A 74-year-old woman with obstructive sleep apnea (OSA) presented to our sleep center. Her split polysomnogram continuous positive airway pressure (CPAP) titration study revealed an apnea-hypopnea index of 31 and a respiratory disturbance index of 36, consistent with severe OSA. She was titrated to a CPAP pressure setting of 7 cm H\textsubscript{2}O, which eliminated all respiratory events, and placed on an autotitrating CPAP set to a range of 5 to 15 cm H\textsubscript{2}O.

One week after tolerating CPAP with a median pressure of 9.6 cm H\textsubscript{2}O, as determined by smart card analysis, the patient noted acute right-sided otalgia and subsequent otorrhea. The patient was seen at an acute care clinic and started on a 10-day regimen of amoxicillin-clavulanic acid.

The patient presented to our office 1 week later with improving but continued right-sided otorrhea, aural fullness, and hearing loss. She denied otalgia, tinnitus, and vertigo and had ceased CPAP use. Examination revealed purulence in the right external auditory canal and a small central tympanic membrane perforation. The left ear was normal. Nasal endoscopy showed no evidence of a mass obstructing the eustachian tube orifice. She was started on otic ciprofloxacin-dexamethasone drops.

At 1-week follow-up, the patient’s otorrhea had resolved, and her tympanic membrane perforation had closed. A tympanogram performed at this time revealed a type A pattern bilaterally with canal volumes of 0.9 mL on the right and 1.0 mL on the left. Her audiogram showed bilateral sloping sensorineural hearing loss, which had been present since 2005. She was seen in the sleep disorders center, and her CPAP was set to a fixed pressure of 7 cm H\textsubscript{2}O. The patient was fitted for hearing aids 1 week later.

**QUESTION:** What is the most likely reason for this patient’s tympanic membrane perforation?
ANSWER: It was noted on smart card analysis that the patient’s CPAP had ramped to 14.9 cm H₂O at the time of her injury, likely resulting in otic barotrauma.

DISCUSSION

Although CPAP therapy has known benefits in the treatment of OSA, CPAP is known to increase middle ear pressure with the potential for otic barotrauma, including tympanic membrane perforation.² Patients with OSA have a higher baseline middle ear pressure, presumably due to soft-tissue extrusion at the level of the eustachian tube.² Additionally, Sivri et al. showed that patients who had used CPAP for longer than 6 months had elevated middle ear pressure.³ Li et al. also correlated increasing CPAP pressure with an increase in middle ear pressure, which is augmented with swallowing.²

With the advent of autotitrating CPAP devices and their increased use, there is an improved ability to control the variations in apnea that occur throughout the course of the night. However, should the device encounter increased resistance, such as from coughing, the pressure delivered throughout the upper airway may acutely rise with the risk for otic barotrauma. This case describes an example of tympanic membrane perforation as a result of excessive ramping of CPAP pressure.

SLEEP MEDICINE PEARLS

1. Recognize the potential for otic barotrauma from an acute rise in airway pressure while using CPAP.
2. Patients on long-term CPAP therapy are at an increased risk for otic barotrauma as a result of increased middle ear pressures.

REFERENCES


CITATION


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Address correspondence to: David W. Chou, BS, 1025 Spruce Street, Philadelphia, PA 19107, Tel: (856) 278-3597; Email: dwc001@jefferson.edu

DISCLOSURE STATEMENT

The authors have indicated no financial conflicts of interest.