

## SLEEP MEDICINE PEARLS

# Sleepy Preteen After Upper Airway Surgery

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A 12-year-old girl was referred to sleep clinic from the plastic surgery service for evaluation of snoring and daytime sleepiness. She presented to an outside caregiver at age 8 years with snoring and frequent strep pharyngitis. She underwent adenotonsillectomy for presumed obstructive sleep apnea (OSA). A preoperative sleep study was not available. Her snoring resolved after adenotonsillectomy but she developed indistinct speech and difficulty swallowing within a few months of this procedure. She was evaluated by the craniofacial team at age 9 years for these issues who diagnosed a submucous cleft palate and velopharyngeal insufficiency (VPI). She underwent pharyngeal flap surgery to improve her VPI at age 9.5 years. Her speech and swallowing improved after this procedure. Within 6 months of surgery she developed recurrence of snoring and development of daytime sleepiness. She had no other daytime symptoms reported at the time. She underwent a sleep study locally in a small town at age 10.5 years. She was then referred to a pediatric sleep clinic at age 11 years. During her visit in clinic her history of snoring and daytime sleepiness were

confirmed (pediatric Epworth Sleepiness Scale score of 15/24). The family did not report gasping or apnea during sleep. Her weight and body mass index (BMI) had remained at the 50th percentile for her age. On examination she had a BMI at the 50th percentile, a neck circumference of 12 inches, and normal blood pressure for age. Her head and neck examination were remarkable for an abnormal pharyngeal examination with evidence of her pharyngeal flap. Her palate was not high arched. No midface hypoplasia or jaw issues were noted. No digital clubbing was noted. The remainder of her examination was unremarkable. Review of her outside sleep study demonstrated an apnea-hypopnea index (AHI) of 0.2 events/h with frequent snoring events reported as 500/h.

**QUESTION: What should be the next step in the evaluation and treatment of this patient?**

**ANSWER:** The next step should be to obtain the raw data from the outside sleep study and determine what criteria were used to score the study.

## DISCUSSION

This patient had a sleep study at a small local sleep laboratory that primarily took care of adult patients. This laboratory used adult scoring criteria and scored hypopneas based on 4% oxygen desaturations with no measurement of CO<sub>2</sub>. Rescoring the study using pediatric scoring criteria and the American Academy of Sleep Medicine recommended hypopnea rule (3% desaturation and/or an arousal after a 30% decrease in nasal pressure)<sup>1</sup> demonstrated an AHI of 10 events/h, increased during REM sleep to 34 events/h. (Table 1). Many events were associated with 3% drops in saturation rather than 4% drops (Figure 1). The family wished to maintain the pharyngeal flap and chose to pursue treatment with continuous positive airway pressure (CPAP). A CPAP titration adequately treated her OSA resulting in significant improvement in snoring and daytime sleepiness.

Pharyngeal flap procedures are associated with postoperative development of OSA with an occurrence of 3% to 90%.<sup>2-4</sup>

One particular study evaluated patients 6 months after pharyngeal flap surgery with sleep studies, and 92% of their patient population had abnormal sleep studies.<sup>2</sup> Moderate to severe levels of OSA were noted in 11% of the adult patients, and 58% of the children.<sup>2</sup>

A pediatric sleep study scored by adult criteria may miss the diagnosis of OSA and delay proper care. In our patient, use of the “acceptable” definition of hypopneas in adults (hypopnea associated with a 4% desaturation)<sup>1</sup> by a laboratory inexperienced in the care of children resulted in an insignificant AHI despite an elevated snoring index. Diagnosis of OSA should be considered particularly in adolescents (who may be scored using either pediatric or adult criteria)<sup>1</sup> with symptoms of unexplained daytime sleepiness, and a “normal” polysomnography—especially when new symptoms have occurred following a surgery. A detailed sleep history should be a routine part of these evaluations. Appropriate monitoring should be used for pediatric patients (including measurement of CO<sub>2</sub>) with appropriate scoring and interpretation to detect OSA in the pediatric population.<sup>1</sup>

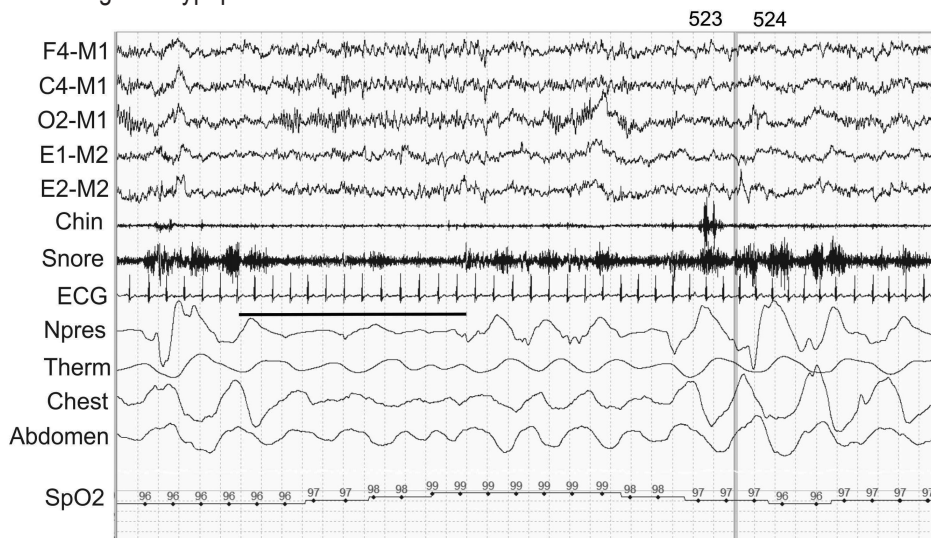
This patient had a submucous cleft palate that was unrecognized prior to upper airway surgery. Diagnosis of submucous cleft palate can be difficult, often leading to a delay in recognition and appropriate treatment.<sup>5</sup> During an adenotonsillectomy, standard operative techniques calls for an assessment

**Table 1—Scoring comparison.**

	TST	AHI	AI	OAI	CAI	MAI	HI	Saturation Nadir	ETCO <sub>2</sub>
Adult criteria	310 minutes	0.2	0.2	0.2	0.0	0.0	0.0	90%	NA
Pediatric criteria	310 minutes	10.0	0.2	0.2	0.0	0.0	9.8	90%	NA

Shown is scoring from the outside sleep laboratory using adult criteria and rescoring using pediatric criteria. ETCO<sub>2</sub> was not measured. AHI = apnea-hypopnea index, AI = total apnea index, CAI = central apnea index, ETCO<sub>2</sub> = end tidal carbon dioxide, HI = hypopnea index, MAI = mixed apnea index, OAI = obstructive apnea index, TST = total sleep time.

**Figure 1—40-second tracing with hypopnea.**



Shown is a 40-second tracing with an 11-second hypopnea resulting in a 3% drop in oxygen saturation. This tracing also demonstrates snoring. ECG = electrocardiogram, Npres = nasal pressure, Therm = thermistor.

for characteristic findings of a submucous cleft palate, such as a bifid uvula, muscular diastasis of the soft palate, notching of the posterior edge of the hard palate, and vaulted “v” shaped palate elevation with gag reflex. However, an occult submucous cleft palate may only be evidenced by a vaulted “v” shaped palate during gag reflex, without additional diagnostic findings. The presence of a submucous cleft palate may alter the surgical approach in a patient requiring adenotonsillectomy to avoid complications such as velopharyngeal insufficiency.<sup>6</sup> Leaving a remnant of inferior adenoid tissue (also known as a superior pole adenoidectomy) may minimize the risk in selected patients.<sup>7</sup> In this patient the submucous cleft likely contributed to her development of velopharyngeal insufficiency and abnormal speech.

## SLEEP MEDICINE PEARLS

1. There should be a high index of suspicion for OSA in symptomatic patients after pharyngeal flap surgery.
2. It is important to know what criteria were used to score polysomnography as the criteria are different for adults and children.
3. Patients 13–18 years of age can be scored using pediatric or adult criteria. Children less than 13 years of age should be scored using pediatric criteria.
4. A submucous cleft palate may be missed on initial examination.
5. Positive pressure is a reasonable treatment in patients with OSA after pharyngeal flap surgery.
6. Velopharyngeal insufficiency can result after adenotonsillectomy and patients with a submucous cleft are at increased risk.

## CITATION

Esteves AR, Raza W, Ryals S, Collins WO, Ching J, Wagner M, Berry R. Sleepy preteen after upper airway surgery. *J Clin Sleep Med*. 2019;15(2):359–361.

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## SUBMISSION & CORRESPONDENCE INFORMATION

Submitted for publication October 7, 2018

Submitted in final revised form November 12, 2018

Accepted for publication November 19, 2018

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## DISCLOSURE STATEMENT

All authors have seen and approved the manuscript. The work for this study was performed at the University of Florida in Gainesville, Florida. Dr. Berry reports financial support in the form of research grants from Phillips Respironics and ResMed. Dr. William Collins reports financial support serving as a product design consultant for Smith and Nephew for a tonsillectomy device. The authors report no conflicts of interest.