Tonsillectomy with Uvulopalatopharyngoplasty and Tongue Base Surgery for Treatment of Obstructive Sleep Apnea

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Objective: *The present study aimed to evaluate the efficacy of tonsillectomy with UPPP and tongue base surgery in the treatment of moderate to severe OSA.*
Study design: *The present study employed a cross sectional design among 18 OSA patients undergoing surgery by a single surgeon from 2005 to 2009. The follow-up period was 25 to 37 months. Data included BMI, ESS and full night PSG recorded to compare pre- and post-operation.*
Results: *In all, 14 of 18 patients (77.8%) carried out the reduction of AHI 50% or lower than 20, postoperatively, defined as the success group. Mean ESS was decreased from 11.11 to 4.77 ($p < 0.001$). Most patients were satisfied with their postoperative results and reduction of subjective symptoms.*
Conclusion: *A combined surgery in moderate and severe OSA had a surgical success rate of 77.8% in short and long term pos-toperation.*

Keywords: *OSA, UPPP, Tonsillectomy, Tongue base surgery*

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Obstructive sleep apnea (OSA) is the disease associated with high morbidity, for example, hypertension, cardiac disease and cognitive impairment due to car accident[1-3]. The non aggressive nasal CPAP is proven to improve the airway obstruction during sleep but many patients refused this treatment because of the discomfort[4,5]. Various surgical techniques are available to treat this condition. UPPP, tongue base surgery, genioglossus advancement, among others, have been developed over the years to correct the obstruction of the airway at multi-levels. The retropalatal and retrolingual areas are thought to be major sites of obstruction especially in moderate to severe OSA groups (AHI > 15), so the goal of the surgery is to reduce soft palate tissue at the base of the tongue or pharyngeal wall. Sorrenti et al performed UPPP and tongue base reduction surgery in eight severe OSA patients. In all, 100% improved their daytime sleepiness symptoms and the respiratory distress index was reduced at least 50%. Jabocowitz et al studied tongue base obstructed groups that underwent UPPP and genioglossus advancement or tongue base radiofrequency surgery to relieve hypopharyngeal narrowing. The success outcome was 76% improved AHI postoperation. Vincente et al followed severe OSA patients who underwent tongue base surgery with UPPP long term. The AHI was still lower than 20 or a 50% reduction of 54%, overall.

As mentioned before, more aggressive surgery tends to have better results in controlling the upper airway obstruction in moderate to severe OSA patients. As such, surgery is an option for these patients especially in those cases refusing CPAP or willing to undergo surgery first.

In the present study, the authors conducted the tonsillectomy, UPPP and tongue base surgery to evaluate the efficacy of surgical treatment for OSA. Other factors affecting the result of treatment and the complication of the surgery were observed.

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Material and Method

Patients

OSA patients, refusing CPAP or willing to

undergo surgery for the treatment, attending Phramongkutklao Hospital, from April 2005 to October 2009 were evaluated for age, BMI and completed ENT examination to determine the level of obstruction from nasal airway to hypopharynx.

All patients were asked to answer questionnaires to evaluate daytime sleepiness symptoms using the Epworth Sleepiness Scale (ESS), and snoring loudness scale compared between pre- and at least a 25 months postoperative period.

Full night polysomnography (PSG) was recorded at pre and 25 months to 37 months postoperation. Patients who missed the postoperative PSG were excluded from the present study. Parameters included apnea-hypopnea index (AHI), minimum oxygen saturation (min SO_2) and mean oxygen saturation (mean SO_2), which were evaluated in comparison.

In all, 18 patients underwent tonsillectomy, UPPP and tongue base surgery by a single surgeon with the same technique.

The success group was defined as having a reduction of AHI postoperatively at least 50% or less than 20. The difference of BMI, snoring loudness scale and oxygen saturation were observed during treatment.

Operative technique

The tonsillectomy was performed with electrocautery technique, following uvulopalatoplasty as depicted in Fig.1.

Midline glossectomy was performed as V-Y advancement technique to pull forward the base of the tongue to reduce the soft tissue in the PAS. Finally, a 2-0 fiber wire traction suture was applied to tie up the base of the tongue with the lower border of the mandible. The aim of this traction suture was to secure the oropharyngeal airway patency during sleep (Fig. 2).

Statistical analysis

The pre and post operative parameters comprised the data of the success/non-success groups compared with pair t-test using SPSS Program. Significance of the study was defined as p-value < 0.05. The present study was approved by the hospital ethical committee.

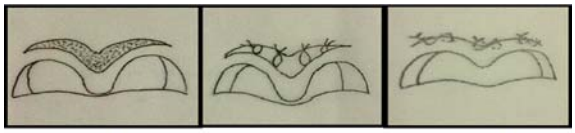

Fig. 1 Surgical steps of uvulopalatoplasty

Results

In total 17 males and 1 females (n = 18) were enrolled in the present study. Mean age of the patients was 47.06 years old (29 to 62 years old) and mean BMI was 29.06 kg/m^2. The baseline characteristics are shown in Table 1. The data of preoperative snoring loudness was assessed by questionnaire, 0 meaning no sound of snoring and 4 meaning very loud snoring noticeable in any part of the house. Mean AHI was 40.6 $\pm$ 15.85 and ESS was 11.11 $\pm$ 5.85. Most subjects had concomittent nasal disease such as allergic rhinitis or deviated nasal septum with intermittent use of intranasal steroid and antihistamines, so they had multilevel airway obstructions preoperatively.

The tonsillectomy, UPPP and tongue base surgery in midline glossectomy plus tongue traction suture technique were carried out in 18 patients. The objective polysomnography and subjective ESS and snoring loudness assessment were conducted from 25-37 months (28.58 $\pm$ 9.69) postoperation. The success rate was 77.8% in reducing AHI 50% or less than 20 postoperation. The mean preoperation AHI of 40.36 was significantly reduced to 16.95 ($p < 0.001$) (Fig. 3 and Table 2) and oxygenation during sleep was increased postoperatively. Subjective assessment of snoring loudness scale with 0 for no sound to 4 for very loud snoring noticeable outside the bedroom and in other parts of the house was not different post-treatment (p 0.371) same as increasing of average BMI (p 0.751). In contrast to daytime sleepiness symptoms,

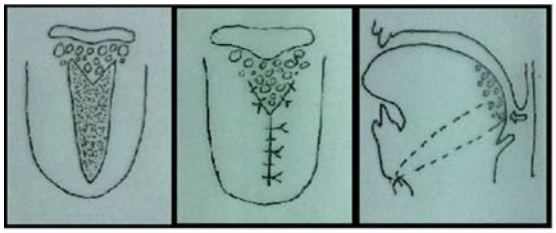

Fig. 2 Midline glossectomy and traction suture procedure to decreased base of tongue volume and enlarged oropharyngeal and hypopharyngeal airway

Table 1. Baseline characteristics

	n	Mean	SD	Median	Min	Max
Age	18	47.06	9.58	48.50	29.00	62.00
BMI						
Preop.	18	29.06	4.10	29.16	21.61	35.40
Loudness						
Preop.	18					
n (%)						
0		0	0.0			
1		8	44.4			
2		6	33.3			
3		4	22.2			
ESS						
Preop	18	11.11	5.84	11.00	4.00	21.00
AHI						
Preop	18	40.36	15.85	36.03	14.58	70.32
Min SO2						
Preop	18	48.56	22.13	56.00	0.00	86.00
Mean SO2						
Preop	18	94.18	2.62	94.64	88.70	97.60
Time (months)	18	28.58	9.69	30.50	25.00	37.00

Sd = Standard deviation, BMI = Body mass index, ESS = Epworth sleepiness scale, AHI = Apnea hypopnea index, Min SO2 = minimal oxygen satuation

Table 2. A comparative data of the objective and subjective assessment

	PreOp	PostOp	Mean difference	p-value[a]
BMI	29.05	29.45	-0.39	0.751
ESS	11.11	4.77	6.33	< 0.001
AHI	40.36	16.94	23.41	< 0.001
Min SO2	47.41	63.88	-16.47	0.005
Mean SO2	94.18	96.48	-2.31	0.002

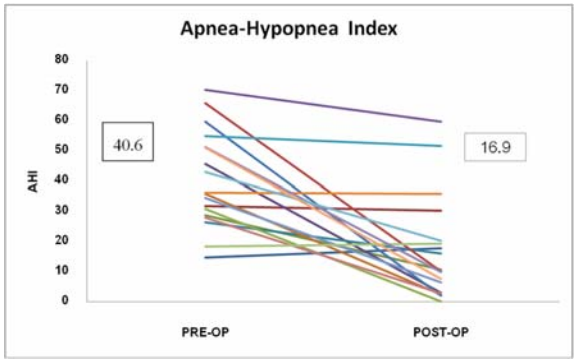

Fig. 3 AHI index in comparative pre- and post operation of 18 pateints. Mean AHI are showed in the box

the ESS was markedly decreased in the postoperative period from 11.11 to 4.77 ($p < 0.001$) (Table 2).

Discussion

The outcomes of surgical treatments for OSA vary due to the severity and level of the obstruction. Many techniques have been developed to enlarge the oropharyngeal and posterior airway space. Due to multilevel airway obstructions, some cases required a combined operation. Riley et al studied in 249 OSA patients by conducted UPPP ± mandibular osteotomy with genioglossus advancement. The success of the phase 1operation is 61% (145 patients) then they offered phase 2 surgery in the non success group (24 patients) with maxillary-mandibular advancement osteotomy. The surgical success rate of this phase was 100%.As Jacobowitz et al study, 76% success of severe OSA patients who underwent a combined surgery; UPPP and genioglossus advancement ± tongue base

radio-frequency treatment. The present study outcome shown high success rate of treatment due to multi-level airway correction.

Corresponding to previous studies, the authors assessed the efficacy of the tonsillectomy combined with UPPP and midline glossectomy plus tongue suspension for the OSA treatment. A total of 18 cases had a thorough head and neck examination for the level of upper airway obstruction and most of them had nasal airway, retropalatal and retrolingual obstructions according to Fujita et al. The patients in the present study took pre- and postoperative polysomnograms from 25 to 37 months. 14 of 18 patients (77.8%) had a reduction of AHI 50% or < 20 events per hour. In subclass analysis of non-success group, 3 of 4 patients fail to relieve their obstruction because of post operative weight gain. All of them had an markedly increased BMI compared to pre operation. On the opposite, only 3 of the success group gained weight. The results indicate that reductions of AHI and ESS were significant, even though overall postoperative BMI tended to increase. The authors suggest that gain weight may worse the OSA symptoms but the severity of OSA may not solely correlate to the body weight but depend on the soft tissue of the airways of individual patients.

Only one case had a serious upper airway obstruction postoperation requiring intubation for several days due to soft tissue edema and obstructing secretion. 8 of the 18 patients (44%) had problems with speech articulation for several months early post operative period. A few of them (2 in 18 patients) felt a foreign body sensation in their throat but it did not disturb their quality of life. There was no fatal complication in the present series.

Most of the patients reported satisfaction with the post operative results and the reduction of subjective ESS. A 77.8% success rate showed the efficacy of the tonsillectomy with UPPP plus tongue base surgery to treat moderate to severe OSA and low morbidities corresponding to the result of previous studies with a less aggressive techniques. This information can be used to encourage patients with low compliance to nasal CPAP in surgical treatment to improve their quality of life and decrease the morbidities of the disease.

Conclusion

Due to the multilevel airway obstruction, the moderate to severe OSA patients need a combined surgery to achieve a significant airway enlargement. The tonsillectomy with UPPP and tongue base surgery carried out 77.8% success in 50% reduction of AHI or < 20 events per hour without any serious complications.

Potential conflicts of interest

Phramongkutklao Hospital's Foundation under Her Royal Highness Princess Maha Chakri Sirindhorn's Patronage.

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การศึกษาถึงผลการผ่าตัดต่อมทอนซิล ตกแต่งเพดานอ่อนและการผ่าตัดโคนลิ้น เพื่อรักษาอาการนอนกรนหยุดหายใจ

ประสิทธิ์ มหากิจ, ปวิณตรา ศิริภูธร, ธนิต เฉลิมวัฒนชัย

วัตถุประสงค์*: เพื่อศึกษาประสิทธิภาพของการผ่าตัดต่อมทอนซิล เพดานอ่อนและโคนลิ้นเพื่อรักษาภาวะทางเดินหายใจอุดกั้นในผู้ป่วยนอนกรนหยุดหายใจ*

วัสดุและวิธีการ*: ประเมินภาวะทางเดินหายใจอุดกั้นในระดับของจมูก ทางเดินหายใจในส่วนหลังต่อเพดานอ่อนและโคนลิ้น ประเมินอาการง่วงนอนตอนกลางวัน ความดังของเสียงกรนโดยการตอบแบบสอบถาม และตรวจการนอนหลับ ทั้งก่อนและหลังเข้ารับการผ่าตัด เพื่อประเมินระดับความรุนแรงของการอุดกั้นทางเดินหายใจขณะหลับ ค่าออกซิเจนในเลือดผลการรักษาที่ถือว่าประสบความสำเร็จเมื่อ ค่าการตรวจการนอนหลับ เพื่อเปรียบเทียบค่าดัชนีการนอนกรนหยุดหายใจ (apnea-hypopnea index; AHI) ที่ลดลงอย่างน้อยร้อยละ 50 หรือมีค่าน้อยกว่า 20 ครั้งต่อชั่วโมงหลังการผ่าตัด*

ผลการศึกษา*: ผู้ป่วยนอนกรนหยุดหายใจ 18 ราย ที่มีภาวะนอนกรนหยุดหายใจระดับปานกลางถึงรุนแรงเข้ารับการผ่าตัดดังกล่าวที่โรงพยาบาลพระมงกุฎเกล้าฯในช่วงเวลาตั้งแต่ เดือนเมษายน พ.ศ. 2548 ถึงเดือนตุลาคม พ.ศ. 2552 มีผลการรักษาถือว่าประสบความสำเร็จในการลดอาการนอนกรนหยุดหายใจถึง ร้อยละ 77.8 ของผู้ป่วยทั้งหมด และผู้ป่วยส่วนใหญ่มีค่าความง่วงนอนตอนกลางวันลดลงอย่างชัดเจน*

สรุป*: การผ่าตัดในผู้ป่วยนอนกรนหยุดหายใจมีวัตถุประสงค์เพื่อลดเนื้อเยื่อส่วนเกินในทางเดินหายใจส่วนต้น โดยค่าดัชนีการนอนกรนหยุดหายใจที่ลดลงจะทำให้โอกาสที่จะเกิดภาวะแทรกซ้อนทางระบบหัวใจและหลอดเลือดอุบัติเหตุทางรถยนต์ลดลง การผ่าตัดทอนซิล เพดานอ่อนและโคนลิ้นของโรงพยาบาลพระมงกุฎเกล้าฯ มีประสิทธิภาพในการรักษาผู้ป่วยนอนกรนหยุดหายใจเป็นที่น่าพอใจ*