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Alternative Sleep Apnea Treatment: Comment

To the Editor:

The analysis, by Sakaguchi *et al.*, of the role of high-flow nasal oxygen administered postoperatively in those diagnosed with obstructive sleep apnea (OSA) in lieu of conventional continuous positive airway pressure therapy is interesting.[1] We would welcome further commentary from the authors on a few points, however.

First, although we agree that high-flow nasal oxygen improves sleep time and oxygenation compared with simple oxygen therapy and overcomes upper airway obstruction in OSA *via* a continuous positive airway pressure–like effect, the institution of 30-degree head-of-bed elevation can also increase pulmonary functional residual capacity and reduce pharyngeal critical closing pressure. These are known to improve oxygenation and relieve upper airway obstruction postoperatively.[2,3] Surprisingly, this was not observed here. Conversely, oxygenation in the 30-degree head-of-bed elevation group was inferior to that in the supine position (table 2[1]). Curiously, although the combination of high-flow nasal oxygen and 30-degree head-of-bed elevation showed additive or even synergistic effects, neither alone showed much impact on the apnea-hypopnea index. This seems hard to understand, and we would welcome the authors' thoughts on the point.

Second, most patients in this study were not particularly obese, and none were morbidly so. In severe obesity, airway obstruction is a major problem. Although a greater number of patients in the second group had moderate OSA, more in the first group had higher apnea-hypopnea indices and more desaturation. This seems surprising. Most patients with OSA have associated chronic obstructive pulmonary disease. Thus, it seems counterintuitive to initiate postoperative delivery of 40% oxygen in the high-flow nasal oxygen group, itself a cause of hypopnea and apnea as is evident table 2. We wonder why the oxygen therapy was not titrated to peripheral oxygen saturation or arterial blood gas analysis?

We thank the authors for their insightful study on combined high-flow nasal oxygen and 30-degree head-of-bed elevation in OSA. However, we would invite further comment on the points mentioned earlier.

Competing Interests

The authors declare no competing interests.

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Alternative Sleep Apnea Treatment: Reply

In Reply:

We thank Roy *et al.*[1] for their relevant comments on our article.[2] As Roy *et al.* correctly pointed out, head-of-bed elevation by 30 degrees did not significantly improve oxygenation variables such as mean nadir oxygen saturation measured by pulse oximetry (Spo_2), lowest Spo_2, and percent time Spo_2 < 90% in our study although, Souza's previous study demonstrated improvement of both apnea hypopnea index (15.7 to 10.7 events/h) and lowest Spo_2 (83.5 to 87%) in symptomatic obstructive sleep apnea (OSA) patients with only 7.5-degree head-of-bed elevation.[3] It would be easy to comment that different patient populations and study design are the cause of the difference. However, we consider that Roy's question has an important pathophysiologic background calling the readers' attention. First, Souza's patients are more obese than ours (body mass index: 29.6 ± 4.8 *vs.* 26.3 ± 4.5 kg/m^2), and, therefore, head-of-bed elevation is expected to increase functional residual capacity and improve oxygenation more effectively in such obese patients. Furthermore, head-of-bed elevation improves pharyngeal airway collapsibility as many previous studies have reported. Our research group demonstrated approximately 6 cm H_2O improvement of pharyngeal closing pressure by 60-degree sitting position in anesthetized and paralyzed patients with OSA.[4] Notably, the improvement of pharyngeal closing pressure was indirectly associated with the severity of OSA. Accordingly, apnea hypopnea index is expected to decrease more effectively in Souza's patients with less severe OSA (15.7 *vs.* 59.6 events/h), and, in fact, application of only 7.5-degree head-of-bed elevation did achieve successful improvement. Considering both Souza's and our findings, head-of-bed elevation does provide better nocturnal oxygenation and breathing pattern, but the optimal degree of head-of-bed elevation may depend on the severity of obesity and OSA.

Second, Roy *et al.* raised optimal oxygen therapy for patients with the overlap syndrome, in which two diseases, chronic obstructive pulmonary disease and OSA, coexist in a single patient. In our study, four participants had both diseases. Two of them did not improve apnea hypopnea index with the combination therapy of head-of-bed elevation and high-flow nasal cannula with 40% oxygen concentration. Currently, the overlap syndrome receives special attention in the fields of pulmonology and sleep medicine because of its greater degrees of nocturnal oxygen desaturation and cardiovascular consequences than those with either condition in isolation.[5] Although this is not the original scope of our study, the overlap syndrome also needs to be paid more attention by anesthesiologists because of the possible development of severe sustained and episodic hypoxemia after surgery, leading to poor postoperative outcome. To date, we do not know whether continuous or bilevel positive airway pressure therapy is effective and what level of oxygen concentration is appropriate for postoperative respiratory management in patients with the overlap syndrome. Optimal continuous positive pressure for OSA may negate the auto–positive end-expiratory pressure in the overlap syndrome patients with emphysema phenotype. In contrast, bilevel positive pressure ventilation may be advantageous in emphysema-predominant patients because continuous positive pressure may exacerbate mechanical disadvantage of the flattened diaphragm contraction leading to severe hypoventilation during sleep. We would like to close our comments by sharing the most recent clinical study demonstrating the effectiveness of high-flow nasal oxygen therapy (30 to 60 l/min with oxygen concentration titrated to increase awake Spo_2 by 3 to 4%) for treatment of the overlap syndrome.[6] Yes, all issues raised by Roy *et al.* are clinically relevant and to be fully answered in the near future.

Competing Interests

The authors declare no competing interests.

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