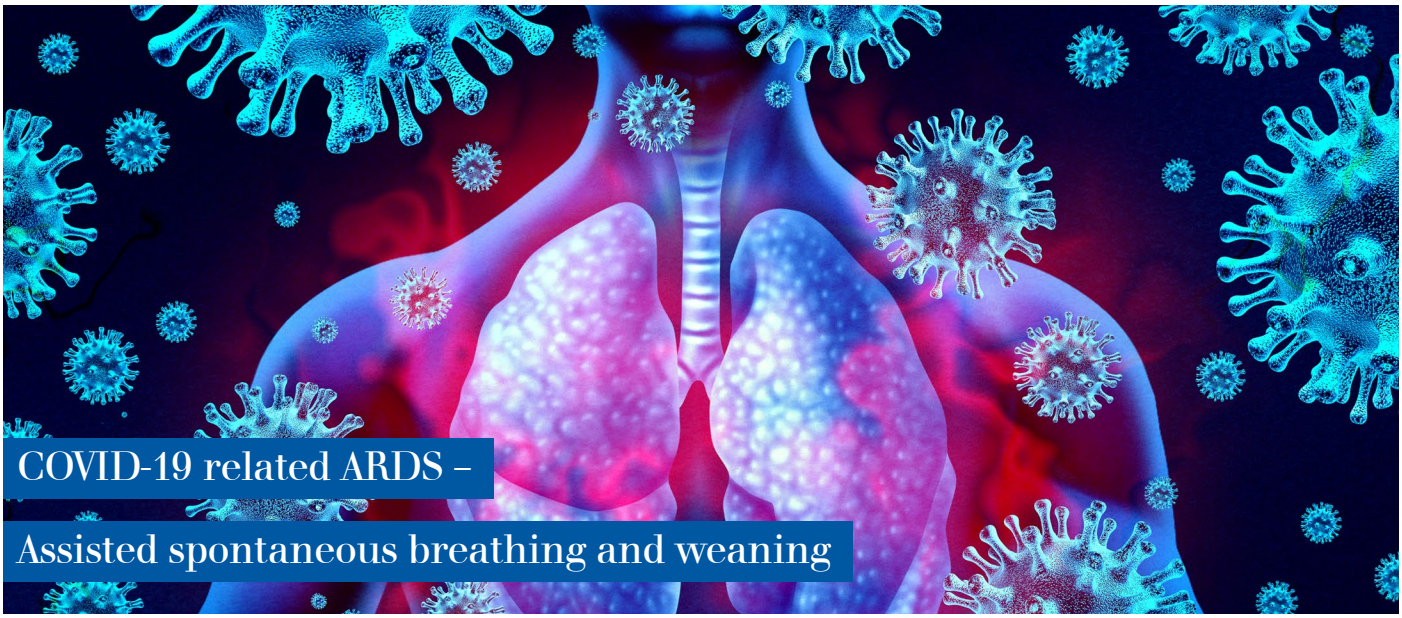

COVID-19 related ARDS –

Assisted spontaneous breathing and weaning

DL-45340-2021

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.

As mentioned earlier, patients with COVID-19 associated ARDS exhibit high respiratory drive and intense effort. It is suspected that this is not only caused by a gas exchange disorder, but also by the direct invasion of respiratory centers due to SARS-CoV-2.

The role of inspiratory effort in promoting lung damage in COVID-19 may be critical.[13] This underlines the need to closely and continuously monitor the respiratory drive and effort during assisted spontaneous breathing.

Various methods for monitoring drive and effort are available, most of which was discussed in the introduction of this article.

- **P0.1 measurement as an indicator for respiratory drive**
  Record the respiratory pressure created by patients during the first 100 ms of a triggered, occluded breath in regular intervals. In a study by Esnault et al. non of the patients with a P0.1 <4cmH_2O experienced deterioration 24h after measurement.[15,18] The first 100ms of inspiration more closely reflects the inspiratory drive, rather than effort, even though this is not entire decoupled.

- **Esophageal pressure (P_{es}) as a surrogate for transpulmonary pressure (P_{tp})**
  Negative pressure swings indicate respiratory effort, higher ΔP_{es} demonstrates increasing effort. P_{es} swings of >15cmH_2O may represent excessive work of breathing.

- **Occlusion Maneuver (P_{occ}) as a measure of muscle pressure**
  Negative airway pressure in an occluded inspiration indicates muscle pressure and this respiratory effort
  Target value ≥-10cmH_2O.

- **Tidal volume as an indicator of respiratory drive and effort**
  High tidal volumes might reflect high drive and effort. No clear cutt-off values defined yet. In NIV Vte >9.5ml/kg/PBW was significantly associated with NIV failure. Beware of double triggering and breath stacking in assisted ventilation resulting into excessive tidal volumes potentially promoting P-SILI.

5. Weaning

Weaning from invasive ventilation

The path of respiratory failure with Covid-19 is usually neither short nor straight. Consequently, weaning of Covid-19 patients is not straightforward, either.

A main cause for weaning failure in COVID-19 patients is the hypoxemic respiratory failure with hyperventilation und low to normal $PaCO_2$ values. CARDS specifics also contribute to difficulties in weaning.[52] The fibrotic remodeling in late CARDS described by Tonelli et al. may contribute to the challenge of weaning COVID-19 patients from mechanical ventilation.[13] In addition, co-morbidities such as renal failure, hepatopathies, cardiac damage and skeletal muscle damage may play a role as well. An early focus on weaning from mechanical ventilation is important as COVID-19 patients frequently require prolonged weaning of up to 6 weeks.[52] In particular, the increased respiratory drive and effort described in COVID-19 patients may need to be taken into account.

Downward adaptation of support levels may alternate with required increases, until the patient is eventually weaned and extubated. Automated systems can help to continuously provide the right support level, while at the same time ensuring that no chance is missed of an attempt to have the patients do more respiratory work on their own. Automated spontaneous breathing trials may help to take a profound decision on the right timing and probability of success of an extubation.

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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