Personalized lung protection
The right protection, for each patient at the right time

This document is intended to provide information to an international audience outside of the US.
The physiological challenges of mechanical ventilation

**Volutrauma**
– lung injury due to alveolar overdistension during controlled ventilation

Protective strategies proposed as standard of care are prescribing low tidal volume per predicted body weight (VT/PBW) and limited plateau and driving pressure (Pdrive), but real-world delivery of these recommendations is sub-optimal. Stress Index and transpulmonary pressure (Plsmcp) are two ways to assess lung stress, where the latter allows for distinguishing between lung and chest-wall contribution to the patient’s respiratory system mechanics. Transpulmonary pressure has also been proposed as a way to guide PEEP titration in ARDS by targeting a slightly positive end-expiratory transpulmonary pressure (Pl ee).1,8

**Atelectrauma**
– lung injury due to cyclic closing and re-opening of alveoli

Protective strategies includes increased PEEP, and lung recruitment with the patient in supine position or by prone positioning. A decremental PEEP titration approach has been proposed as an optimal method, where it also provides diagnostic information about lung recruitability through the precise analysis of the respiratory system compliance (Cdyn). Through this approach, PEEP that is inefficient in recruitment can be avoided. Advanced hemodynamic monitoring aids in understanding any effects on the cardiocirculatory function, severity of lung injury and find an optimal benefit-to-cost ratio for both heart and lungs.11,12
ventilation requires a powerful toolkit

Barotrauma (pendelluft)
– alveolar pressure drop with lung volume re-distribution during spontaneous breathing

The concept of Patient self-inflicted lung injury (P-SILI) describes how a strong spontaneous breathing drive in already injured lungs (two-hit model) aggravates the situation, where deep sedation and neuromuscular blockade (NMBA) is recommended in order to protect the "baby lung". Concern about the impact of the patient’s own respiratory drive, and assessment whether spontaneous breathing will be beneficial or detrimental, can be assessed by both esophageal pressure monitoring (ΔPes and P/l.smcp) and electrical activity of the diaphragm (Edi). Edi is the Gold standard for assuring optimal timing and effort of spontaneous breathing, and can be used to assess impact of sedation and to optimize patient inspiratory effort levels to shorten time of ventilation and improve outcome. Edi can also reveal reverse triggering which is the phenomenon of large diaphragmatic contractions triggered by ventilator inflations in paralyzed patients that may result in excessive tidal volumes. Edi could also help to improve patient-ventilator interaction and predict successful weaning during extra-corporeal life-support (ECLS).

Myotrauma
– diaphragmatic injury due to inappropriate load and/or asynchrony

Edi monitoring: Strong respiratory drive / Muscle paralysis by NMBA

Pes & PL monitoring: Baydur-test passed / Excessive ΔPes and PL drive

Auto SRM: Non-responder – pursue lung rest strategy?

Edi monitoring: Titration of support to protect both lungs and diaphragm
References


29. Karakannidis G, Grassmann S, Schwarz S et al Control of respiratory drive by extra-corpooreal CO2 removal in acute exacerbation of COPD breathing on non-invasive NAVA; Critical Care 2019 23:135

Watch video explaining Servo-u 4.0

How has personalized lung protection been integrated in the Servo-u system version 4.0? Why is it so unique and what can it do for you?

https://www.youtube.com/watch?v=8CO8Ifm20I8