Non-Invasive Ventilation with PAV mode in Rehabilitation for Patients with Chronic Obstructive Pulmonary Disease: Systematized Review and Meta-Analysis

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Abstract

Background: High-intensity exercise therapy is recommended for the treatment of Chronic Obstructive Pulmonary Disease (COPD) patients; however, limitations in exercise capacity often arise due to symptoms of dyspnea and reduced ventilatory capacity. Incorporating Non-invasive Positive Pressure Ventilation (NPPV) into exercise therapy holds the potential to enhance exercise performance. Proportional Assist Ventilation (PAV) developed considering synchronization between the patient and the ventilator, may offer continuous ventilatory support tailored to the patient's inspiratory effort and lung mechanics. This makes PAV a promising mode suitable for rehabilitation efforts involving increased inspiratory effort during exercise. This study aims to systematically examine the effectiveness of employing NPPV with the PAV mode in exercise therapy for COPD patients.

Methods: We conducted a search on PubMed, CINAHL, EMBASE, and the Cochrane Central Register of Controlled Trials for relevant articles. The inclusion criteria encompassed randomized controlled trials or crossover trials that compared the PAV mode with other conditions in patients with COPD. The primary outcomes were set as the Borg scale and exercise endurance time. In the secondary outcomes, minute ventilation, respiratory rate, oxygen uptake, heart rate, and work rate were examined. Summary estimates of the effect were calculated using the mean difference, along with accompanying 95% confidence intervals. Risk of bias was assessed using the Cochrane Collaboration’s tool for RCTs.

Results: Nine studies were included. The Borg Scale (Dyspnea) was significantly lower in patients using the PAV mode compared to spontaneous breathing without mechanical ventilation, sham, or CPAP modes. There was no significant difference in the Borg Scale (Leg). Exercise endurance time was significantly longer in patients using the PAV mode compared to spontaneous breathing without mechanical ventilation, sham, or CPAP modes.

Conclusion: The use of NPPV with PAV mode during exercise therapy in COPD patients may lead to alleviation of breathlessness and improvement in exercise tolerance.

Keywords: Proportional Assist Ventilation (PAV), Chronic Obstructive Pulmonary Disease (COPD), Non-invasive Positive Pressure Ventilation (NPPV), systematized review, meta-analysis

List of abbreviations

COPD	Chronic Obstructive Pulmonary Disease
CPAP	Continuous Positive Airway Pressure
PAV	Proportional Assist Ventilation
NPPV	Noninvasive Positive Pressure Ventilation
QOL	Quality of Life
ADL	Activities of Daily Living
RCT	Randomized Controlled Trial