



Literature List

Proportional Pressure Support

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Yin C, et al.	Comparison of the effect of CPAP+PPS mode and CPAP+ASB mode in weaning on acute exacerbation of chronic obstructive pulmonary disease patients	Department of Critical Care Medicine 2018
<p>Background: Early exercise of critically ill patients may have beneficial effects on muscle strength, mass and systemic inflammation. During pressure support ventilation (PSV), a mismatch between demand and assist could increase work of breathing and limit exercise. A better exercise tolerance is possible with a proportional mode of ventilation (Proportional Assist Ventilation, PAV+ and Neurally Adjusted Ventilatory Assist, NAVA). We examined whether, in critically ill patients, PSV and proportional ventilation have different effects on respiratory muscles unloading and work efficiency during exercise.</p> <p>Methods: Prospective pilot randomized cross-over study performed in a medico-surgical ICU. Patients requiring mechanical ventilation >48 h were enrolled. At initiation, the patients underwent an incremental workload test on a cycloergometer to determine the maximum level capacity. The next day, 2 15-min exercise, at 60% of the maximum capacity, were performed while patients were randomly ventilated with PSV and PAV+ or NAVA. The change in oxygen consumption (ΔVO_2, indirect calorimetry) and the work efficiency (ratio of ΔVO_2 per mean power) were computed.</p> <p>Results: Ten patients were examined, 6 ventilated with PSV/PAV+ and 4 with PSV/NAVA. Despite the same mean inspiratory pressure at baseline between the modes, baseline VO_2 (median, IQR) was higher during proportional ventilation (301 ml/min, 270-342) compared to PSV (249 ml/min, 206-353). Exercise with PSV was associated with a significant increase in VO_2 (ΔVO_2, median, IQR) (77.6 ml/min, 59.9-96.5), while VO_2 did not significantly change during exercise with proportional modes (46.3 ml/min, 5.7-63.7, $p < 0.05$). As a result, exercise with proportional modes was associated with a better work efficiency than with PSV. The ventilator modes did not affect patient's dyspnea, limb fatigue, distance, hemodynamics and breathing pattern.</p> <p>Conclusions: Proportional ventilation during exercise results in higher work efficiency and less increase in VO_2 compared to ventilation with PSV. These preliminary findings suggest that proportional ventilation could enhance the training effect and facilitate rehabilitation.</p>		

<p>Akoumianaki E, et al.</p>	<p>Can proportional ventilation modes facilitate exercise in critically ill patients? A physiological cross-over study: Pressure support versus proportional ventilation during lower limb exercise in ventilated critically ill patients.</p>	<p><u>Ann Intensive Care. 2017</u></p>
<p>Background: Early exercise of critically ill patients may have beneficial effects on muscle strength, mass and systemic inflammation. During pressure support ventilation (PSV), a mismatch between demand and assist could increase work of breathing and limit exercise. A better exercise tolerance is possible with a proportional mode of ventilation (Proportional Assist Ventilation, PAV+ and Neurally Adjusted Ventilatory Assist, NAVA). We examined whether, in critically ill patients, PSV and proportional ventilation have different effects on respiratory muscles unloading and work efficiency during exercise.</p> <p>Methods: Prospective pilot randomized cross-over study performed in a medico-surgical ICU. Patients requiring mechanical ventilation >48 h were enrolled. At initiation, the patients underwent an incremental workload test on a cycloergometer to determine the maximum level capacity. The next day, 2 15-min exercise, at 60% of the maximum capacity, were performed while patients were randomly ventilated with PSV and PAV+ or NAVA. The change in oxygen consumption (ΔVO_2, indirect calorimetry) and the work efficiency (ratio of ΔVO_2 per mean power) were computed.</p> <p>Results: Ten patients were examined, 6 ventilated with PSV/PAV+ and 4 with PSV/NAVA. Despite the same mean inspiratory pressure at baseline between the modes, baseline VO_2 (median, IQR) was higher during proportional ventilation (301 ml/min, 270-342) compared to PSV (249 ml/min, 206-353). Exercise with PSV was associated with a significant increase in VO_2 (ΔVO_2, median, IQR) (77.6 ml/min, 59.9-96.5), while VO_2 did not significantly change during exercise with proportional modes (46.3 ml/min, 5.7-63.7, $p < 0.05$). As a result, exercise with proportional modes was associated with a better work efficiency than with PSV. The ventilator modes did not affect patient's dyspnea, limb fatigue, distance, hemodynamics and breathing pattern.</p> <p>Conclusions: Proportional ventilation during exercise results in higher work efficiency and less increase in VO_2 compared to ventilation with PSV. These preliminary findings suggest that proportional ventilation could enhance the training effect and facilitate rehabilitation.</p>		

<p>Bosma K, et al.</p>	<p>Patient-ventilator interaction and sleep in mechanically ventilated patients: pressure support versus proportional assist ventilation.</p>	<p><i>Crit Care Med.</i> 2007</p>
<p>Objectives: To understand the role of patient-ventilator asynchrony in the etiology of sleep disruption and determine whether optimizing patient-ventilator interactions by using proportional assist ventilation improves sleep.</p> <p>Design: Randomized crossover clinical trial.</p> <p>Setting: A tertiary university medical-surgical intensive care unit.</p> <p>Patients: Thirteen patients during weaning from mechanical ventilation.</p> <p>Interventions: Patients were randomized to receive pressure support ventilation or proportional assist ventilation on the first night and then crossed over to the alternative mode for the second night. Polysomnography and measurement of light, noise, esophageal pressure, airway pressure, and flow were performed from 10 pm to 8 am. Ventilator settings (pressure level during pressure support ventilation and resistive and elastic proportionality factors during proportional assist ventilation) were set to obtain a 50% reduction of the inspiratory work (pressure time product per minute) performed during a spontaneous breathing trial.</p> <p>Measurement and main results: Arousals per hour of sleep time during pressure support ventilation were 16 (range 2-74) and 9 (range 1-41) during proportional assist ventilation ($p = .02$). Overall sleep quality was significantly improved on proportional assist ventilation ($p < .05$) due to the combined effect of fewer arousals per hour, fewer awakenings per hour (3.5 [0-24] vs. 5.5 [1-24]), and greater rapid eye movement (9% [0-31] vs. 4% [0-23]), and slow wave (3% [0-16] vs. 1% [0-10]) sleep. Tidal volume and minute ventilation were lower on proportional assist ventilation, allowing for a greater increase in PaCO₂ during the night. Patient-ventilator asynchronies per hour were lower with proportional assist ventilation than with pressure support ventilation (24 +/- 15 vs. 53 +/- 59; $p = .02$) and correlated with the number of arousals per hour ($R = .65$, $p = .0001$).</p> <p>Conclusions: Patient ventilator discordance causes sleep disruption. Proportional assist ventilation seems more efficacious than pressure support ventilation in matching ventilatory requirements with ventilator assistance, therefore resulting in fewer patient-ventilator asynchronies and better quality of sleep.</p>		

<p>Thille, A et al.</p>	<p>Patient-ventilator asynchrony during assisted mechanical ventilation</p>	<p><u>Intensive Care Med.</u> <u>2006</u></p>
<p>Objective: The incidence, pathophysiology, and consequences of patient-ventilator asynchrony are poorly known. We assessed the incidence of patient-ventilator asynchrony during assisted mechanical ventilation and we identified associated factors.</p> <p>Methods: Sixty-two consecutive patients requiring mechanical ventilation for more than 24 h were included prospectively as soon as they triggered all ventilator breaths: assist-control ventilation (ACV) in 11 and pressure-support ventilation (PSV) in 51.</p> <p>Measurements: Gross asynchrony detected visually on 30-min recordings of flow and airway pressure was quantified using an asynchrony index.</p> <p>Results: Fifteen patients (24%) had an asynchrony index greater than 10% of respiratory efforts. Ineffective triggering and double-triggering were the two main asynchrony patterns. Asynchrony existed during both ACV and PSV, with a median number of episodes per patient of 72 (range 13-215) vs. 16 (4-47) in 30 min, respectively (p=0.04). Double-triggering was more common during ACV than during PSV, but no difference was found for ineffective triggering. Ineffective triggering was associated with a less sensitive inspiratory trigger, higher level of pressure support (15 cmH₂O, IQR 12-16, vs. 17.5, IQR 16-20), higher tidal volume, and higher pH. A high incidence of asynchrony was also associated with a longer duration of mechanical ventilation (7.5 days, IQR 3-20, vs. 25.5, IQR 9.5-42.5).</p> <p>Conclusions: One-fourth of patients exhibit a high incidence of asynchrony during assisted ventilation. Such a high incidence is associated with a prolonged duration of mechanical ventilation. Patients with frequent ineffective triggering may receive excessive levels of ventilatory support.</p>		