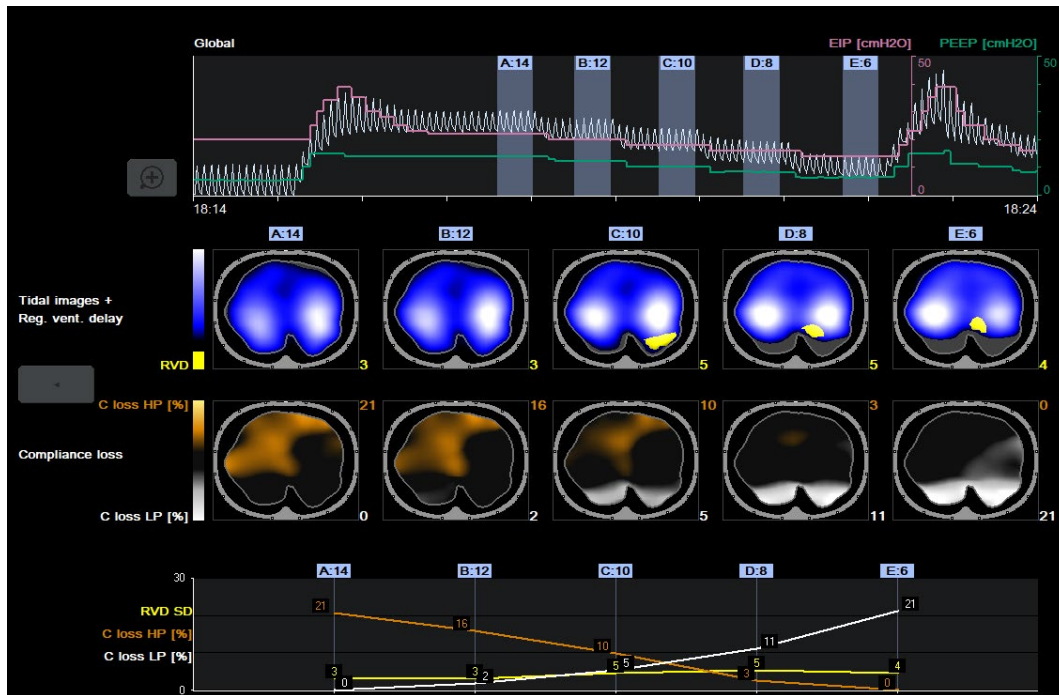
EIT could therefore represent a valuable bedside tool assisting clinicians in assessing the state of their CARDS patients in real-time at the bedside.²⁷

Regional transpulmonary pressures and the role of EIT

Vulnerability to lung injury seems to depend on the transpulmonary pressure, the pressure the lung actually “sees”, and – to a far greater extent – on its regional amplification by inhomogeneities, so called “stress raisers”.²⁸ Collapsed lungs adjacent to the remaining and ventilated “baby lung” amplify the mechanical stress and can accelerate VILI. The question is: Can this be avoided? Can regional lung collapse be reversed, and at what expense? In-homogeneously injured lungs typically and simultaneously show signs of overdistension and lung collapse. Recruitment maneuvers and higher PEEP should only be applied on responders – as in non-responders, both measures seem to have rather a detrimental effect.²⁹ Monitoring patients with EIT reveals if a patient responds positively by a more homogenous distribution of ventilation.

During a decremental PEEP trial, EIT can show where and to what extent lung overdistension and lung collapse are taking place. This information can be used to find the best compromise.³⁰

The use of EIT can also be helpful to differentiate responders from non-responders during prone-positioning, a procedure many Covid-19 patients underwent.³¹ Prone positioning may help to improve oxygenation, reduce driving pressures and mortality, but is difficult and resource-intensive.^{32,33} Predicting which patients benefit from being turned prone can therefore be a big help, as CT scans take more time, use radiation and cannot serve as continuous monitoring: In Northern Italy, it was reported that at the height of the pandemic, 30 patients per hour would have had to be assessed.²⁵



In our article on ventilating patients with COVID-19-associated ARDS, we reviewed relevant literature and four current guidelines to provide a practical overview. For references and details, please visit our website: www.draeger.com/covid-ventilation



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