

Surgical treatment outcome of obstructive sleep apnea patient with nasal cavity and oropharyngeal airway abnormality

Abstract

Background: The purpose of this study was to evaluate the result of the multilevel single-stage procedure for obstructive sleep apnea (OSA) with a narrow nasal cavity and oropharyngeal, velopharyngeal airspace. A retrospective study was performed in OSA patients who underwent surgery in Khon Kaen hospital, Thailand.

Methods: A retrospective study was conducted and medical records were reviewed between 2015 May and 2019 November in patients with loud snoring and having symptoms and signs of OSA, 43 patients included for evaluation history taking and physical examination by fiberoptic laryngoscope and performed multilevel single-stage procedure and evaluated clinical postoperative.

Results: All patients were evaluated preoperatively by a history taking and physical examination for clinical assessment including fiberoptic laryngoscope examination. There were 3 surgical procedure, **Procedure 1:** 12 patients underwent Tonsillectomy with uvulopalatopharyngoplasty (27.9%), **Procedure 2:** 22 patients underwent Tonsillectomy with uvulopalatopharyngoplasty and inferior turbinoplasty (51.2%), **Procedure 3:** 9 patients underwent Tonsillectomy with uvulopalatopharyngoplasty and inferior turbinoplasty, and septoplasty (20.9%). After a 1-week post-operation 41 patients (95.3%), all (100.0%) no symptoms of OSA, and 60.9% improved their loud snoring more than 80.0%. After 3-week post-operation, 32 patients (74.4%) followed up and all (100.0%) no symptoms of OSA, 27 patients (84.4%) improved their loud snoring by more than 80.0%.

Conclusion: Clinical assessment in patient with OSA is important before treatment. The Multilevel single-stage procedure is alternative choice for first treatment of OSA patients who reject continuous positive airway pressure (CPAP) or failure using CPAP. The results outcome is good for both obesity and non-obesity patients and improve clinical in OSA.

Keywords: obstructive sleep apnea, surgical treatment outcome, multilevel single-stage procedure

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Abbreviations: AMO, anterior mandibular osteotomy; BMI, body mass index; CI, confidence interval; CPAP, continuous positive airway pressure; ISO, inferior sagittal osteotomy; Min, minimum; Max, maximum; OSA, obstructive sleep apnea

Background

Snoring is the sleep problem worldwide and also in Thailand with a prevalence of 26.4%¹ and 15.4% in males and 6.3% in females for obstructive sleep apnea (OSA).² The incidence relates to overweight, obesity, stress, physical inactivity, obstruction airspace in the nasal cavity, velopharynx, oropharynx. Continuous positive airway pressure (CPAP) is the primary treatment of OSA but some cannot use CPAP or reject CPAP at first. The conservative therapies, such as losing weight, regular exercise, reducing stress, sleep hygiene, and sleep positioning adjustment, oral appliances may help some of these patients whereas there are many failed conservative treatments. The single-level procedure such as tonsillectomy or tonsillectomy and uvulopalatoplasty improve clinical outcome 65.0%,³ and 56.0%⁴ for the surgical outcome of septoplasty and/or inferior turbinoplasty.

Since OSA is usually caused by multilevel obstructions, the physical examination include fiberoptic laryngoscope found deviated nasal septum, Inferior turbinate hypertrophy, tonsillar hypertrophy, narrowing velopharynx, and oropharynx. This study reviewed the multilevel single-stage procedure in loud snoring with OSA by clinical assessment before surgery and evaluation of clinical outcome.

Objective

To evaluate surgical treatment outcome of obstructive sleep apnea patient with nasal cavity and oropharyngeal airway abnormality by the multilevel single-stage procedure.

Method

A retrospective study was conducted and medical records were reviewed between May 2015 and November 2019 in patients who underwent multilevel single-stage procedure by one surgeon (researcher). Case recorded form was used to collect data including underlying disease, symptom and sign, operation, and outcome. The data were analyzed by descriptive statistics.

Inclusion criteria

Patients with loud snoring and having symptoms and signs of OSA such as night awaken, unrefreshing wake-up, excessive daytime sleepiness, and physical examination found deviated nasal septum, inferior turbinate hypertrophy, tonsillar hypertrophy, narrowing velopharynx, oropharyngeal airspace and rejected CPAP or failure to use CPAP. The sample size was calculated using an average prevalence of OSA 10.85 % in Thailand,² a precision of $\pm 10\%$ with a 95% confidence interval (CI). The minimum number of subjects in the study was 38 subjects.

Ethical consideration

This study followed the details of the approval of the Ethical Committee of Khon Kaen hospital. The review was done following the process of ethical issues with the purpose of providing benefit to the participants and keeping confidentiality KEXP63005.

Results

Forty-three adult patients presenting with a chief complaint of loud snoring and sleep-disordered breathing, 34 were male and 9 were

female. The age was between 15 - 66 years and an average of 42.8 years. All patients were evaluated preoperatively by a history taking and physical examination included fiberoptic laryngoscope. 43 patients (100.0%) presented with loud snoring, 30 patients (69.8%) presented with stuffy nose, 32 patients (74.4%) presented with sleep apnea, 39 patients (90.7%) presented with night awaken. 41 patients (95.3%) presented with excessive daytime sleepiness. BMI was between 19.0 and 47.9 with an average of 30.1. 43 patients (100%) found that physical examination showed narrow velopharynx, oropharynx, and redundant mucosa of the soft palate. Inferior turbinate hypertrophy found in 37 patients (86.0%), long uvula found in 36 patients (83.7%), deviated nasal septum found in 12 patients (27.9%). For tonsillar enlargement grade 2 found in 25 patients (58.1%), grade 3 found in 15 patients (34.9%), grade 4 found in 3 patients (7%) (Table 1).

There were 3 surgical procedures. Procedure 1, 12 patients underwent Tonsillectomy with uvulopalatopharyngoplasty (27.9%). Procedure 2, 22 patients underwent Tonsillectomy with uvulopalatopharyngoplasty and inferior turbinoplasty (51.2%). Procedure 3, 9 patients underwent Tonsillectomy with uvulopalatopharyngoplasty and inferior turbinoplasty, and septoplasty (20.9%) (Table 2).

Table 1 Demographic data and physical examination of OSA patients

Demographic data and physical examination	N	Percent
Sex		
Male	34	79.1
Female	9	20.9
Age (year)		
15-20	2	4.7
21-30	9	20.9
31-40	8	18.6
41-50	7	16.3
51-60	15	34.8
> 60	2	4.7
Min 15, Max 66, Mean 42.8		
Chief complaint		
Snoring	43	100
Stuffy nose	30	69.8
Sleep apnea	32	74.4
Night awaken	39	90.7
Excessive daytime sleepiness	41	95.3
BMI (Kg/m²)		
< 23	5	11.6
23-25	4	9.3
26-30	13	30.2
30-35	13	30.2
35-40	5	11.6
> 40	3	7.0
Min 19.0, Max 47.9, Mean 30.1		
Physical examination		
Deviated nasal septum	12	27.9
Inferior turbinate hypertrophy	37	86.0
Narrow velopharynx	43	100.0
Narrow oropharynx	43	100.0
Redundant mucosa of soft palate	43	100.0
long uvula	36	83.7
Tonsillar enlargement grade 2	25	58.1
Tonsillar enlargement grade 3	15	34.9
Tonsillar enlargement grade 4	3	7.0

Table 2 Type of surgical procedure

Surgical procedure	N = 43	Percent
Procedure 1: Tonsillectomy and uvulopalatopharyngoplasty	12	27.9
Procedure 2: Tonsillectomy, uvulopalatopharyngoplasty, and inferior turbinoplasty	22	51.2
Procedure 3: Tonsillectomy, uvulopalatopharyngoplasty inferior turbinoplasty, and septoplasty	9	20.9

After 1-week surgery followed up by 41 patients (95.3%), all (100.0%) no symptoms of sleep apnea, excessive daytime sleepiness, night awakening, and 60.9% improved their loud snoring by more than 80.0%. After 3-week surgery followed up by 32 patients (74.4%), all (100.0%) no symptoms of excessive daytime sleepiness, night

awaken, 27 patients (84.4%) improved their loud snoring more than 80%. After 7 week surgery follow up by 16 patients (37%), all (100.0%) no symptoms of excessive daytime sleepiness, night awaken, and improved their loud snoring (Table 3).

Table 3 Outcomes of surgical results post-surgery 1,3,7 weeks

Clinical follow up	1 week post-surgery N = 41 (%)	3 week post-surgery N = 32 (%)	7 week post-surgery N = 16 (%)
≥ 80% improve of loud snoring	25 (60.9)	27 (84.4)	16 (100.0)
No symptom of OSA	41 (100.0)	32 (100.0)	16 (100.0)

Discussion

43 patients with loud snoring and OSA symptoms were included in this study and evaluation for the outcome of the surgery. The results of the multilevel single-stage procedure in this study including of Tonsillectomy with uvulopalatopharyngoplasty (procedure 1), Tonsillectomy with uvulopalatopharyngoplasty and turbinoplasty (procedure 2), Tonsillectomy with uvulopalatopharyngoplasty, inferior turbinoplasty, and septoplasty (procedure 3). The clinical evaluation from physical examination found obstruction airspace of the nasal cavity, velopharynx, and oropharynx in each patient by severity assessment before decision making for the which procedure depending on their clinical assessment. Procedure 1, for patients who had narrow velopharynx and oropharynx airspace. Procedure 2, for patients who had narrow velopharynx, oropharynx airspace, and nasal cavity obstruction by inferior turbinate hypertrophy. Procedure 3 for patients who had narrow velopharynx, oropharynx airspace, and nasal cavity obstruction by inferior turbinate hypertrophy and deviated nasal septum. There were some mild postoperative complications such as irritation on swallowing but no serious complications found in this study. For the clinical assessment and satisfaction of patients during follow-up period found that all no symptoms of sleep apnea, excessive daytime sleepiness, night awaken and most of them improved their loud snoring by more than 80%, CPAP was not necessary for all patients after surgery. Most previous studies and reviews focused on the efficacy of uvulopalatopharyngoplasty, a single-level procedure for the treatment of OSA. Some study reported on a new surgical approach to treat OSA by uvulopalatopharyngoplasty designed to enlarge the potential airspace in the oropharynx. The outcome found that twelve patients underwent the operation, nine relieved of symptoms, eight improved in nocturnal respiration and sleep pattern.⁵ The surgery procedure in some research, divided into 2 phases treatment, Phase I, the surgical procedure includes nasal reconstruction, uvulopalatopharyngoplasty, limited mandibular osteotomy with genioglossus advancement, and hyoid suspension. Phase II, procedure is selected only for those patients who have failed phase I by objective study and are of

acceptable health to proceed with more extensive surgery. For the outcome of responder rate of phase I surgery has been 67.0% and phase II surgery has been 90.0% compared with the medical results of CPAP.⁶ There was 3 stages treatment in some study, Stage I consisted of uvulopalatopharyngoplasty and anterior mandibular osteotomy (AMO) or inferior sagittal osteotomy (ISO) with genioglossus muscle advancement. Stage II reconstruction consisted of bimaxillary advancement with rigid fixation. Stage III reconstruction consisted of hyoid myotomy and advancement.⁷ This study found that multilevel single-stage procedures improve the clinical outcome and decrease OSA symptoms. Tonsillectomy and uvulopalatopharyngoplasty are the procedure to enlarge the potential airspace in the oropharynx, velopharynx. Inferior turbinoplasty and septoplasty are the procedure to enlarge the potential airspace in the nasal cavity. There were some surgical complications such as minimal pain on swallowing, but no nasopharyngeal reflux found in this study. The multilevel single-stage procedure in many studies had the same outcome⁸ and had good results when there were many lesions to reconstruction.⁹ In this study, our patients with loud snoring and OSA had a high BMI on average of 30.1. About 70% of adult OSA patients have obesity, and the higher the BMI, the greater the prevalence. Obesity may worsen OSA because of fat deposition in tissues of the oropharynx, velopharynx resulting in a smaller lumen and increased collapsibility, and in the thorax, reducing chest compliance and functional residual capacity.¹⁰ Regular physical exercise also has beneficial effects that increase in upper airway dilator muscle tone and in slow-wave sleep time and decreases in fluid accumulation in the neck, systemic inflammatory response, and body weight.¹¹

Conclusion

The multilevel single-stage procedure is an alternative choice for first treatment of OSA patients who reject CPAP or failure using CPAP. The results are good for both obesity and non-obesity patients and improve clinical use in OSA patients. Postoperative outcome depends on optimal preoperative evaluation, postoperative care and behavioral adjustment in each patient.

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Conflicts of interest

Author declare that there is no conflicts of interest in publishing this article.

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