Clinical Image

Flow wave forms during weaning can be important

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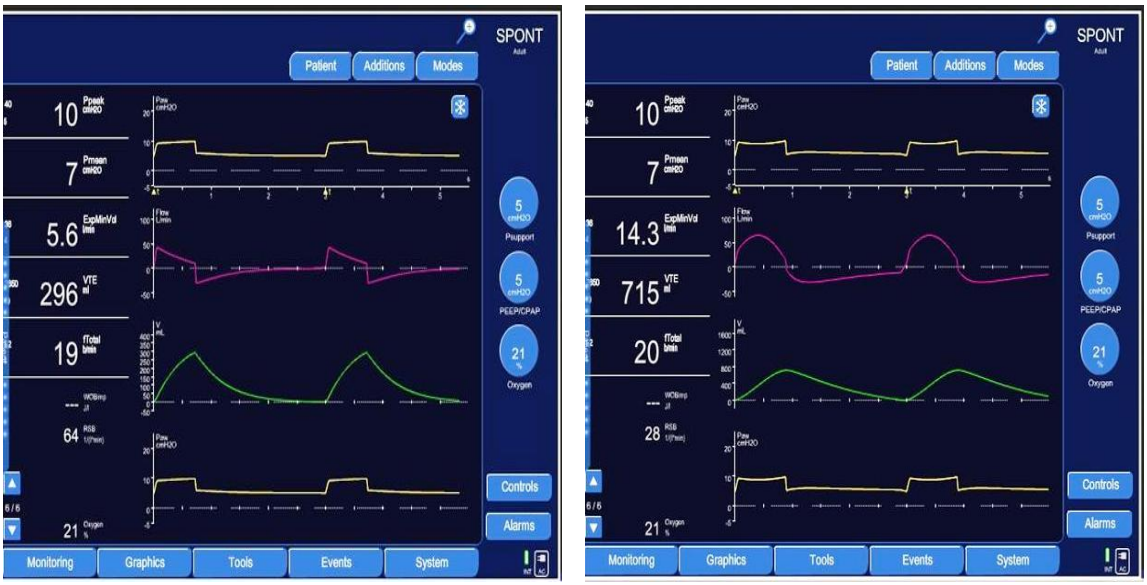

Yellow curve: Pressure (cmH_2O) on X-axis and Time (seconds) on Y-axis
Pink curve: Flow (L/sec) on X-axis and Time (seconds) on Y-axis
Green curve: Tidal volume (ml) on X-axis and Time (seconds) on Y-axis

Two patients with respiratory failure secondary to COPD exacerbations are undergoing a spontaneous breathing trial with Pressure support ventilation 5 cmH_2O and PEEP of 5 cmH_2O with 25% expiratory cycle.
Who is more likely to be liberated safely, who might pass, and who might fail?

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Both patients present with adequate respiratory rate of 25 bpm and rapid shallow breathing index (RSBI) below 105 (64 for patient on left and 28 for patient on right); however, the airway occlusion pressure in 0.1 second (P0.1) for the patient on the left is - 1.6 cmH_2O, while the patient on the right has P0.1 of - 7.7 cmH_2O. Despite similar respiratory mechanics (compliance of 80 ml/cmH_2O and resistance of 20 cmH_2O/l/s), the different tidal volumes are due to increased muscle work and pressure generated by the patient on the right.

Looking at the curves in the first figure, notice that the flow curve is almost linear from the peak inspiratory flow (PIF) till cycling to exhalation, and the pressure curve is also linear. In the second figure, the flow curve concaves upward, while the pressure curve is convex downwards both indicating marked inspiratory effort by the patient.

Weaning and the decision to liberate from mechanical ventilation is a complex process and is based on numerous decision factors. Improvement in the disease process, hemodynamics, mental status, and muscle strength are amongst those important clinical factors. A spontaneous breathing trial (SBT) [1] is usually carried out and based on the performance of such a trial, determining as to whether or not to extubate the patient. Multiple society guidelines [2] exist to guide clinicians in such a difficult task. Multiple weaning parameters were developed to predict success or failure of the SBT. Most commonly used is the RSBI [3] (RR/TV < 105), with a high sensitivity but unfortunately low specificity. Another parameter showing promise is the P0.1 [4] with good sensitivity and specificity, though a cutoff range has not been specified. Most studies have used a number falling between - 2.3 to -5.5 cmH_2O. There are no studies directly comparing both parameters in successful weaning.

The role of the flow curves during mechanical ventilation, particularly during weaning, is not well understood or utilized. A recent review [5] highlighted the role of observing flow curves during mechanical ventilation. The role of measuring mean inspiratory flow or area under the curve for the flow-time curve remains under investigation.

References

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