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Is day stay adenotonsillectomy safe in children with mild to moderate obstructive sleep apnoea? A retrospective review of 100 patients

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ABSTRACT

Objective: This study explored the perioperative course of 100 children with polysomnogram (PSG) proven mild to moderate OSA to evaluate if day stay adenotonsillectomy is safe.
Methods: A retrospective chart review of patients who had undergone tonsillectomy with or without adenoidectomy following an overnight PSG at The Children's Hospital at Westmead Sleep Laboratory. 263 records were reviewed. Patients with apnoea hypopnea index (AHI) ≥1 and <15/h and/or a final sleep study report of mild to moderate OSA were included. Exclusion criteria were age <3 years, weight <10 kg, or any significant co-morbidities or other surgery that would preclude day stay surgery. Demographic, PSG and post-operative data was analyzed.
Results: No major respiratory complications occurred. No patient required an unplanned medical review for respiratory concerns, or admission to a high care facility. Eleven children left recovery with oxygen prescribed. One child had a desaturation to 88% in recovery, and one child had laryngospasm. The nine other children required oxygen to maintain saturation >90%.

Supplemental oxygen was prescribed to 7 patients on the ward. Of these, three patients received supplemental oxygen beyond 6 h. The other 97 patients had an uncomplicated post-operative course and would have been suitable for day-stay surgery. Increasing severity of OSA grade on pre-operative PSG was significantly associated with post-operative supplemental oxygen use ($p = 0.003$; Cochrane-Armitage test for trend).
Conclusions: Children who are otherwise well with mild to moderate OSA have a sufficiently low risk of respiratory complications following adenotonsillectomy to permit day-stay surgery in the setting of appropriate facilities with careful post-operative monitoring for the first 6 h to identify a small sub-group who require overnight observations.

1. Introduction

Obstructive sleep apnoea (OSA) is now the leading indication for adenotonsillectomy in children [1,2]. The potential cardiorespiratory and neurocognitive complications of untreated OSA are well recognized, and surgery with adenotonsillectomy remains the first line treatment of this condition. Studies suggest the incidence of OSA to be 2–3% of the paediatric population under 10 years of age, with primary snoring estimated to affect 8–12% [3]. In many countries the current rates of adenotonsillectomy performed suggest that the groups of children affected by OSA are being significantly undertreated [4].

The serious potential perioperative complications of severe OSA patients are well documented, and these patients need to be managed postoperatively in a monitored or intensive care setting. The risks associated with the perioperative course of mild to moderate OSA patients however is less well known, and many of these patients are routinely admitted for overnight monitoring based on concerns raised from the literature regarding severe OSA patients. There are few studies that have evaluated the perioperative course of mild to moderate paediatric OSA patients.

We undertook a retrospective review of patients who had polysomnogram (PSG) proven mild to moderate OSA prior to adenotonsillectomy. The aim was to explore the perioperative

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course of these paediatric patients to evaluate the safety of performing adenotonsillectomy as a day-stay procedure in those with mild to moderate OSA.

2. Methods

Retrospective chart review of patients who had undergone tonsillectomy with or without adenoidectomy following an overnight PSG was performed. 263 charts from the period March 2007 to March 2012 were assessed in order to find 100 patients suitable for inclusion.

All children had undergone overnight PSG to determine if they had OSA, in the David Read Paediatric Sleep Unit at the Children's Hospital at Westmead. Studies were performed in accordance with the American Thoracic Society guidelines and included the monitoring and digital recording (Sandman Elite® Version 9.2 system, Embla Systems, Broomfield, US) of sleep architecture, respiration (including airflow, respiratory effort, oxygen saturation and transcutaneous carbon dioxide monitoring), pulse rate and sleep behavior [5]. Data were than analyzed in accordance with the 2007 American Association of Sleep Medicine guidelines. Briefly, respiratory events were marked if their duration was $\geq$2 respiratory cycles; and for central events, associated with oxygen desaturations $\geq$3% from baseline; obstructive apnoea was defined as an obstructive apnoea hypopnoea index (OAHI) $\geq$1 [6]. Baseline categorisation used published criteria, so that children with an OAHI $<$1.0 were classified as not having OSA, while children with an OAHI $\geq$1 were diagnosed as having OSA [6]. For this study, inclusion criteria were an apnoea hypopnea index (AHI) of $\geq$1 and $<$15.

Final classification of severity relative to the overall apnoea index was determined by the sleep physician reporting the study after evaluating other factors such as the work of breathing, relative changes in gas exchange, and presence of sub-criteria respiratory events. Carbon dioxide retention was used to upgrade severity on the assumption that these children are predisposed to respiratory depression [7]. Whereas there is a normal, slight decrease in CO_2 observed during REM periods, children with OSA who demonstrated any CO_2 retention during REM sleep periods ($\geq$2–3 mmHg) or to have $\geq$8 mmHg CO_2 increase with sleep onset, were considered to have CO_2 retention. Thus a study where the AHI classification was severe, may have a final classification "moderately-severe", where the physician had downgraded because of the lack of other indicators of marked airway obstruction.

Physicians ascribed six categories of OSA severity: mild, mild-moderate, moderate and moderate-severe, and severe. Those included in this study were: mild, mild-moderate (AHI mild, but other signs meant disease was more severe than the OAHI might otherwise suggest), moderate and moderate-severe (OAHI moderate, but other signs meant disease was more severe than the OAHI might otherwise suggest Or OAHI severe, but other signs meant disease was less severe than the OAHI might otherwise suggest). These physicians' classifications were used and included in this study to assess the risk for complications and safety for any child whose study may be considered "mild or moderate".

Exclusion criteria were children aged less than 3 years, weight less than 10 kilograms, or any significant comorbidity or additional procedure that would have otherwise precluded day stay surgery. Charts were examined for demographic details, PSG results, perioperative and postoperative events and interventions and discharge/readmission information.

Demographic data included age, sex, height and weight. Polysomnography data analyzed were AHI, lowest oxygen desaturation and the presence of carbon dioxide retention.

Intraoperative data included tonsillectomy method, and use of corticosteroid and muscle relaxant medication. Postoperative recovery data included use of corticosteroid or opioid medication, unplanned anaesthetist review, any airway intervention, lowest oxygen desaturation, and supplemental oxygen use after leaving recovery. Postoperative ward documentation of any corticosteroid or opioid medication use, unplanned medical review, any airway intervention required, lowest oxygen saturation, any supplemental oxygen given and transfer to a higher care facility was analyzed. All children were observed overnight except one who was discharged after 4.5 h of uneventful post-operative observation. Typical standard of care would include continuous pulse oximetry overnight.

Discharge information included length of stay and any readmission to hospital within 2 weeks.

Data was analyzed using SAS version 9.2. Ethical approval for the study was given from The Children's Hospital at Westmead Service Improvement Unit QIE-2012-03-11.

3. Results

3.1. Patient demographics and PSG data (Table 1)

Of 100 patients meeting inclusion criteria 62 were male. The median age was 5 years. Length of stay is shown in Table 1, with no child staying longer than one day for any airway complication.

Five patients had an AHI $\geq$15. Obstructive AHI results were available for 65 patients with mean, SD and range shown. There were 68 patients with mild OSA, 9 with mild to moderate OSA, 17 with moderate OSA and 6 with moderate to severe OSA (Fig. 1). 17 patients showed carbon dioxide retention on their PSGs, with carbon dioxide retention having no correlation with the severity of OSA.

3.2. Intraoperative data

Total tonsillectomy was performed in 98 children, 81 of which were dissected with heat-generating instruments, 4 dissected cold, 1 harmonic scarpel, and 12 unknown. 2 partial microdebrider tonsillectomies were performed; both had an uneventful post-operative course. All but nine tonsillectomies were performed concurrently with adenoidectomy.

Table 1
Patient demographics and PSG data.

	Mean (SD)	Range
Age	5.9 (2.7)	3–15
Length of stay	1.1 (0.4)	1–4
AHI	7.6 (5.6)	1–23
OAHI	5.2 (4.1)	0.1–18.3
Lowest PSG oxygen saturation	87 (7.0)	61–96

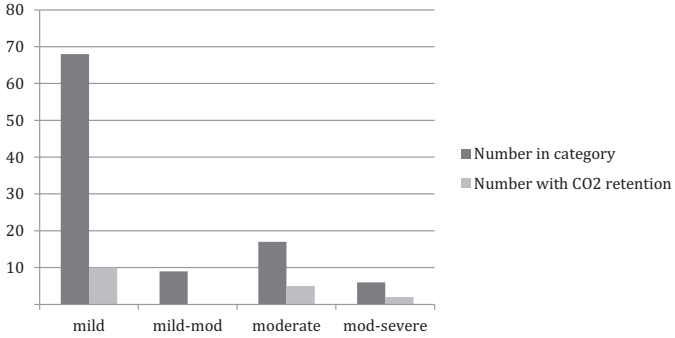

Fig. 1. OSA category and carbon dioxide retention.