



Case report

Management of postoperative respiratory complication in a child with severe obstructive sleep apnoea syndrome during Covid-19

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ARTICLE INFO

Article history

Received: October 16, 2021

Accepted: October 1, 2022

Available online: November 3, 2022

Keywords

Covid-19

Severe paediatric OSAS

Major respiratory eventP

ICU

Doi

<https://doi.org/paom/155079>

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ABSTRACT

Introduction: Coronavirus disease (Covid-19) was first discovered in December 2019 with no signs of conceding to date. Many operations which are regarded as not lifesaving are postponed indefinitely owing to hospital bed shortage as well as to reduce the spread of infection among patients and staff. However, healthcare professionals are thrown down a huge challenge when deciding the timing of treatment for non-life-threatening conditions like severe paediatric obstructive sleep apnoea syndrome (OSAS) with a substantial impact on the development of very young children.

Aim: To outline management of postoperative respiratory complication in a child with severe obstructive sleep anoea syndrome during Covid-19.

Case study: We present a case of a major respiratory event requiring reintubation that developed post-adenotonsillectomy in a 3-year-old child with severe OSAS.

Results and discussion: The child was given close monitoring for 6 h in the post-anaesthetic care unit (PACU) before he was transferred to the general paediatric ward, without PICU admission during his stay in the hospital.

Conclusions: Postoperative monitoring at the step-down unit with a high nurse-to-patient ratio appears to be beneficial as it does not compromise the need for close postoperative observation, meanwhile saving costs.

1. INTRODUCTION

Paediatric obstructive sleep apnoea syndrome (OSAS) is known to affect 1%–5% of children in the general population.^{1–3} Traditionally, it entails around the airway expansion muscles that fails to withstand the underpressure generated by the breathing muscles.⁴ Airway surgery, namely adenoidectomy, tonsillectomy or their combination, are the most frequently employed treatment modality for paediatric OSAS. This is attributed to three factors: adenotonsillar hypertrophy is the most common cause of airway obstruction in an otherwise healthy child; poor continuous positive airway pressure (CPAP) compliance among the paediatric population; and the evidence that paediatric OSAS is successfully treated by adenotonsillectomy in 75% of healthy, non-obese children.^{5,6} With Covid-19 hitting the world as the global health crisis, many planned elective treatment procedures, including adenotonsillectomy, are rescheduled or held off till further notice. In this article, we present a case of paediatric OSAS, who developed major respiratory event postoperatively needing reintubation at the recovery area during Covid-19 pandemic. We would also like to highlight the fact that other than stricter criteria in performing adenotonsillectomy for paediatric OSAS in our centre during Covid-19, there is no significant differences between the management of postoperative respiratory complications during and without Covid-19.

2. AIM

To outline management of postoperative respiratory complication in a child with severe OSAS during Covid-19.

3. CASE STUDY

A healthy Malay boy was first noted by his mother to have frequent loud snoring during sleep since the 6th month of age. He was also noted to have copious amount of nasal discharge daily as well as mouth-breathing at daytime, though there was no identifiable allergy towards food and medications. The child was first seen in the otolaryngology clinic at the age of 2 years with the main parental concern of poor speech development despite achieving milestones in physical, intellectual, as well as social and emotional development. During the nasal endoscopic examination, a huge adenoid was seen occupying almost the whole of the nasopharynx. Bilateral tympanic membranes appeared intact but dull. Tonsils were grade II bilaterally. Pure tone audiogram showed a right-sided mild hearing loss and left-sided mild-to-moderate hearing loss. Tympanogram was type B with normal ear canal volume bilaterally. Overnight pulse oximetry showed the nadir SpO_2 down to 78% (Figure 1) with 2 clusters of desaturation seen. A request to proceed for adenoidectomy with bilateral myringotomy and grommet insertion was denied as the hospital was swamped with Covid-19 cases. He was prescribed intranasal steroids and given regular follow-up in our clinic. One year after, albeit compliant to medications, parents claim that there was still no improvement in speech development, and his nasal symptoms and sleep quality worsened. A repeated nocturnal pulse oximetry revealed the lowest desaturation down to 54% (Figure 2), with an increase in the number of clusters of desaturation to three. Due to great parental concerns, adenoidectomy with bilateral myringotomy and grommet insertion was scheduled. No significant difficulties were encountered during operation. Following successful extubation, child cried and actively moved all four limbs without noticeable oxygen desaturation. He was escorted to

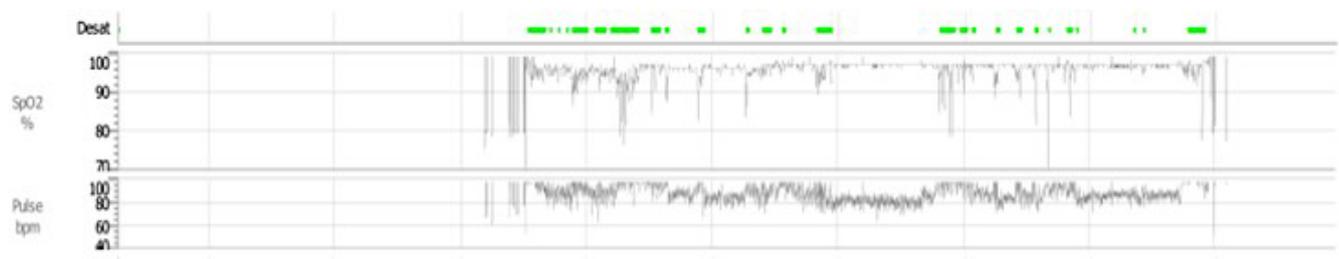


Figure 1. Initial oximetry with lowest saturation at 78%.

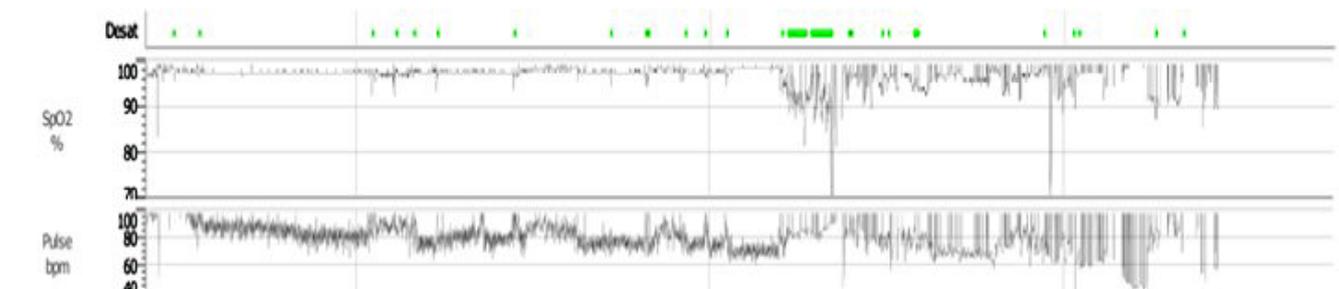


Figure 2. Repeated oximetry with lowest saturation at 54%.

the recovery area (about 5 minutes away from the operation room) in a prone position without supplementary oxygen administration, accompanied at all times by an anaesthesiology resident. Upon reaching the recovery area, the child was placed in the supine position, and he was noted to be cyanotic and less responsive. SPO_2 was 80% under room air, though no bradycardia and hypotension were noted. Following bag-valve-mask ventilation, oxygen saturation picked up to 100%. Positional therapy wasn't attempted out of consideration that desaturation was caused by a critical event. Child was reintubated by anaesthesiology resident for airway protection as paediatric CPAP machine was not available. Child then regained consciousness with a good cough reflex. After assessment by the anaesthesiologists, a decision was made to remove the endotracheal tube after 30 minutes of intubation. The child was given closed monitoring for 6 h at the post-anaesthesia care unit (PACU) before being transferred to the general paediatric ward. Throughout his stay in the hospital, no more episodes of desaturation were noted. The child was discharged well after 48 h. During his clinic review 1 week after the operation, parents expressed great appreciation as the child showed significant improvement in speech communication as well as with better sleep at night.

4. RESULTS AND DISCUSSION

Although polysomnography remains the gold standard for diagnosis of paediatric OSAS, it is not widely available in Malaysia as it is costly, time-consuming and difficult to perform. Overnight pulse oximetry, on the other hand, can easily be carried out in most centres. According to McGill oximetry scoring system, a child is diagnosed with OSAS when at least three clusters of desaturation events are recorded during an overnight sleep. Mild OSAS is defined by having at most 3 drops in SO_2 less than 85%, moderate OSAS having at most 3 drops in SO_2 less than 80%, while severe OSAS having more than 3 drops in SO_2 less than 80%.⁷

According to a paper published by European Respiratory Society (ERS) in 2016, a child is at high risk of developing postoperative respiratory complications following adenotonsillectomy when child is less than 3 years of age, when overnight oximetry showing at least three clusters of desaturation with at least three desaturations with SPO_2 less than 90%, apnoea-hypopnoea index (AHI) of more than 26, when child is obese or of low body weight, or with craniofacial, neuromuscular or genetic disorders.⁸ A prospective study published by Benedek et al. in 2022 showed that more than 50% of children with comorbidities suffered from respiratory complications post-adenotonsillectomy, and suggested that all paediatric OSAS patients with comorbidities should be monitored in PACU or PICU for at least 1 night after adenotonsillectomy, irrespective of severity of OSAS.⁹ In our case, the child is of 3 years of age without significant comorbidity during adenoidectomy, with worsening OSAS

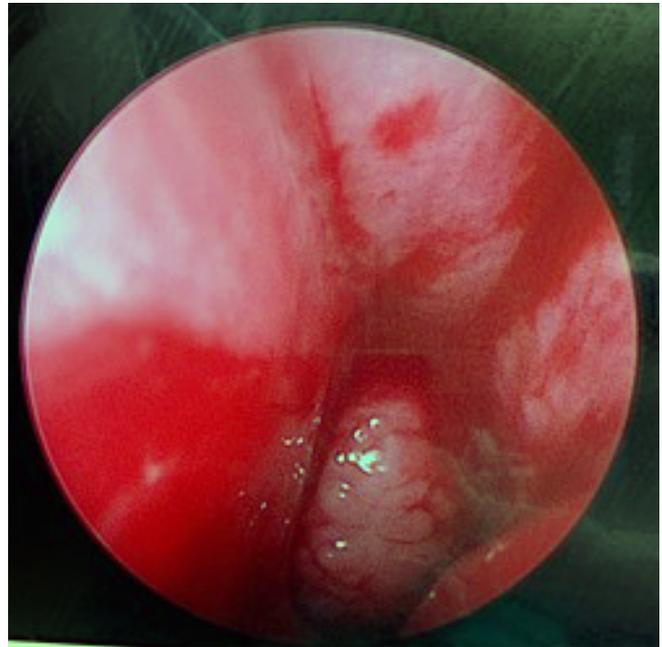


Figure 3. Adenoid occupying entire nasopharynx.

as indicated by an increase in the number of clusters of desaturation from 2 to 3, with SPO_2 reaching as low as 54% from 78%, 1 year apart.

A multitude of events that can lead to hypoxemia after adenotonsillectomy include:

- (1) Prolonged effects of anaesthetic medications into the postoperative period on level of consciousness and suppression of respiratory centre activity (particularly opioid-induced respiratory depression);
- (2) Reduced muscle tone leading to airway collapse and obstruction;
- (3) Loss of hypoxic drive: Respiration is driven by a high carbon dioxide (CO_2) level under normal circumstances. In patients with OSAS, chemoreceptors in the respiratory centre became accustomed to the persistently high level of CO_2 and therefore relied on hypoxic drive to initiate breathing. Airway surgery allows a surge in oxygen level in a short period of time, thereby dampening the urge to breathe;
- (4) Negative pressure pulmonary oedema;
- (5) REM rebound hypoventilation may occur following a relief in airway obstruction that was previously causing deprivation of REM sleep. Patients with REM rebound are at risk of developing hypoventilation with reduced breathing muscle tone during extremely prolonged REM sleep;¹⁰
- (6) Laryngospasm.

Postoperative respiratory events are subdivided into major and minor events based on the types of medical interventions employed when a child experiences desaturation.¹¹ In our case, though only for a brief period of time, the child developed a major respiratory compromise as he desaturated to 80% and was unresponsive, needing bag-valve-mask ventilation followed by reintubation. This episode was likely, in part, attributed to the prolonged muscle

relaxant effect of Propofol on pharyngeal and laryngeal musculatures leading to airway collapse.

American Academy of Otorhinolaryngology Head and Neck Surgery recommended inpatient care of at least 24 h after the operation with continuous pulse oximetry monitoring for children with severe OSAS or if a child is less than 3 years of age.¹² However, multiple studies conducted at reviewing the outcome of planned, elective PICU admission post-adenotonsillectomy for all patients with severe paediatric OSAS showed that this decision is controversial, especially in healthcare facilities with limited resources. Retrospective studies led by McColley et al. (1992) and Arambula et al. (2018) revealed that less than 25% of cases among those children with planned PICU admission developed severe respiratory compromise.^{13,14}

Arachchi et al. proposed conducting the postoperative care of children with severe OSAS but who do not warrant elective PICU admission at high acuity unit (HAU), a step-down, 4-bedded unit with a high nurse-to-patient ratio (1 to 2) that provides continuous pulse oximetry monitoring for up to 24 h from the start of HAU list. Patients who were not discharged were then transferred to the general paediatric ward. Children with documented severe OSAS were admitted to HAU after they were deemed fit to be transferred out of PACU. None of the patients from HAU developed major respiratory events needing unplanned PICU admission. To date, there's no strict guideline for planned postoperative PICU admission among treatment centres in Malaysia. Paper published in 2020 by one of the largest tertiary medical centres in Malaysia mentioned that their criteria for planned PICU/PHDU admission post-adenotonsillectomy is based on the presence of co-morbidities.¹⁵ In our centre, patients with comorbidities and moderate-to-severe OSAS would have planned PICU admission during the pre-Covid period.

5. CONCLUSIONS

Postoperative monitoring after adenotonsillectomy at the step-down unit with a high nurse-to-patient ratio or prolonged monitoring at PACU appears to be beneficial as it does not compromise the need for close postoperative observation, meanwhile saving costs and beds in PICU for cases that need them most.

A well-thought-of preoperative planning is of utmost importance when admitting a child with severe OSAS for adenotonsillectomy, especially during the Covid-19 pandemic.

Conflict of interest

All authors have no conflict of interest.

Funding

No funding involved.

Acknowledgements

We would like to thank all involved.

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