Successful ventilation weaning with Proportional Pressure Support® (PPS)

Respiratory support proportional to respiratory drive for patients with spontaneous breathing: Beatrice Totten, Senior Physician in the Department of Internal Medicine and Rheumatology of the St. Ansgar Hospital Sulingen, talks about her experience with weaning in patients with a severe pulmonary disease and the advantages of PPS.

Since 2009, the ventilation mode PPS has successfully been used in the Sulingen Clinic for ventilation weaning. In particular for patients with a severe restrictive and obstructive airway disease. “Patients who formerly would have been transferred to a special clinic for weaning can now be weaned from ventilation with PPS at the Sulingen Clinic. Since then, even other hospitals have been transferring patients to Sulingen Clinic” Dr. Sven Dubbert says.

The clinic treats patients who suffer from a wide spectrum of internistic diseases and has also been treating patients with rheumatologic diseases since 2008. The interdisciplinary intensive care unit has more than 7 beds and is specialised in the treatment of pulmonary diseases: Patients with pneumonia, COPD (Chronic Obstructive Pulmonary Disease) or emphysemas as well as patients with pulmonary involvement in rheumatic diseases.

The ventilation systems at our disposal are mainly respirators of the Evita family that feature the PPS option. Totten says, “We mostly work with EVITA XL.” According to Totten working with so-called “burned out” COPD-patients is one of the most challenging tasks at the intensive care unit. These are patients who have been suffering from a severe COPD for years and cannot easily be weaned from ventilation. “We often experience setbacks, as COPD patients get new infections.”

THE WEANING PROCESS HAS CHANGED

Totten says, “Since we have been using PPS the treatment of severe diseases has significantly changed. We used to wean in the CPAP/ASB mode (Continuous Positive Airway Pressure/Assisted Spontaneous Breathing) which was often very difficult and not successful. Since we have been weaning patients from ventilation in the PPS mode we haven’t had a single weaning failure. When I learned about PPS and started to work with it, I shortly realised that this form of respiratory support may be of great value for us and our patients.”

In contrast to CPAP/ASB whose pressure support is always constant at each inspiration, the pressure support of PPS is proportional to the inhalation process at each point in time, so that pressure support can optimally be adjusted to the spontaneous breathing of the patient.

Knowledge of resistance and elastance of lungs is required for the primary setting of PPS. The device determines these values e.g. under volume-controlled ventilation with a constant inspiratory flow without spontaneous breathing of the patient. When switching to the proportional pressure support, it is recommended to set a maximum support of 75-80 % on the basis of the two determined values and to gradually reduce those in the course of weaning.

WEANING PROCESS SHOULD START AS SOON AS POSSIBLE

Asked when the right time might be to start weaning patients from ventilation, Totten answers, “We start the weaning process as soon as possible, since we know from experience that respiratory muscles of COPD/emphysema patients and those of elderly people atrophy relatively quickly. Patients who g. underwent reanimation for example usually remain on controlled ventilation for 24 hours. After that we reduce the sedation and – once the patients are more alert and breathe spontaneously – we begin supporting spontaneous breathing with PPS.”

INDIVIDUALLY ADJUSTED TO EACH PATIENT

“Depending on the values for resistance and compliance determined by the device, the adjustments appropriate to the respective situation and patient are carried out with the Flow-Assist and Volume-Assist. We can’t just go by the book. We choose the setting in order to maintain a sufficient expiration and breath minute volume and to avoid causing the patient unnecessary stress. The blood gas analysis tells us if the patient is sufficiently oxygenised” Totten says.

A GOOD CLINICAL COURSE IN A SEVERE CASE

In particular one case impressed Totten very deeply. “We once had a patient, born in 1963, with a severe lung fibrosis and distinctive pulmonary emphysema. It was the first time that we made use of PPS. A year ago he stayed at our clinic, where he received long-term ventilation. At that time we were able to wean him from the respirator with CPAP/ASB. But now he was suffering from an acute breathlessness and an infective exacerbation of COPD. At first he received non-invasive ventilation delivered by mask. As he became exhausted, we had to intubate the patient and put him under controlled ventilation. The patient was put on controlled ventilation for one week. When it became obvious that we would not be able to extubate him without any problems, we tracheotomised the patient after 10 days. Afterwards we started the weaning process. First, for 8 days in the CPAP/ASB mode and then in the PPS mode.

It was difficult in the beginning, as we did not have any experience with the PPS mode. We relied on the values for Resistance and Compliance computed by the device. In this case they matched perfectly. We started from a Flow-Assist of 6 mbar/L/sec and a Volume-Assist of 8 mbar/L. Within 15 days we were able to reduce respiratory support to the point that the patient finally did not require respiratory support and was permanently capable of breathing without a ventilator. Afterwards we were able to remove the tracheostomy tube. The weaning process took approximately 3 weeks. Fortunately, the patient was alert and cooperative during the whole time.

We changed the parameters in consultation with the patient and were able to come up with his need for more or less respiratory support. He was satisfied with it. Although the patient disease was severer during his first stay, weaning with PPS turned out to be easier than with CPAP/ASB. Contrary to our expectations, the clinical course was very good. “We were actually standing with our backs against the wall” Totten says.

EFFECTIVE AND COST-SAVING

Among those advantages of PPS, also with regard to saving potential and cost optimisation, Totten mentions the following aspects, “The intensive care unit stay and ventilation time has definitely become shorter.”

“We observed this less often with our own patients than with patients transferred to our clinic. Those are often ventilated with CPAP/ ASB but their condition remains unchanged in this mode. We succeeded in weaning patients from ventilation with PPS permanently within a relatively short period of time. This tells us how effective PPS is.” Totten is convinced that PPS has an indirect effect on the patients‘ outcome. Another fact speaking in favour of the better outcome and the high effectiveness of PPS is that no patient weaned from ventilation with PPS had to be reintubated, as opposed to those weaned with ASB.

LOWER SEDATION AND LESS STRESS

Totten says, “Another advantage is that patients weaned in the PPS mode experience less stress and are calmer than they are under CPAB/ASB. In the CPAB/ASB mode patients have to tolerate pressure support set by the ventilator, whereas PPS allows the patient to control ventilation. Many patients coped better with PPS. Remarkably, the PPS mode requires a much lower sedation.”

According to Totten, the aim is to wean patients from ventilation preferably without causing them stress. Respiratory and heart rate may not serve as good indicators for the patient’s stress level, since both depend on the individual’s perception. “Some are able handle a respiratory rate of 24, while others can not. What is important for me, and what I always take care of, is that the patient tolerates the mode. We monitor our patients very closely, in order to assess the patient’s condition” says Totten.

A GOOD USER COMFORT

Senior physician Totten is convinced of the user comfort of PPS, “I think it is a great advantage that I can set the two parameters by myself. This allows me to either react to a pathological resistance by means of the Flow-Assist or to a pathological compliance of the patient with the aid of the Volume-Assist . This approach gives me confidence in providing optimal care for the patient.”

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90 68 248 | 15.07-2 | Communications & Sales Marketing | PP | LE | Printed in Germany | Chlorine-free – environmentally compatible | Subject to modifications | © 2015 Drägerwerk AG & Co. KGaA

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