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More than one million of COPD patients receive long term oxygen therapy (LTOT) at home in United States1. In spite of oxygen therapy, desaturations frequently occur during exercise2, during the night3 and even at rest4. During exertion, oxygen therapy is associated with short term physiological benefits5-7. Current recommendations are to add 1L/min to the baseline oxygen flow during exertion8. However, clinical benefits with present administration of oxygen during exercise are not clear9. We developed a new closed-loop system (FreeO2) that automatically adjusts every second the oxygen flow to the patient’s needs based on the SpO2, EtCO2 and respiratory rate. The aim of this study is to evaluate this system in COPD patients during endurance shuttle walking.

Methods (Figure 1)

Inclusion criteria: age > 40 years, moderate to very severe COPD with known desaturation during exertion (or suspected if SpO2 at rest is below 95%), smoker or ex-smoker. Five visits are planned with a minimum of 48 hours between each visit (Figure 1). At study visits # 1, 2 and 3, one ESWT is performed in a random order with one of the following conditions:

1) air (at 2L/min) 2) oxygen (at 2L/min) 3) FreeO2 (variable oxygen flow: SpO2 target set at 94%).

The patients were blinded for the condition tested as well as investigators, except for one. 10 patients have been included and 9 have completed the study. Patient #7 did the first study visit, but deterioration of his clinical condition did not allow to complete the whole study. Mean age was 69±8 years, mean FEV1 1.2±0.4L (50±13% pred.), baseline PaCO2 was 41±4mmHg (3 patients had PaCO2 > 45 mmHg), baseline PaO2 was 74±12mmHg. None of the patients had received LTOT.

Four patients attained the maximum duration of the ESWT test with FreeO2 and one with constant O2. With FreeO2, mean and maximum oxygen flows were 3.5±1.9 and 6.7±2.3 L/min respectively.

Results

In these preliminary data, automatic adjustment of oxygen during exertion was associated with increased endurance time and walking distance. The gain in walking distance was above 200 meters and almost 400 meters when compared with oxygen and with air. It was recently stated that a change in endurance shuttle walking performances above 60 meters was likely to be perceived by patients (after bronchodilatation)10. SpO2 was better maintained within the predefined ranges and severe desaturation were less than 1% with FreeO2. In spite of high oxygen flows during exertion with FreeO2 (up to 11.3 L/min), no induced-hypercapnia occurred probably because hyperoxia was avoided. This system may improve exercise tolerance and maintain oxygenation during daily activity such as walking in patients with COPD.

Conclusions

References:

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