INTRODUCTION

Obstructive Sleep Apnea (OSA) is of particular concern to anaesthetists. The term Obstructive Sleep Apnoea Syndrome (OSAS) is applied when OSA is accompanied by daytime sequelae, such as excessive daytime sleepiness. It is being increasingly recognized as a common disorder in children and can be associated with substantial morbidity. It occurs in 3% of children and is more common in prematurely born infants. It is characterized by oxygen desaturation and reduced oronasal airflow despite preserved thoracic and abdominal respiratory effort. Adenotonsillar hyper-trophy is one of the common pre-disposing factors of OSAS and adenotonsillectomy is frequently performed now-a-days for its treatment. OSAS has been associated with serious anaesthetic complications, like difficult intubation, and perioperative respiratory and cardiac complications. Identifying these specific complications can help in formulating a safe anaesthetic strategy for these children. The aim of this study was to evaluate the frequency and rate of complications, experienced by children having Obstructive Sleep Apnea Syndrome (OSAS), who undergo adenotonsillectomy.

METHODOLOGY

The study was carried out at the Department of Anaesthesiology, Saudi Armed Forces Hospital, Najran, Saudi Arabia, over a period of 15 months from November 2006 to January 2008. After institutional approval and consent from parents, 60 children scheduled for adenotonsillectomy were selected for the study, on the basis of non-random convenience sampling. They were divided into two groups, group-1 (n=30) with obstructive sleep apnoea syndrome and group-2 (n=30) having history of recurrent tonsillitis without OSAS. The exclusion criteria of patients was those having any coexistent medical illness, history of allergy, obesity, neuromuscular disorders, craniofacial anomalies, associated with maxillary hypoplasia and retrognathia.
All patients were admitted on the evening before surgery. An anaesthetist of consultant level having more than 10 years of experience administered the anaesthesia and same anaesthetic technique was used in all patients. All received atropine 15 µg/kg⁻¹ and metoclopramide before induction of anaesthesia. An intravenous induction with sodium pentothal 12.5% was used. All children were intubated with RAE-tube, using atracurium 0.5 mg/kg⁻¹ as a muscle relaxant. Intraoperative analgesia was provided with fentanyl 1.5 µg/kg⁻¹. Dexamethasone 0.25 mg/kg⁻¹ was also administered to all patients. Anaesthesia was maintained with nitrous oxide, oxygen and sevoflurane. At the end of procedure, every child received diclofenac suppository. All children were extubated when awake in the operating room and then taken to recovery room, where they were given oxygen by facemask. Intravenous morphine was administered in repeated doses (50 µg/kg⁻¹), as the opioid of choice in the postoperative care unit until the child was able to tolerate oral analgesics. In addition, all children were monitored with pulse-oximeter on the first postoperative night. Peri-operative events of interest included both respiratory complications and medical interventions. Respiratory desaturation was defined as room air oxygen saturation (SaO₂) less than 95%. Administration of oxygen, insertion of an oropharyngeal airway, reintubation and ventilation were considered medical interventions.

The data was analyzed by using Statistical Package for Social Sciences SPSS for Windows version 12.0. Fisher's exact test was used to assess the statistical significance. P-value of <0.05 was considered statistically significant. Odds ratio was also determined except for the group where one of the groups counted nil.

**RESULTS**

In group-1 (n=30), there were 18 male and 12 female children; ASA-status was one in 23 children, while ASA-II in 7 children. In group-1, the mean age was 6.13 ± 2.01 years and mean weight was 22.25 ± 4.58 kg. In group-2 (n=30), there were 20 male and 10 female children; 24 children were ASA-I and rest 6 were ASA-II. The mean age was 7.06 ± 1.52 years and mean weight was 25.15 ± 3.50 kg (Table I). Duration of surgery was 53.43 ± 8.12 minutes in group-1 and 48.93 ± 7.15 minutes in group-2. Differences between age, weight, gender and duration of surgery were not statistically significant (p>0.05).

The frequency of difficult intubation was higher in the OSAS group than in the control group (16.6% vs. 3.3%, p=0.194, odds ratio 5.8, Table II). Ten children in the OSAS-group (n=30) developed desaturation (SaO₂<95%), while only 2 children from group-2 developed desaturation (33.3% vs. 6.6%, p=0.021, odds ratio 7, Table II). At the time of extubation, desaturation was significantly higher in OSAS group (43.3% vs. 6.6%, p=0.002, odds ratio 10.70, Table III). Although, complications at extubation, for example cough, laryngospasm and PONV were higher in the OSAS group but statistically these were not significant (p>0.05). In the PACU, the frequency of complications and medical interventions was also higher in OSAS group. In OSAS group, 19 patients required oxygen as compared to only 3 children from group-2 (63.3% vs. 10%, p < 0.001, odds ratio 15.54, Table IV). Six children from OSAS group required insertion of an oropharyngeal airway, while no child from non-OSAS group required it (p=0.023).

**DISCUSSION**

It is generally agreed that an apnea, defined as a cessation of airflow, has to exceed 10 seconds duration to be considered significant. The apneas may be
obstructive, central or mixed. Obstructive apneas are characterized by persistent effort without airflow, while with central apnea; effort is absent. The Obstructive Sleep Apnea Syndrome (OSAS) is a common and serious condition during childhood. The clinical presentation of OSAS in children includes snoring, frequent colds or coughing, enuresis, headaches, restless sleep, hyperactivity, aggression and behavioural disturbance, poor school performance, and cardiovascular sequelae, including systemic and pulmonary hypertension. History alone does not distinguish OSAS from simple snoring and agrees with a polysomnographic diagnosis. The Gold standard investigation for sleep apnea is full overnight polysomnography (PSG) from which the type and severity of any apnea may be determined. The pathophysiology of OSAS remains poorly understood. It is estimated that up to 3% of all children are affected by obstructive sleep apnea. Although, OSAS is related to adenotonsillar hypertrophy in children, adenotonsillar hypertrophy is not likely the sole cause of sleep-disordered breathing in this age group. Large tonsils and adenoids appear to precipitate OSAS in children with underlying abnormalities of upper airway function. Normal children have a relatively narrow upper airway, but maintain airway patency during sleep because of increased upper airway neuromotor tone and an increased central ventilatory drive. It is speculated that OSAS occurs in children lacking the compensatory upper airway neuromotor responses.

Obstructive sleep apnea syndrome has become an important indication for adenotonsillectomy for children. But anaesthetic management of these children carries certain risks, some of which can be serious. This study shows that children with OSAS undergoing adenotonsillectomy, not only had more frequent complications during induction and emergence but they were also more likely to require more medical interventions (supplemental oxygen and use of oropharyngeal airway) in the immediate postoperative period.

In this study, it was also found that children of relatively younger age were being increasingly operated for adenotonsillectomy for the relief of OSAS. In group-1, 6 children were of less than 4 years of age, while in group-2 the youngest child was 4 years of age. The combination of OSAS and young age predispose these children to certain serious anaesthetic complications. Although numerous studies have shown that adenotonsillectomy reverses the symptomatology associated with pediatric OSAS, children with OSAS are at risk for respiratory complications in the immediate period after adenotonsillectomy. Two recent reviews reported an increased respiratory morbidity in children with OSAS who were monitored after adenotonsillectomy in an Intensive Care Unit (ICU) setting. About a fifth of patients below the age of 36 months develop dangerous postoperative airway oedema after adenotonsillectomy, so small children should be closely monitored for cardiorespiratory compromise for at least 24 hours. Positive pressure airway breathing is helpful in those with obstructive sleep apnea that persists despite adenotonsillectomy. Corticosteroids seem to reduce the size of adenoids and the severity of symptoms slightly and serve as an adjunctive treatment.

There was higher incidence of difficult intubation in the group-1. Upper airway control was one of the most important aspects of anaesthesia management in patients with OSAS. An association between the severity of OSAS and the occurrence of difficult intubation has been speculated. Another retrospective study showed that difficult intubation occurred more often in OSAS patients than in controls. Therefore, it is important that equipment for management of a difficult airway should be in place before induction of general anaesthesia. All children with OSAS should be pre-oxygenated for 3-5 minutes before intubation and every such case is dealt as a ‘potential difficult intubation case’. The recovery room stay should be kept longer than usual and before shifting from recovery room, every such patient should be evaluated by an experienced anaesthetist. Koomson et al. found that children with OSAS who had adenotonsillectomy in the morning were less likely to have postoperative desaturation than those operated in the afternoon. The possible reason is that children operated on in the morning have a longer time to recover from the effects of anaesthesia before their first postoperative nocturnal sleep. Secondly, post-operative children may be better observed by day staff and alert parents early in the day.

**CONCLUSION**

Children with OSAS undergoing adenotonsillectomy are at risk of certain serious anaesthetic complications. Identification of these risk factors is important as it can help in making a safe anaesthetic plan for such patients. A high-level of vigilance on the part of anaesthetist and attending staff, early identification of specific risk factors, careful monitoring and early medical intervention is the key to success for the safe and successful management of these children.

**REFERENCES**


