Tonsillectomy as a Treatment of Obstructive Sleep Apnea in Adults with Tonsillar Hypertrophy

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Abstract

Background: The high surgical success rates for tonsillectomy or adeno-tonsillectomy in children with obstructive sleep apnea (OSA) have been described and confirmed in various studies. The situation in adults is not that clear since many other factors seem to influence the outcome of isolated tonsillectomy in adult patients suffering from OSA and tonsillar hypertrophy. The present study was, therefore, geared at exploring the efficacy of isolated tonsillectomy as a treatment of OSA in adults with tonsillar hypertrophy with special emphasis on the effect of the position of the palate in relation to the tongue base on the outcome of the operation.

Study design: 40 adult patients with obstructive sleep apnea and tonsillar hypertrophy (Friedman grades 3 or 4) were included in the study. Patients with body mass index > 40, or other obvious causes of OSA were excluded from the study. The patients were randomly allocated to two equal groups according to Friedman palatal position score. Conventional extracapsular tonsillectomy and standard preoperative and postoperative polysomnography were performed for all patients. The criteria for successful surgical response were defined as a 50% drop and below 20 of postoperative AHI.

Results: The mean apnea hyperpnoea index (AHI) of group (A) was 31.6 preoperatively and 10.7 postoperatively and the difference between pre- and postoperative indices was statistically significant. The mean apnea hyperpnoea index (AHI) of group (B) was 50.3 preoperatively and 44.7 postoperatively and the difference between pre- and postoperative indices was not statistically significant. The outcome of isolated tonsillectomy of group (A) was significantly better than the outcome of the procedure of group (B).

Conclusions: Adult patients with OSA who are likely to benefit from isolated tonsillectomy, in the absence of other causes of OSA, are those with mild OSA, Friedman tonsillar grades 3 or 4, and Friedman palatal scores 1 or 2.

INTRODUCTION

Several studies repeatedly showed that tonsillar hypertrophy is a major risk factor for OSA in children, and that tonsillectomy is highly successful in treating those children [1,2]. The situation in adults is not that clear. While some studies reported a high success rate approximating 100%, other studies reported disappointing results [3-7].

Clearly, several factors, including anatomical characteristics of the patients, might have attributed to this obvious discrepancy. The position of the palate with respect to tongue base is one of the key clinical factors in predicting the outcome of treatment of OSA [8]. Theoretically, the position of the palate may be one of the anatomical features that should be considered when we select adult patients with OSA who are likely to benefit from an isolated tonsillectomy operation [9].

The present study was, therefore, geared at exploring the efficacy of isolated tonsillectomy as a treatment of OSA in adults with tonsillar hypertrophy with special emphasis on the effect of the position of the palate in relation to the tongue base on the outcome of the operation.

PATIENTS AND METHODS

The study was performed on 40 adult patients with obstructive sleep apnea and tonsillar hypertrophy who were operated upon during the period from January 2005 to December 2010.

The clinical staging system proposed by Friedman et al. [8,9],...
for the size of the tonsil and the position of the palate was used in the study. Tonsil size was rated as follows:

**Tonsil size 1:** Tonsils are barely seen behind the anterior pillars.

**Tonsil size 2:** Tonsils are clearly visible behind the anterior pillars.

**Tonsil size 3:** Tonsils extend three quarters the way to the midline.

**Tonsil size 4:** Tonsils extend to the midline (kissing tonsils).

The Position of the palate (relationship between the palate and tongue base) was rated as follows:

**Friedman palate position 1:** The entire uvula, tonsils, and pillars are visible.

**Friedman palate position 2:** The uvula is visible but the tonsils are not completely visible.

**Friedman palate position 3:** The uvula is not visible but the soft palate is visible.

**Friedman palate position 4:** Only the hard palate is visible.

The classification of OSA was performed according to Viner et al [10], the severity was rated mild with an AHI of 10 to 29, moderate with an AHI of 30 to 49, and severe with an AHI equal to or greater than 50.

**Inclusion Criteria**

1. Tonsil size grades 3 or 4 [8].
2. Apnea/Hypopnea index > 10.

**Exclusion criteria**

1. Tonsil size Friedman grades 0, 1, 2.
2. Body mass index (BMI) > 40.
4. Evident collapse of the hypopharynx and/or retro-lingual area.
5. Obvious skeletal or anatomic deformities such as micrognathia.

**Patients were divided into two equal groups**

1. **Group A:** Tonsil size Friedman grades 3 or 4 and Friedman palatal position grades 1 or 2 [8].
2. **Group B:** Tonsil size Friedman grades 3 or 4 and Friedman palatal position grades 3 or 4.

**Surgical technique**

All patients underwent conventional extracapsular tonsillectomy under general anesthesia without any palatal procedure or stitching of the tonsillar pillars.

**Polysomnographic method**

Each patient underwent a fully attended standard polysomnography [7]. Apnea was defined as cessation of airflow at the nose and mouth for ≥ 10 seconds. Hypopnea was defined as a reduction of airflow ≥ 50 for ≥ 10 seconds. The apnea index (AI) was defined as the number of apneic episodes per hour. The apnea hypopnea index (AHI) was defined as the number of apneic and hypopneic episodes per hour.

**Follow up**

The patients were followed up weekly until complete healing of the tonsillar bed has occurred. Postoperative Polysomnography was performed in the same laboratory 3 months after surgery.

**Criteria for successful surgical response**

The criteria for successful surgical response were defined as a 50% drop and below 20 of postoperative AHI [11]. The paired Student t-test and the Chi Squared test with Yates correction were used for statistical analysis. A (P) value less than 0.05 were considered statistically significant.

The ethical committee of Alexandria Medical School approved the study and all patients signed informed consents after the nature of the research has been fully explained to them.

**RESULTS**

Twenty adult patients, 34 males and 6 females, with obstructive sleep apnea and tonsillar hypertrophy were included in the study. The mean age of the patients of group A and B was 38.8 years and 42.2 years respectively.

A summary of the characteristics of the patients is shown in Table (1). Group (A) included 14 patients with mild OSA and 6 patients with moderate OSA. Group (B) included 16 patients exhibited moderate OSA and four patients with severe OSA.

A summary of the polysomnographic results is shown in Table (2). The apnea hypopnea index (AHI) of group (A) decreased from 31.6 preoperatively to 10.7 postoperatively and this decrease was statistically significant (t = 16.583, P < 0.001). The same significant change was observed regarding the apnea index (AI), which decreased from 20.4 preoperatively to 6.4 postoperatively (t = 9.910, P < 0.001), and the lowest SpO₂ that increased from 80.8 preoperatively to 90.7 postoperatively (t = 6.631, P < 0.001).

On the other hand, the apnea hypopnea (AHI) of group B decreased from 50.3 preoperatively to 44.7 postoperatively. This decrease was not statistically significant. (t = 2.109, P > 0.005). The same insignificant change was observed in the apnea index (AI), which decreased from 40.1 preoperatively to 36.0 postoperatively (t = 1.902, P > 0.05), and the lowest SpO₂ that increased from 73.9 preoperatively to 76.1 postoperatively (t = 1.753, P > 0.05).

The overall outcome of isolated tonsillectomy is shown in Table 2. The operation was successful, according to the AHI 50% reduction criteria, in 18 of group A patients and only 4 of group B patients. The outcome of the operation of group A was significantly better than the outcome of group B (Chi squared equals 7.273 with 1 degrees of freedom, P < 0.05).

All patients with mild OSA (AHI < 30) improved after surgery. On the other hand, none of the patients with Severe OSA (AHI > 50) responded favorably, according to the criteria for successful surgical response, although they showed some improvement in...
their respiratory parameters. The study included 22 patients with moderate OSA (AHI 30-49) in both groups (6 in group A and 16 in group B). Tonsillectomy was successful in 8 of them (4 in each group). The remaining 14 patients showed variable improvement in their postoperative polysomnographic data.

**DISCUSSION**

There are several treatment options for OSA. Patients usually turn to surgical treatment when nonsurgical options fail. Uvulopalatopharyngoplasty (UPPP), with its numerous modifications, remains the most common first-step surgical procedure for OSA. However, the success rates of the procedure vary considerably [8,12,13]. A recent meta-analysis of the available data indicates UPPP success rate of about 40% [14]. Another study even mentioned that some the patients who fail to improve become worse after UPPP [15]. Furthermore UPPP has its well known immediate and long-term complications [16].

While the usefulness of tonsillectomy in treating children with OSA has been firmly established, its role in adults is not clear or reasonably defined. Although some earlier investigations have shown a reasonable success rate of tonsillectomy in the treatment of OSA in adults who exhibited tonsillar hypertrophy, they pointed to this success only as a trend without providing any individual polysomnographic data [17-19]. In fact, to date, the choice between UPPP and tonsillectomy remains a crucial decision to select when the tonsils are large in OSA patients. This encouraged us to study the efficacy of isolated tonsillectomy as a treatment of adults with OSA due tonsillar hypertrophy and to characterize the patients who are more likely to benefit from the procedure.

Palate position had been previously studied and found to be an important clinical indicator of OSA. Friedman et al [9] found that the key clinical findings in predicting the presence of OSA were found to be palate position in relation to tongue base, tonsil size, and body mass index (BMI). In the present study, 40 patients were divided into 2 groups according to the relationship between the palate and tongue base. The tonsils in both groups were graded 3 or 4 according to Friedman’s grading system of tonsils size [8].

In the present series, the success rate of tonsillectomy, defined as a 50% drop and below 20 of postoperative AHI [11], 90% for group A, and 20% for group B. The difference between the two groups was statistically significant. Further analysis of the results revealed statistically significant differences between pre- and postoperative AHI, AI, and lowest SpO2 in group A only. On the other hand, postoperative changes of group B patients were quite insignificant.

The high success rate of group A agrees with the findings of Nakata et al. [11], who reported a success rate of 88.9% in their series and without any serious complications. Verste et al. [20], also reported similar findings supporting our results and pointing to the efficiency of the operation in some selected patients. The poor results of group B, on the other hand, highlighted the important role of the palate in the pathogenesis of the disease as well as in predicting the expected outcome of the operation.

The present study showed that there was an inverse relationship between the response rate and the severity of OSA, the operation being more successful in mild OSA. Therefore, based on the results of the study, we can conclude that isolated tonsillectomy may be indicated in patients with mild OSA, Friedman tonsil size grades 3 or 4, and Friedman palatal position grades 1 or 2. For other patients, the operation may be done in conjunction with other procedures or help the patient to use their CPAP devices.

**SUMMARY**

1. Isolated tonsillectomy can be an effective treatment in carefully selected adults with obstructive sleep apnea due
to tonsillar hypertrophy.

2. The patients who are likely to benefit from isolated tonsillectomy are those with:
   i. Friedman tonsil size grades 3 or 4.
   ii. Friedman palatal position grades 1 or 2.
   iii. Mild, and to a less degree, moderate obstructive sleep apnea.

3. Isolated tonsillectomy is not suitable in patients with
   a. Friedman palatal scores 3 or 4.
   b. Severe obstructive sleep apnea.
   c. Airway obstruction at other levels such as the hypopharynx.

4. The operation, however, may be used in conjunction with other surgical procedures or to facilitate the use of CPAP.

REFERENCES