Residual Obstructive Sleep Apnea in Children Less Than Three Years of Age after Adenotonsillectomy

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ABSTRACT

Obstructive sleep apnea syndrome (OSAS) affects approximately 2.3-5% of the pediatric population. Obstructive sleep apnea in children less than three years of age is usually managed with adenotonsillectomy (T&A). Both preoperative and postoperative PSGs are typically performed to evaluate for residual OSAS after T&A. The current gold standard for diagnosis of obstructive sleep apnea is an overnight sleep study or polysomnography (PSG). The severity of OSAS is determined, among other indices, by the apnea-hypopnea index (AHI) which is the total number of apneas and hypopneas per hour of sleep. In most studies within the United States, AHI>9 is considered abnormal in children; however, this cutoff is arbitrary and may be too low for this age group. AHI>15 has been considered mildly abnormal, and AHI>10 considered severe.

RESIDUAL OSA IN CHILDREN LESS THAN THREE YEARS OF AGE AFTER T&A

In children under 3 years of age there has been significant interest in the management of OSAS. Both preoperative and postoperative PSGs tend to be smaller and have less severe disease compared to older children. In our institution, we compared the demographics and PSG data within the group that had the pre and postoperative PSGs and reported significantly improved outcomes in children under 3 years of age. AHI<15 was considered a minimal residual disease and AHI<5 considered remission. Children under 3 years of age with severe OSAS (AHI>30) are at highest risk for residual OSAS. It has been reported that 70% of children have residual disease after T&A. Two hundred and eighty-three children under the age of 3 years who underwent T&A in our institution had severe OSAS and were predominantly African Americans reflecting our urban area of practice. Among the 283 children, 225 had a preoperative PSG and 194 had a postoperative PSG. When the group that underwent both pre and post operative PSGs was examined, there was a significant reduction in AHI to AHI<10 (90% reduction). However, in children under 3 years of age, residual OSAS was present in 79.9% of children with an AHI>10 preoperatively and 44.7% of children with an AHI>5 postoperatively. Furthermore, there is a concern that complete resolution of OSAS does not occur in all children within that age group and that the group that had postoperative PSGs had severe OSAS as measured by postoperative AHIs>10. Despite some limitations, our data suggest that a postoperative PSG should be considered to identify residual OSAS in children under 3 years of age. Most of these patients would benefit from additional therapies.

INTRODUCTION

Obstructive sleep apnea in very young children is routinely treated with T&A. Two hundred and eighty three children under the age of three with PSG-confirmed obstructive sleep apnea syndrome (OSAS) were evaluated for persistent OSAS after T&A at our institution. Our study has limitations, the most significant of which is that it was a retrospective review of patients who had undergone T&A between March 2000 and June 2010 at the University of Chicago Comer Children’s Hospital by two pediatric otolaryngologists (DS&FB). Children with systemic abnormalities, chromosomal abnormalities, concurrent tracheostomies, and craniofacial abnormalities were excluded. The pre and postoperative PSG results of the 70 children were then compared. T&A resulted in a significant reduction in AHI (34+5 vs 10+1, p<0.0001), the least amount of O2 desaturation (94+2 vs 89+5, p<0.0001) and an increase in minimum oxygen saturations (77+11 vs 90+2, p<0.0001) (Fig 1).

RESULTS

Two hundred and eighty-three children with a mean age of 3.2 years underwent T&A due to severe OSAS in our institution. Seventy of the 283 children had both pre and post operative PSGs. Their preoperative characteristics were compared to the group of 70 children in order to determine if there was a bias in referring a subject for PSG postoperatively. Preoperative and postoperative PSG parameters were compared with the main outcome of interest being resolution of disease with AHI>5 and their preoperative characteristics were compared to identify possible predictors of persistent disease after T&A. A p value <0.05 was considered significant.

MATERIALS AND METHODS

We performed a retrospective chart review on all children under three years of age who underwent T&A for PSG-defined OSAS between October 1, 2003 and June 30, 2010 at the University of Chicago Children’s Hospital by two pediatric otolaryngologists (DS&FB). Children with cardiovascular abnormalities, neurologic abnormalities, chromosomal abnormalities, concurrent tracheostomies, and craniofacial abnormalities were excluded. Two hundred and eighty-three patients were included. For each, we recorded the following: age, sex, weight, height, body mass index (BMI), age at procedure, preoperative PSG diagnosis, and time between surgery and postoperative PSG when available. We also recorded the following PSG parameters: total sleep time, sleep efficiency, REM-AHI, AH1, baseline oxygen saturation, and minimum oxygen saturation.

Seven of the 283 children had both pre and postoperative PSGs. Their preoperative characteristics were comparable to the 216 children in the group to determine if there was a bias in referring subject for PSG postoperatively. Preoperative and postoperative PSG parameters were compared with the main outcome of interest being resolution of disease with AHI>5 and their preoperative characteristics were compared to identify possible predictors of persistent disease after T&A. A p value <0.05 was considered significant.

A logistic regression model was established with the outcome being the postoperative REM-AHI and the predictors being Preop REM-AHI and AHI (in years). The following variables were tested: age <0.75 and age ≥0.75, sex, BMI<0.85 and BMI≥8.05, gestational age <0.75 and gestational age ≥0.75, time between surgery and postoperative PSG<30 days and time between surgery and postoperative PSG≥90 days, and presence of a postoperative PSG<200 days and presence of a postoperative PSG≥200 days. A p value <0.05 was considered significant.

DISCUSSION

The treatment of choice for most children with OSAS is adenotonsillectomy (T&A). Children under 3 years of age are considered to be at high risk for residual OSAS due to T&A complications after T&A. Furthermore, there is a concern that complete resolution of OSAS does not occur in all children within that age group and that the group that had postoperative PSGs had severe OSAS as measured by postoperative AHIs>10. The treatment of choice for children with OSAS is adenotonsillectomy (T&A). Children under 3 years of age are considered to be at high risk for residual OSAS due to T&A complications after T&A. Furthermore, there is a concern that complete resolution of OSAS does not occur in all children within that age group and that the group that had postoperative PSGs had severe OSAS as measured by postoperative AHIs>10. Seventy of the 283 children underwent both pre and postoperative PSGs. Preoperative characteristics of this group with persistent OSAS were compared to the children who did not react a postop PSG. The group with postoperative PSG was significantly younger, had lower heights and weights, and had more severe OSAS suggesting a bias by the clinicians in referring the younger and lower weight kids and those with worse OSAS for a postoperative PSG. Severity of the above children underwent both pre and postoperative PSGs. Preoperative characteristics of this group with persistent OSAS were compared to the children who did not react a postop PSG. The group with postoperative PSG was significantly younger, had lower heights and weights, and had more severe OSAS suggesting a bias by the clinicians in referring the younger and lower weight kids and those with worse OSAS for a postoperative PSG. Similar results were obtained if residual OSAS was defined as AHI>1.

Despite some limitations, our data suggest that a postoperative PSG should be considered to identify residual OSAS in children under 3 years of age. Most of these patients would benefit from additional therapies.

CONCLUSIONS

Despite inherent design limitations, this study suggests that a sizeable proportion of children under 3 years of age will have residual OSAS post T&A. It is important to consider repeat PSG postoperatively in this patient population especially in the younger patients and those with more severe OSAS preoperatively.

REFERENCES