PREVALENCE OF CENTRAL APNEIC EVENTS IN CHILDREN WITH OBSTRUCTIVE SLEEP APNEA
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ABSTRACT
Purpose: Central sleep apnea (CSA), characterized by cessation of airflow without respiratory effort during sleep, may occur in association with a variety of disorders. Aims of the present study were to determine prevalence of CSA and effect of tonsillectomy and adenoidectomy on CSA in children with obstructive sleep apnea (OSA) following surgery.

Material and Methods: The medical charts of children who underwent tonsillectomy and adenoidectomy for obstructive sleep apnea were reviewed to obtain information on history and physical examination, past medical history, polysomnogram findings, and surgical management. Number of central apnea events and central apnea index were evaluated before and after tonsillectomy and adenoidectomy.

Results: Six hundred sixty seven children (age range: 1 to 18 yrs, mean: 5.8±3.4) with polysomnogram documented obstructive sleep apnea were identified. CSA events occurred in 609 of 667 (91%) patients. Number of CSA events ranged from 0.1 to 31.9 events/hr. In 104 patients who had postoperative polysomnogram, number of CSA events after surgery (4.9±5.3) was less compared to number of CSA events before surgery (9.4±14.9) (p<0.001). CSA index after surgery (0.9±0.1) was less than CSA index before surgery (2.4±0.6) (p<0.01).

Conclusion: Central apneic events occur in children with obstructive sleep apnea. After surgical treatment number of central apnea events and central sleep apnea index improves.

BACKGROUND
Pediatric sleep disordered breathing is classified as obstructive sleep apnea and central sleep apnea according to International Classification of Sleep Disorders. Obstructive sleep apnea is characterized by reduction or complete cessation of breathing and increased respiratory effort in response to repetitive obstruction of the upper airway during sleep. Central sleep apnea (CSA), characterized by cessation of airflow without respiratory effort during sleep. To date, obstructive sleep apnea has been widely investigated in children; however, characteristics of central sleep apnea in children who present to otolaryngology clinic has not been systematically studied.

AIM
To determine prevalence of CSA and effect of tonsillectomy and adenoidectomy on CSA in children with obstructive sleep apnea (OSA) following surgery.

METHODS
• The charts of patients who had undergone polysomnogram for evaluation of sleep disordered breathing between February 2008 and June 2011 were reviewed retrospectively.
• Patients under the age of 21 years were eligible. Children were not excluded due to craniofacial anomalies, developmental delay, psychiatric illness, immunodeficiency, possible neoplasia, possible post-transplant lymphoproliferative disorder, or other chronic condition.
• An all-night, attended polysomnography was performed in the sleep laboratory using a computerized polygraph; sleep measurements were based on the criteria of the American Academy of Sleep Medicine.
• The following data were collected: history and physical examination, past medical history, polysomnogram findings including counts and indexes of obstructive apneas, obstructive hypopneas, and central apneas.

RESULTS
• The obstructive apnea-hypopnea index (OAH) was calculated as the sum of obstructive apneas and hypopneas per hour. The central sleep apnea index (CAI) was calculated as central apneas per hour. The severity of central sleep apnea was categorized according to CAI/OAH: mild, CAI/OAH between 1 and 5; moderate, CAI/OAH between 5 and 10; or severe, CAI/OAH greater than 10.
• Number of central apnea events and central apnea index were evaluated before and after tonsillectomy and adenoidectomy.

• Data analysis:
  • Parametric (one way analysis of variance) and nonparametric tests (Kruskal Wallis one way analysis of variance) as appropriate. Student-Newman-Keuls method or Dunn's method was used to identify which group or groups differed from the others.
  • Comparisons of prevalence were performed by a chi-square test or Fisher exact test as appropriate. A p value less than 0.05 deemed statistically significant. Data are presented as mean ± standard deviation.

• The prevalence of central sleep apnea and obstructive sleep apnea was 45% and 86%, respectively.
• The prevalence of central sleep apnea in children with obstructive sleep apnea was 47%.
• The prevalence of central sleep apnea was 34% in children with no OSA, 36% in mild OSA, 49% in moderate OSA, 54% in severe OSA (Figure 1).

• The prevalence of central sleep apnea in children with moderate and severe OSA was higher than that of children with no OSA and mild OSA (p<0.05) (Figure 1).

• The obstructive apnea-hypopnea index after tonsillectomy and adenoidectomy was less than the obstructive apnea-hypopnea index before tonsillectomy and adenoidectomy (p<0.05) (Figure 3).
• Similarly central sleep apnea index after tonsillectomy was less than the central sleep apnea before tonsillectomy and adenoidectomy (p<0.05) (Figure 3).

CONCLUSIONS
• Central apnea events occur in children who present to pediatric otolaryngology clinic for evaluation of sleep disordered breathing.
• Prevalence of central sleep apnea is higher in children with moderate OSA and severe OSA.
• Varying degrees of central sleep apnea occurs in children with OSA. In this group of children, severe central sleep apnea occurred in children with severe OSA.
• Central sleep apnea as well as obstructive sleep apnea improves after tonsillectomy and adenoidectomy.