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Canadian Journal of Anesthesia/
Journal canadien d'anesthésie

ISSN 0832-610X
Volume 64
Number 1

Can J Anesth/J Can Anesth (2017)
64:109-110
DOI 10.1007/s12630-016-0755-2



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CORRESPONDENCE

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Received: 8 September 2016 / Accepted: 12 October 2016 / Published online: 20 October 2016
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To the Editor,

Obstructive sleep apnea (OSA) is a common co-morbidity in surgical patients, with a prevalence of 7–10%.^{1,2} Patients with OSA – especially those with undiagnosed and untreated OSA – are at increased risk of postoperative complications.^{1–3} The risk of cardiovascular complications, primarily cardiac arrest and shock, was significantly higher in patients with undiagnosed OSA than in those with diagnosed OSA who had been given a prescription for continuous positive airway therapy.⁴

The exact mechanism for the increased risk of postoperative complications associated with OSA is unknown. In a recent letter to the *Journal*, Deflandre *et al.* showed that surgical patients with OSA of similar severity may have different degrees of hypoxia.⁵ Among their patients with severe OSA (i.e., apnea hypopnea index [AHI] > 30 events per hour), 33% had no or only mild nocturnal hypoxia [defined as an oxygen desaturation index (ODI) of < 5 or 5–15 events per hour], and 29% and 38% had moderate or severe nocturnal hypoxia (ODI 15–30 or > 30 events per hour).⁵ This variation in the severity of

hypoxia may be related to different OSA phenotypes and variations in the underlying OSA pathophysiology.⁶

Deflandre *et al.* proposed the hypothesis that hypoxia-mediated inflammatory modifications could increase the risk of postoperative complications.⁵ At present, however, there are no direct data indicating that hypoxia-mediated inflammation in a patient with OSA increases the risk of postoperative complications. Indirect data, however, show that preoperative nocturnal hypoxia is associated with increased postoperative complications.

We have shown that ODI is a sensitive, specific predictor of OSA. In 573 patients (37.1% with moderate/severe OSA and an AHI of >15 events per hour), preoperative nocturnal hypoxia was associated with the incidence of postoperative complications.⁷ In the same study, among patients with a mean oxygen saturation (SpO₂) of < 92.7%, an ODI of > 28.5 events per hour, and/or an accumulated overnight duration of oxygen saturation of < 90%, > 7.2% were at higher risk for postoperative adverse events.⁷ In addition, in a longitudinal study (5.3 years) of 10,701 patients with OSA, sudden cardiac death was associated with an AHI of > 20 events per hour [hazard ratio (HR), 1.60], a mean nocturnal SpO₂ of < 93% (HR, 2.93), and a lowest nocturnal SpO₂ of < 78% (HR, 2.60) (all *P* < 0.001).⁸ The lowest nocturnal SpO₂ predicted an 81% increase in sudden cardiac death.⁸

Various potential mechanisms for increased cardiovascular complications have been proposed, including increased vascular sympathetic activity and serum catecholamines, cardiac autonomic dysfunction, and an ineffective arousal mechanism related to impaired chemosensitivity.⁸ If the hypothesis that nocturnal hypoxia plays a key role in mediating complications is confirmed, supplemental oxygen and/or continuous positive airway therapy during the postoperative period may prevent

This letter is accompanied by a reply. Please see Can J Anesth 2017; 64: this issue.

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hypoxic episodes and thus reduce sudden cardiac death.⁹ At present, limited evidence from our previous study⁷ supports the idea that nocturnal hypoxia may play a key role in mediating complications. Further trials are needed to investigate this hypothesis.

Conflicts of interest Dr. Frances Chung: STOP-Bang is proprietary to the University Health Network. Grant support from ResMed Foundation and Acadia.

Editorial responsibility This submission was handled by Dr. Hilary P. Grocott, Editor-in-Chief, *Canadian Journal of Anesthesia*.

References

1. Mokhlesi B, Hovda MD, Vekhter B, Arora VM, Chung F, Meltzer DO. Sleep-disordered breathing and postoperative outcomes after elective surgery: analysis of the nationwide inpatient sample. *Chest* 2013; 144: 903-14.
2. Memtsoudis SG, Stundner O, Rasul R, et al. The impact of sleep apnea on postoperative utilization of resources and adverse outcomes. *Anesth. Analg* 2014; 118: 407-18.
3. Opperer M, Cozowicz C, Bugada D, et al. Does obstructive sleep apnea influence perioperative outcome? A qualitative systematic review for the Society of Anesthesia and Sleep Medicine Task Force on preoperative preparation of patients with sleep-disordered breathing. *Anesth Analg* 2016; 122: 1321-34.
4. Mutter TC, Chateau D, Moffatt M, Ramsey C, Roos LL, Kryger M. A matched cohort study of postoperative outcomes in obstructive sleep apnea: could preoperative diagnosis and treatment prevent complications? *Anesthesiology* 2014; 121: 707-18.
5. Deflandre EP, Bonhomme VL, Brichant JF, Joris JL. What mediates postoperative risk in obstructive sleep apnea: airway obstruction, nocturnal hypoxia, or both? *Can J Anesth* 2016; 63: 1104-5.
6. Subramani YW, Kushida CA, Malhotra A, Chung F. Understanding phenotypes of obstructive sleep apnea: applications in anesthesia, surgery, and perioperative medicine. *Anesth Analg* 2016; in press.
7. Chung F, Zhou L, Liao P. Parameters from preoperative overnight oximetry predict postoperative adverse events. *Minerva Anestesiol* 2014; 80: 1084-95.
8. Gami AS, Olson EJ, Shen WK, et al. Obstructive sleep apnea and the risk of sudden cardiac death: a longitudinal study of 10,701 adults. *J Am Coll Cardiol* 2013; 62: 610-6.
9. Nagappa M, Mokhlesi B, Wong J, Wong DT, Kaw R, Chung F. The effects of continuous positive airway pressure on postoperative outcomes in obstructive sleep apnea patients undergoing surgery: a systematic review and meta-analysis. *Anesth Analg* 2015; 120: 1013-23.