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# Tonsillectomy and adenotonsillectomy in management of obstructive sleep apnea at King Chulalongkorn Memorial Hospital

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- Objective** : *To evaluate the cure rate of snoring and obstructive sleep apnea (OSA) in patients treated by tonsillectomy or adenotonsillectomy*
- Design** : *Prospective descriptive study*
- Setting** : *Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University*
- Materials and Methods** : *Fifty patients with well-documented obstructive sleep apnea and adenotonsillar hypertrophy undergoing tonsillectomy or adenotonsillectomy from June 1996 to November 1997 were evaluated. The preoperative clinical presentation, and sleep evaluation by SAM<sup>®</sup> were compared to those of post operative symptoms and signs. The cure rate of the snoring and apnea was evaluated.*
- Result** : *Major presentations in 50 the patients were snoring (100%), gasping for breath (88%), daytime hypersomnolence (24%) and morning headache (8%). Twenty seven patients underwent tonsillectomy, and 23 adenotonsillectomy. Following surgery,*

*the latency of sleep onset returned to normal values ( $P < 0.01$ ), and the gasping for breath improved ( $P < 0.01$ ), but blood pressure and pulse rates did not change. Blood oxygenation significantly increased ( $P < 0.01$ ), and the apnea and desaturation indexes reduced significantly ( $P < 0.01$ ). The surgical cure rate of the snoring was 80 %, and that of the OSA was 64%.*

**Conclusions** : *Fifty OSA patients with adenotonsillar hypertrophy (documented by SAM<sup>®</sup>), underwent tonsillectomy or adenotonsillectomy. The overall cure rates for the snoring and OSA were 80 and 64 per cent respectively. The patients were satisfied and their quality of life improved.*

**Key words** : *Obstructive sleep apnea, Sleep apnea monitoring, Snoring, Tonsillectomy, Adenotonsillectomy.*

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วิระชัย ศิริกาญจนะรงค์, เดชาศักดิ์ สุขนวล, ภาคภูมิ สุปียพันธ์ุ, มานัต อุทุมพฤษพร. การผ่าตัดต่อมทอนซิลหรือต่อมอะดีนอยด์ เพื่อแก้ไขภาวะการหยุดหายใจขณะหลับในโรงพยาบาลจุฬาลงกรณ์. จุฬาลงกรณ์เวชสาร 2543 พ.ย; 44(11): 831 - 8

**วัตถุประสงค์** : เพื่อศึกษาอัตราการหายจากการกรน และการหยุดหายใจขณะหลับในผู้ป่วยที่ได้รับการผ่าตัดแก้ไขด้วย การผ่าตัดต่อมทอนซิล และผ่าตัดต่อมทอนซิลร่วมกับต่อมอะดีนอยด์

**รูปแบบการวิจัย** : การศึกษาเชิงพรรณนาและไปข้างหน้า

**สถานที่** : ภาควิชาโสต นาสิก ลาริงซ์วิทยา คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

**วิธีการศึกษา** : ทำการศึกษาผู้ป่วยที่มีอาการหยุดหายใจขณะหลับและมีภาวะต่อมทอนซิลและต่อมอะดีนอยด์โต จำนวน 50 รายที่ได้รับการผ่าตัดต่อมทอนซิล หรือผ่าตัดต่อมทอนซิลร่วมกับต่อมอะดีนอยด์ในระหว่างเดือนมิถุนายน พ.ศ. 2539 - พฤศจิกายน พ.ศ. 2540 เปรียบเทียบลักษณะทางคลินิกและการตรวจการนอนหลับก่อนการผ่าตัด กับอาการ อาการแสดงและผลการตรวจหลังผ่าตัด ศึกษาอัตราการหายจากการกรน การหยุดหายใจภายหลังการผ่าตัด

**ผลการศึกษา** : ในผู้ป่วย 50 ราย ส่วนใหญ่มีอาการกรน (100 %) หายใจลำบาก (88 %) ง่วงซึมในเวลากลางวัน (24 %) และปวดศีรษะในช่วงเช้า (8 %) ผู้ป่วย 23 รายได้รับการผ่าตัดต่อมทอนซิล อีก 27 รายได้รับการผ่าตัดต่อมทอนซิลและต่อมอะดีนอยด์ภายหลังการผ่าตัดระยะเวลาที่ใช้ก่อนจะหลับกลับสู่ภาวะปกติ ( $P < 0.01$ ) ภาวะหายใจลำบากดีขึ้น ( $P < 0.01$ ) แต่ความดันโลหิตและชีพจรไม่เปลี่ยนแปลงหลังผ่าตัด ระดับออกซิเจนในเลือดเพิ่มอย่างมีนัยสำคัญทางสถิติ ( $P < 0.01$ ) ภาวะการหยุดหายใจที่ลดลงอย่างชัดเจน ( $P < 0.01$ ) ในภาพรวมนั้นผู้ป่วยหายจากการกรน 80 % หายจากการหยุดหายใจขณะหลับ 64 %

**สรุป** : ผู้ป่วยที่มีอาการหยุดหายใจขณะหลับจำนวน 50 รายที่มีภาวะต่อมทอนซิลและต่อมอะดีนอยด์โต ได้รับการผ่าตัดต่อมทอนซิล หรือผ่าตัดต่อมทอนซิลและต่อมอะดีนอยด์ ผู้ป่วยหายจากการกรน 80 % หายจากการหยุดหายใจขณะหลับ 64 % ผู้ป่วยมีความพอใจในผลการรักษาและมีคุณภาพชีวิตที่ดีขึ้น

Sleep apnea is a life-threatening condition because of its association with various disorders such as stroke, hypertension, myocardial infarction and pulmonary diseases. Sleep apnea affects a large number of people. It is estimated that one-third of the general population suffer from sleep related disorders; i.e. insomnia, enuresis, nightmares, excessive daytime sleepiness and sleep apnea.<sup>(1-3)</sup>

Apnea is defined as a cessation of airflow at the nose and mouth lasting at least 10 seconds in adults and longer than 15 seconds in children less than 6 months old or longer than 20 seconds in preterm infants.<sup>(1,4-5)</sup> Obstructive sleep apnea (OSA) is a cessation of airflow resulting from an obstruction of the airway. However, a global cessation of all respiratory effort resulting from respiratory muscle inactivity is referred to as central sleep apnea. Clinically, mixed apnea occurs in most cases, but the predominate type should be identified.<sup>(6)</sup> Further, predominant OSA is many times more frequent than central apnea.<sup>(6,7)</sup>

Whenever the diagnosis of OSA is established, a search for the area of obstruction and anatomical abnormalities in the air passages should be carried out. Nonsurgical or surgical treatment is individually considered. Where surgical intervention is documented tonsillectomy and adenotonsillectomy are quite common.<sup>(1,8-10)</sup>

The purpose of this study was to evaluate the King Chulalongkorn Memorial Hospital cure rate of the well-documented OSA patients undergoing tonsillectomy (T) and adenotonsillectomy (T&A).

## Materials and Methods

A prospective clinical study was performed on patients documented with OSA who visited the

Department of Otolaryngology, Faculty of Medicine of King Chulalongkorn Memorial Hospital from June 1996 to November 1997. A total of 156 patients with snoring and other histories suspected of OSA were subjected to complete history taking and physical examination at the outpatient unit to isolate the site of obstruction in the airways. The patients were then admitted to the hospital for an overnight stay and underwent sleep monitoring all that night. In this study, a commercially available SAM<sup>®</sup> model was used (Intercare Technologies Inc.), to monitor the sleep and to establish the diagnosis of OSA. The objective data provided by SAM<sup>®</sup> were pulse average, EKG tracing, O<sub>2</sub> saturation, apnea index, desaturation index, either chest and abdominal respiratory effort and snoring events.<sup>(11)</sup> The nasal airflow is detected by thermal detector at anterior nares.

The apnea index is defined as an average number of apnea episodes in one hour of sleep. The desaturation index is the average number of episodes of a decrease in oxygen saturation of 10 % or greater in one hour of sleep.<sup>(1,2,4-9)</sup> If an apnea index greater than 10 or a desaturation index greater than 15, including a well-documented tonsillar with or without adenoid hypertrophy, was established, the patients were eligible to be included in the study and scheduled for correction surgery. Fifty patients diagnosed with OSA (using the above criteria) with adenotonsillar (23 cases) or tonsillar (27 cases) pathology underwent adenotonsillectomy, or tonsillectomy.

Postoperatively the patients were scheduled for at least three visits, at the end of first, second and fourth weeks. The patients were questioned on changes of their clinical symptoms. At the end of fourth week, the patients were readmitted and

underwent a second sleep monitoring with SAM<sup>®</sup>.

The pre- and postoperative parameters were compared with a paired t-test. Snoring was evaluated as "cured" (absence of snore), "improvement" (still snoring but with less severity) and "worse" (increased severity of snoring). A complete resolution of OSA or "cured" was indicated whenever the apnea index was less than 10 or the desaturation index less than 15.

### Results

For the 50 patients, 20 were female and 30 were male. Patients' ages ranged from 3 to 62 years with mean of 18.28 +/- 15.22 years. Half of the patients were students (25 cases), 15 patients had their own businesses (freelance), 3 patients were government officials and for the remaining 7 patients the occupation was not (Table 1). The major presenting symptom was snoring (100 %). Other symptoms were gasping for breath at night (88%), daytime hypersomnolence (24 %) and morning headache (16 %).

Table 1. Demographic data.

Total patients	50
Male / female	30 / 20
Age (years)	3 - 62 (18.28 +/- 15.22)
Occupation	
Student	25
Freelance	15
Government official	3
Other	7
Presenting symptoms	
Snoring	50 (100 %)
Gasping for breath	44 (88 %)
Daytime hypersomnolence	12 (24 %)
Morning headache	8 (16 %)
Physical findings	
Adenoid hypertrophy	23 (46 %)
Tonsillar hypertrophy	50 (100 %)

Following tonsillectomy and adenotonsillectomy, the latency of sleep onset was significantly changed to within normal limits at the end of the fourth postoperative week (T, P < 0.01; T&A, P < 0.01). There was an improvement of gasping for breath at night in all patients of each group within 4 weeks (T, P < 0.01; T&A, P < 0.01). Blood pressure and pulse rates were not changed postoperatively in both groups. However, blood oxygenation (percent of oxygen saturation) was significantly increased after surgery (T, P < 0.01; T&A, P < 0.01). The apnea and desaturation indexes were remarkably reduced with a statistical significance (T, P < 0.01; T&A, P < 0.01) (Table 2). The cure rates for the snoring in overall patients, T group and T&A group were 80, 74.1 and 86.9 percent respectively. The overall cure rate of OSA in our series was 64 % (66.7 % for T, and 60.9 % for T&A). No patients reported a worse outcome (Table 3).

### Discussion

In the general population, the prevalence of OSA is less than 5 percent.<sup>(7,12)</sup> It is estimated that sleep apnea problems may exist in approximately 1 % of the general population.<sup>(13)</sup> However, the prevalence is higher in certain subgroups such as habitual snorers and obese males. The incidence increases with age and is associated with sex; 24 % of middle aged men, 4 -14 % of middle aged women and higher in patients older than 60 years in both sexes.<sup>(12,14)</sup> In our study, among the patients with sleep related symptoms, OSA was found in 32 % (50/156). Most cases were children or adults who had oropharyngeal pathology, i.e. tonsil or adenoid hypertrophy. In Italy, Franceschi et al surveyed an unselected population of 2518 patients who had been admitted

**Table 2.** Pre - and postoperative SAM<sup>®</sup> test results for 50 OSA patients who underwent Tonsillectomy or adenotonsillectomy.

	Tonsillectomy (27 cases)			Adenoidectomy (23 cases)		
	Pre-op	Post-op	Significance	Pre-op	Post-op	Significance
Latency of sleep onset (min)	15.6	18.9	P < 0.01	17.3	27.7	P < 0.01
Gasping for breath	1.67	1.00	P < 0.01	1.74	1.08	P < 0.01
BP (mmHg)	95.06	96.52	No	88.33	88.72	No
Pulse (min)	81.08	80.32	No	88	87.55	No
O <sub>2</sub> saturation (%)	95.88	98.42	P < 0.01	96.05	98.17	P < 0.01
Apnea index (OSA)	14.85	3.41	P < 0.01	16.55	3.86	P < 0.01
Desaturation index	16.69	5.70	P < 0.01	17.64	6.95	P < 0.01

**Table 3.** Cure and improvement rates for snoring and OSA following surgery.

	Cure			Improvement		
	T	T & A	All	T	T & A	All
Snoring	20	20	40	7	3	10
(percent)	(74.1)	(86.9)	(80)	(25.9)	(13.1)	(20)
OSA	17	14	32	9	9	16
(percent)	(66.7)	(60.9)	(64)	(33.3)	(39.1)	(36)

to a general hospital during a 1 year period and reported 0.99 % with sleep apnea documented by polysomnography.<sup>(15)</sup> In our series, the ratio of males to females was 1.5:1, which was comparable to other studies. Guilleminault, et al, has emphasized that more men than women exhibited sleep apnea syndrome. He reviewed the literature and found that the female: male ratio varies among authors from 1:10 to 1:60.<sup>(16)</sup> The major presenting symptoms were snoring (100 %), gasping for breath at night (88 %), daytime hypersomnia (24 %) and morning headache (16 %) and this was similar to other studies.<sup>(1-4,8,9)</sup> Other authors

have reported that OSA patients were usually obese, however in our series most were of normal weight.<sup>(1,8,17)</sup>

Establishment of OSA requires a hospital based polysomnographic sleep monitoring, however, in this study we used for portable type SAM<sup>®</sup>. The correlation coefficient of SAM<sup>®</sup> to conventional polysomnography was 0.96.<sup>(11)</sup> A technical error of the portable type was reported to be as high as 9 % when used for home monitoring.<sup>(11)</sup> In our study, the patients were hospitalized and monitored by medical personal and rechecked every 2-3 hr while monitoring, thus eliminating the technical error.<sup>(11,14,18)</sup> Surgical

treatment of OSA depends on the location of anatomic abnormalities and/or pathology.<sup>(1-2,8,10)</sup> The most common sites of obstruction were in the oro and nasopharynx i.e. tonsils, lingual tonsils and adenoid.<sup>(1,19-20)</sup> Tonsillectomy or adenotonsillectomy was frequently advised in those patients with such pathology. In our study, the cure rates for the snoring were 74.1, 86.9 and 80 percent following T, T&A and overall, respectively and for OSA were 66.7, 60.9 and 64 percent. Compared to other studies the success rate for OSA with surgical treatment ranged from 50 to 80% by adenotonsillectomy.<sup>(1-2,21)</sup> Other investigations advocated a uvulopalatopharyngoplasty (UPPP) for OSA and found 30 % markedly improved 33 % somewhat improved and 30 % unimproved.<sup>(22)</sup> Further, an improvement in central sleep apnea was also achieved following surgery.<sup>(16,19,22)</sup> In this study the patients, that were studied by sleep test, 32 % was OSA and there were some degree of tonsillar or adenotonsillar hypertrophy.

All of the patients were satisfied with the surgery. An improvement or absence of snoring resulted in restful sleep for both the patients and their spouses. Interrupted sleep also declined, thus an improved quality of life was obtained.

### Conclusions

Fifty OSA patients documented by SAM<sup>®</sup>, with adenoid and/or tonsillar hypertrophy underwent adenotonsillectomy or tonsillectomy. The overall cure rates of their snoring and OSA were 80 and 64 percent, respectively. Despite a cure rate for the OSA, of only 64 %, the patients did sleep well without awakening. The patients were satisfied and an improved quality of life was obtained.

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