Abstract

The comparison of spontaneous ventilator modes during exercise is extremely important to prevent disuse syndrome. There are a variety of spontaneous modes of ventilation that can be used to ventilate patients during ambulation and mobilization. However, there is little research that supports which spontaneous mode of ventilation is a more comfortable mode during exercise; however, there are many spontaneous modes. This study demonstrated that during exercise, CPAP with PS with Esens 50% had the least patient-ventilator asynchronies (79), as seen on the graphic waveforms recorded. Additionally, CPAP with PS had the lowest PIP (5.94 cm H\textsubscript{2}O), the lowest Pmean (3.94 cm H\textsubscript{2}O) and the lowest VE (17.02 LPM). CPAP with PS also had the fewest asynchronies coupled with the highest Modified Borg Scale ranking (2.4), the lowest mode ranking (2.2), and the lowest number of asynchronies (79). While participants walked for two minutes on a treadmill at 2.5 MPH with no incline, there were no statistically significant differences in results between PAV+ 30% and PAV+ 60%. These results suggest that CPAP with PS 5 cm H\textsubscript{2}O is the most comfortable spontaneous mode for healthy subjects to breathe on exercise.

Methods

After receiving IRB approval, informed consent was obtained from 20 subjects (10 female, 10 male). Subjects were screened for physical activity via the modified physical activity readiness questionnaire (PAR-Q). The PAR-Q consisted of seven questions screening against any known cardiovascular, pulmonary or neuromuscular diseases, as well as hypertension, dizziness, syncope, bone or joint problems, or chest pain with and without physical exertion. The order of modes for each subject was randomized. Baseline heart rate and \text{SpO\textsubscript{2}} were returned to baseline, the next mode of ventilation was evaluated. All ventilator graphics were recorded by video camera for detection of asynchrony during walking in post-analysis. The subjective ranking of each mode from easiest to most difficult (1-4) and Modified Borg Scale score (1-10) were recorded for each mode, as well as total asynchronies.

Results

Data show that CPAP with PS with Esens 50% had the least patient-ventilator asynchronies (79). CPAP with TC had the highest Modified Borg Scale (2.58), highest mode ranking of 3.3 and highest number of asynchronies (146) as compared with PAV+ 60% (117). However, participants perceived work of breathing by using a Modified Borg Scale (1-10) was recorded for each mode, as well as total asynchronies. The subjective ranking of each mode from easiest to most difficult (1-4) was recorded. The correlation is also seen during CPAP with TC as it had the highest number of asynchronies (146) as compared with PAV+ 60% (117). Furthermore, there is a strong correlation with a positive linear trend between the number of asynchronies and Modified Borg Scale score. This same number of asynchronies correlates with the total number of asynchronies in the mode. This same number of asynchronies correlates with the total number of asynchronies in the mode. The primary limitation of the study is that the study's population is a small sample of healthy subjects without cardiopulmonary compromise; it is unknown if the results will be the same in patients with cardiopulmonary compromising conditions. Additionally, there is no normal distribution of the Modified Borg Scale score (1-10). The results of this study can be a guide to choose which mode is better to use during exercise.

Conclusion:

This study demonstrated that during exercise, CPAP with PS with Esens 50% had the least patient-ventilator asynchronies (79), as seen on the graphic waveforms recorded. Additionally, CPAP with PS had the lowest PIP (5.94 cm H\textsubscript{2}O), the lowest Pmean (3.94 cm H\textsubscript{2}O) and the lowest VE (17.02 LPM). CPAP with PS also had the fewest asynchronies coupled with the highest Modified Borg Scale ranking (2.4), the lowest mode ranking (2.2), and the lowest number of asynchronies (79). While participants walked for two minutes on a treadmill at 2.5 MPH with no incline, there were no statistically significant differences in results between PAV+ 30% and PAV+ 60%. These results suggest that CPAP with PS 5 cm H\textsubscript{2}O is the most comfortable spontaneous mode for healthy subjects to breathe on exercise.