

Respiratory change during sleep in COPD

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Objective: Hypoxemia is a recognized cause of increased mortality in COPD. Nocturnal hypoxemia during sleep in COPD occurs more frequently and is often underestimated and overlooked. Nighttime hypoventilation is supposed to be the main cause of hypoxemia, but the mechanism and difference from normal people are not clear.

Methods: We prospectively enrolled moderate to severe COPD non-OSA patients and normal controls confirmed by spirometry and standard polysomnography (PSG) from our chest outpatient clinic. Breath-by-breath based respiratory parameters calculation (including: respiratory timing parameters: respiratory rate, inspiratory and expiratory duration, inspiratory duty cycle and ventilatory parameters: tidal volume, and minute ventilation) during wakefulness and sleep were performed by pneumotach for COPD and controls in the sleep lab. The respiratory parameters were compared between wakefulness and sleep status and compared between COPD and controls statistically.

Results: 6 COPD non-OSA and 6 normal control male patients were recruited in this study. In controls, from awake to sleep status, increased inspiratory duty cycle (0.34 to 0.41) compensating decreased mean inspiratory flow (254.8 to 208.8 ml/s) results in stable tidal volume (315.9 to 350.7 ml) and even stable minute ventilation (5.1 to 5.25 L/min); however, in COPD, severe decrease in mean inspiratory flow (336.1 to 201.9 ml/s) with little compensatory response in increased inspiratory duty cycle (0.26 to 0.30) during sleep leads to obvious drop in tidal volume (356.3 to 246.3 ml) and even minute ventilation (5.25 to 3.6 L/min) .

Conclusion: In COPD, expiratory airflow obstruction limits responses in lengthening of inspiratory duty cycle that are required to maintain ventilation in the face of inspiratory flow limitation during sleep.

中文題目：慢性阻塞性肺疾病在睡眠時呼吸的改變

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