Laser-assisted Outpatient Septoplasty and Laser-assisted Uvulopalatoplasty for Nasal Obstruction and Snoring

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Objective: *Nasal obstruction always occurs when the nasal passages are narrowed by a hypertrophic turbinate or a deviated nasal septum. Patients with nasal obstruction often have associated snoring. Laser-assisted outpatient septoplasty (LAOS) has a specific clinical application in chronic nasal obstruction due to moderate anterior septal deviation. Significant improvement has been reported in the measures of nasal obstruction following LAOS. The purpose of the present study was to evaluate the safety and efficacy of LAOS as an adjunctive procedure for snoring resulting from nasal obstruction.*

Material and Method: *Thirty-five patients with septal deviation and bothersome snoring were enrolled. Patients underwent a polysomnography study to rule out significant obstructive sleep apnea. Ablation of the nasal septum was undertaken with a carbon dioxide laser. No nasal packing was required. LAOS procedures were performed in conjunction with other snoring procedures (laser-assisted uvulopalatoplasty or laser turbinectomy) on an outpatient basis under local anesthesia. Data on the patients were compared from the preoperative to the postoperative assessment. Statistics used were determined by the Studentís paired t test.*

Results: *All patients tolerated the procedure well. The additional surgical time needed to perform this procedure averaged 10 minutes. The mean nasal obstruction scale improved from 6.2 ± 3.2 to 1.6 ± 0.8 ($p < 0.01$) and the mean total nasal resistance decreased significantly after operation. Significant improvement was observed in the snoring scale (8.8 ± 2.2 vs 2.8 ± 1.7, $p < 0.05$). No significant complications were noted. There were 2 cases of minor bleeding, which were easily treated. Postoperative pain was rated as minimal (VAS < 4). Follow-up of 4 to 6 months showed overall improvement of nasal obstruction and snoring symptoms in more than 90% of the patients.*

Conclusion: *LAOS is a simple and well-tolerated treatment for deviated nasal septum. It appears to be a safe and effective adjunct surgical procedure for snorer with nasal obstruction on an outpatient basis.*

Keywords: *Laser, Outpatient, Septoplasty, Uvulopalatoplasty, Nasal obstruction, Snoring*

J Med Assoc Thai 2005; 88 (Suppl 1): S66-72
Full text. e-Journal: *http://www.medassocthai.org/journal*

Nasal obstruction is a common problem and it can significantly impact the quality of a personís life and may be noted particularly at night. Reduced nasal cross-sectional area causes increased nasal resistance and predisposes a patient to inspiratory collapse of the oropharynx, hypopharynx or both. Nasal obstruction always occurs when the nasal passages are narrowed by hypertrophic turbinate or deviated nasal septum. It has frequently been mentioned as a possible factor in snoring[1]. Maurice et al[2] found that mouth opening in normal subjects increases upper airway collapsibility during sleep and it may contribute to the occurrence of sleep related breathing abnormalities. Therefore, even if nasal resistance were not contributing directly to the development of snoring, it may contribute to mouth breathing during sleep, which then results in a cascade of events leading to snoring.

Population studies suggesting the relationship between nasal obstruction and snoring also exist. Patients who had symptomatic nasal obstruction were statistically more likely to report habitual snoring and chronic excessive daytime sleepiness[3]. Blakely and

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Mahowald[4] used anterior rhinomanometry in snoring and control subjects. They found that nasal resistance was higher in snoring patients than in the control group.

Correction of nasal obstruction has been reported to be an effective treatment of snoring in patients with nasal obstruction[5]. There are both medical and surgical treatments for patients with nasal obstruction, when medical treatment fails, surgical treatment is the alternative. Laser-assisted outpatient septoplasty introduced by Kamami (LAOS) has a specific clinical application in chronic nasal obstruction due to moderate anterior septal deviation. Significant improvement has been reported in the measures of nasal obstruction following this procedure[6,7]. However, LAOS was performed as the first step of the treatment for snoring before laser-assisted uvulopalatoplasty (LAUP). The purpose of the present study was to evaluate the safety and efficacy of LAOS in the correction of nasal obstruction, along with LAUP as a one-stage procedure for the treatment of nasal obstruction and snoring on an outpatient basis.

Material and Method

Eighty consecutive adult patients were evaluated for treatment of nasal obstruction and snoring at Vajira Hospital over a 10-month period. A complete history was taken of each patient and thorough physical and otolaryngology examinations were performed. The nose, nasopharynx, hypopharynx and larynx were visualized with the use of a flexible endoscope, with Mullerís maneuver performed at the level of the nasopharynx and the base of the tongue. A radiologic sinus and cephalogram were taken routinely. Patients were advised of conservative treatments to reduce nasal obstruction and snoring. The patients who had failed to respond to the conservative treatments were counseled about the benefits and risks of surgical procedures.

Thirty-five (43.8%) patients with septal deviation and bothersome snoring were found to be suitable for LAOS and LAUP performed in an outpatient setting. The main indication for treatment was the history of socially disruptive snoring based with nasal obstruction. Patients with a primary complaint of daytime sleepiness and or apneic events and patients with severe septal deviation and clinically evident maxillofacial abnormalities were excluded. Only patients with septal deviations occluding less than two-thirds of the nasal lumen (mild to moderate degree) and patients with elongated uvula, thick soft palate had laser procedures performed. Patients underwent polysomnography study to rule out significant obstructive sleep apnea. It was diagnosed in patients who experienced daytime sleepiness or disturbed sleep and had more than five respiratory disturbances per hour of sleep.

Baseline information was collected. The patientís bed partner or observer used a 10-cm visual analog scale (VAS) to grade the severity of snoring prior to the procedure, and postoperative treatment. ìNo snoringî occupied the far left portion of the scale, while ìsevere snoringî occupied the far right of the scale. An Epworth sleepiness scale (ESS) which reflected the chance of dozing in specific situations as well as daytime sleepiness was completed at baseline.

A visual analog scale for nasal symptoms was completed both preoperative and postoperative. The patients were asked to rate nasal obstruction on a continuous scale from 0 (none) to 10 (complete nasal obstruction). They were asked to rate rhinorrhea from a continuous scale from 0 (none) to 10 (severe bothersome), puritus from 0 (none) to 10 (very annoying) and sneezing from 0 (none) to 10 (excruciating), respectively. Rhinomanometry was performed with Rhinoscreen (Erich Jaeger GmbH, Wuerzburg, Germany), and the total resistance at 150 Pa was used for comparison. The present study was a prospective clinical trial and it was approved by the hospital ethical committee. Every procedure was performed after obtaining informed consent.

Laser-assisted outpatient septoplasty

LAOS was performed as described originally by Kamami[7], using the modification in which the procedure was performed with FlexiLase nasal probe, attached to the articulated arm by using a CO_2 coupler (Sharplan Laser, Allendale, NJ). The nasal probe was a hallow optical waveguide with a tip and it was 3 mm in diameter and 10 cm in length. LAOS was performed with the patient under local anesthesia in the sitting position. The nasal mucosa was anesthetized by insertion a small piece of gauze containing 5% lidocaine with adrenaline into the nasal cavity for about 15 minutes. The nasal probe was inserted under endoscopic guidance and it was held against the target at a distance of about 1-2 mm.

The surface of deviated nasal septum was vaporized in anterior-to-posterior direction within 2-3 mm of vertical height on its medial, convex side, using

Superpulse continuous wave mode at a power setting of 10 W. Some patients also required laser turbinate surgical procedure because of turbinate hypertrophy. In which two-thirds of the anterior end of the hypertrophic turbinate was vaporized. No nasal packing was required.

Laser-assisted uvulopalatoplasty

The soft palate was anesthetized with xylocaine 10% topical dispersion, and 5 to 10 ml xylocaine 1% with adrenaline solution were additionally injected at three points 1 cm from the lower rim of the palatal arch. LAUP was performed with the patients sitting upright and a clinician using a CO_2 laser at 15 to 20 W continuous power with a handpiece designed to protect the posterior pharyngeal wall. Vertical transpalatal incisions were made bilaterally through the soft palate just lateral to the base of the uvula. This was followed by partial vaporization of one-half to one-third of the uvula.

After treatment, patients were observed for 20 to 30 minutes. Postoperative medications included an antibiotic and acetaminophen with codeine as needed for pain relief. Patients were seen in the postoperative period every week in the first month and every month for 4 to 6 months. Rhinomanometry was performed at 3 months, postoperatively. A visual analog scale postoperative pain was completed once daily for 10 days after the procedure. The patients were asked to rate operative pain on a continuous scale from 0 (none) to 10 (excruciating or intense pain). Data on VAS of nasal symptoms and snoring were compared from the preoperative to the postoperative assessment and analyzed by Studentís paired t test. The correlation between nasal obstruction measures was analyzed by Pearsonís correlation, p-value < 0.05 was considered statistical significant.

Results

All patients tolerated the procedure well. The additional surgical time needed to perform this procedure averaged 10.4 ± 3.4 minutes (range 10-15 minutes). The patients completed rhinomanometry studies and were examined between 4 to 6 (5.2 ± 2.3) months after the operation. Age ranged from 22 to 54 (35.2 ± 16.4) years. Thirty (86%) patients were married and 5 (14%) were single or divorced; 32 (91%) were male. Body mass index (BMI) was calculated (weight in kilograms divided by the square of the height in meters). BMI at the time of surgery ranged from 20.5 to 28.2 kg/m^2 (26.2 ± 4.2 kg/m^2) and at postoperative period 20.6 to 28.7 kg/m^2 (26.4 ± 5.2 kg/m^2). There was no significant difference between preoperative and postoperative BMI.

The nasal obstruction measured with VAS (O to 10) showed significant improvement after surgery. The mean preoperative VAS was 6.2 ± 3.2 and the mean postoperative was 1.6 ± 0.8 ($p < 0.01$). The severity of nasal obstruction after surgery began to improve significantly from the first week after treatment ($p < 0.05$) (Fig. 1) and this improvement continued to the 6 - month postoperative period ($p <$

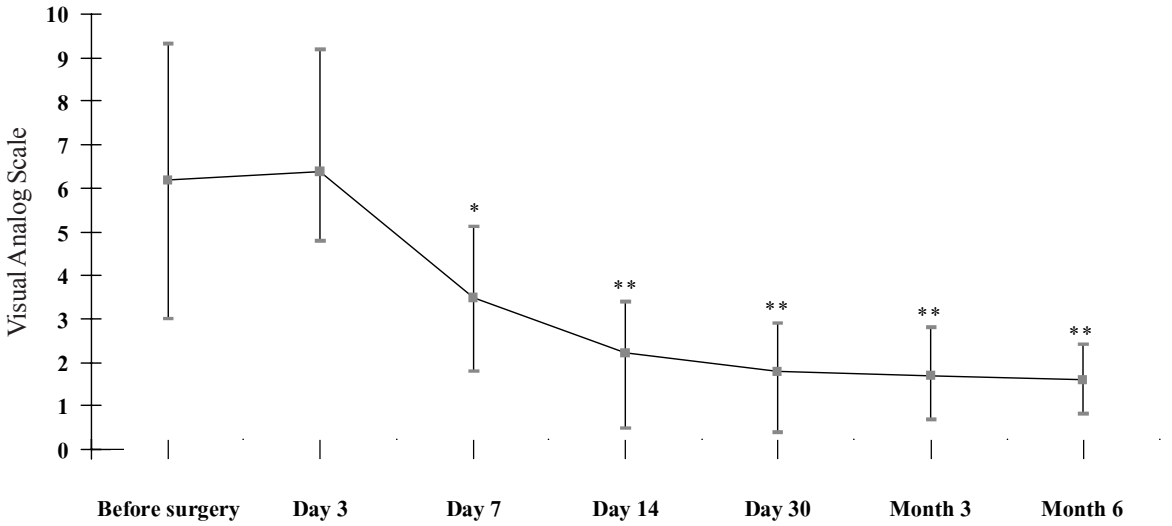

Fig 1. Nasal obstruction scale (visual analog scale) before surgery an on days 3, 7, 14, and 30 after surgery
* = VAS was significantly lower on day 7 than before surgery ($p < 0.05$)
** = VAS was significantly lower on day 14, day 30, month 3 and month 6 than before surgery ($p < 0.01$)

0.01). Among the nasal symptoms associated with nasal obstruction, rhinorrhea, nasal puritus, and sneezing were significantly reduced after surgery ($p < 0.05$). The mean preoperative vs postoperative VAS was 5.8 ± 1.4 vs 2.1 ± 1.8, 6.1 ± 2.2 vs 2.3 ± 0.9, 7.1 ± 2.3 vs 2.5 ± 1.7, respectively. All patients stated that they would have this procedure repeated if necessary.

The mean total resistance decreased significantly from 0.39 ± 0.8 Pa/mL/cm^3 to 0.28 ± 0.5 Pa/mL/cm^3 ($p < 0.05$). The correlation between nasal obstruction measures following LAOS procedure, the changes in total nasal resistance and the changes in subjective nasal obstruction was not statistically significant ($p = 0.45$, Pearsonís correlation).

Significant improvement from the baseline (8.8 ± 2.2) was observed in VAS of snoring at postoperative period (2.8 ± 1.7, $p < 0.05$). The average preoperative VAS was 8.8, indicating moderate to severe snoring in this group of patients. Snoring was considered to be cured by the bed partner or observer if the VAS was less than half the baseline[8]. Based on this criteria for a cure of snoring, the problem was eliminated in 91% (32 of 35) of the patients.

There was minimal morbidity associated with LAOS treatment. One patient had pain during the cases of minor bleeding which was controlled with suction electrocautery. No packing was required and the patients had no further sequel. Nasal cavity edema and crusting were observed at postoperative day 3 and week 1. Three weeks after the procedure, the mucosa at the operative zone was completely healed and closed. LAOS postoperative pain was rated as minimal (VAS ≤ 4). Data collected from VAS showed the discomfort to be worst at postoperative day 1 and nearly resolved by postoperative day 7 (Fig. 2). There were no synechiae, no septal perforation and no emergent airway complications. LAUP was performed in all LAOS treated patients and laser turbinectomy in 14 (40%) patients.

Discussion

Upper airway obstruction occurring during sleep can appear at multiple sites that range from the nares to the larynx. Patients who had symptomatic nasal obstruction are statistically more likely to report habitual snoring. Snoring causes many problems for both snorers and family members. Approximately 25% of men and 15% of women snore habitually[9]. It may be a common problem, but it is also a medical condition that should not be ignored.

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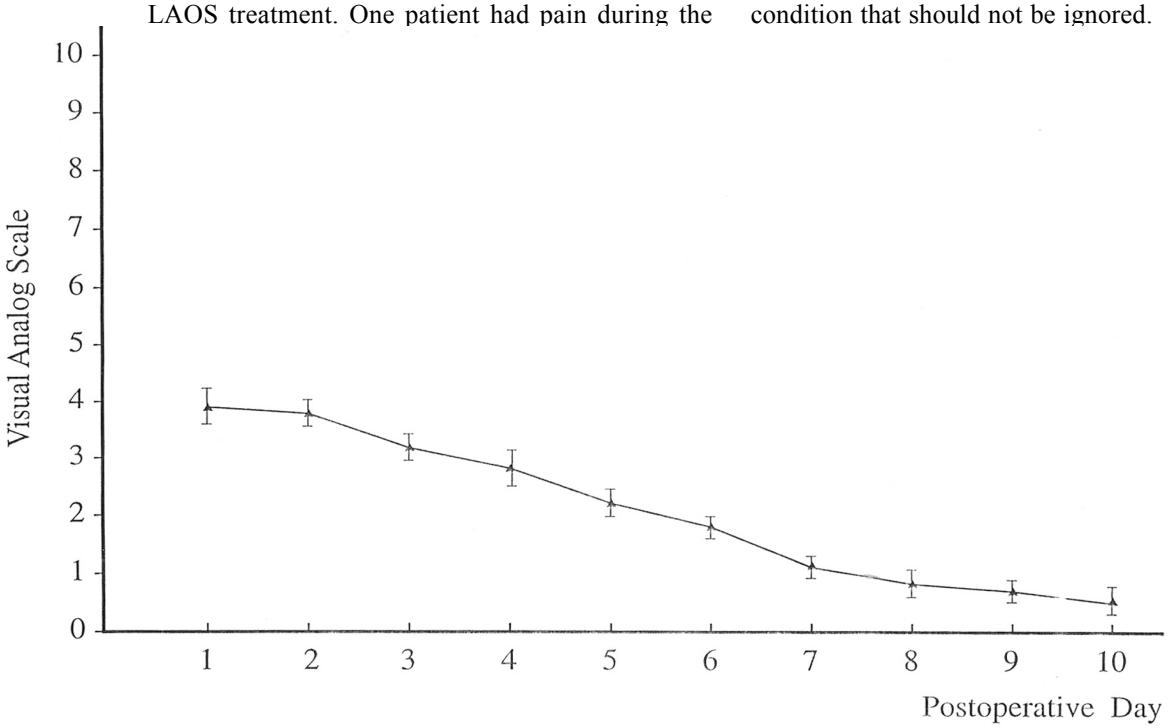

Fig 2. Mean visual analog scale for LAOS postoperative pain

open their mouths. The relaxed tongue falls back and occludes the pharynx, thereby increasing the upper airway resistance of the airflow. Difficulty of breathing through the nose can cause or worsen snoring. Sometimes the snorers are still capable of breathing through the nose, even with constricted nasal breathing, but must exert more effort to draw air through the nasal airway. The additional effort produces a greater vacuum in the throat, which further collapses the throat tissues and reduces the airspace[10].

A number of studies have been performed to better delineate the relationship between nasal obstruction and nocturnal breathing and sleep. Zwillich et al[11] found that the number of obstructive respiratory events increased significantly during the night of nasal obstruction. Olsen et al[12] found that snoring was heard in non-obese men with the nose obstructed and rarely heard during the unobstructed nights. Issa and Sullivan[13] found that nasal occlusion caused upper airway closure during inspiratory efforts in all of these individuals and there was some relationship between the subjective severity of the snoring and the upper airway closing pressure. Reversal of nasal obstruction can reverse some from sleep-related breathing disorders. Vibrations of the palate and soft tissues, which generate snoring sounds, can be prevented when patients inhale less heavily.

When a narrow nasal space is dilated, an airflow through the nose is increased above normal and less pressure is not sufficient to start the vibrations of soft tissues of the throat which are needed for a generation of snoring sounds. In other cases, when the vibrations start, the sound level seems to be lower.

Simple dilatation of the nasal valve using an internal dilator has been shown to substantially reduce the noise level of snoring[14]. Many patients with nasal obstruction are satisfactorily treated with medical treatments. For some the symptom is so distressful as to warrant consideration of surgical treatments. Most deviations are asymptomatic, but when severe, can lead to increased nasal resistance. Gray revealed[15] that only 21% of the septum were considered straight. The junction of the cartilagenous septum with the bony septum is a typical site for septal spurs to occur and leads to a common form of septal deviation.

In the present study, a significant decrease in nasal obstruction was observed 1 week postoperatively. Patients must be informed about the possibility of temporary nasal obstruction before deciding on this surgical procedure. Objective assessment of nasal obstruction was also improved. Anterior rhinomanometry measurements demonstrated a significant improvement in total nasal resistance. These LAOS results were comparable to the previous LAOS results which ranged from 90% to 96%[6,7]. In the present study the overall success rate for nasal obstruction was 91%.

This LAOS was performed as a one-stage surgery under local anesthesia on an outpatient procedure, allowing the patient to return to work or home immediately after treatment. It did not put the airway at risk with general anesthesia or sedation. All patients tolerated the procedure well and it was performed in an average of 10 minutes.

The surgical concept for treatment of snoring is to enlarge the upper airway, thereby restoring its patency during sleep. Nasal surgery has been documented by many studies to successfully improve snoring, decrease arousal and daytime somnolence. Fairbanks[16] reported excellent results in 113 patients who had nasal surgery for chronic obstruction. Forty-two percent of these individuals said they snored prior to nasal surgery; 77 percent had either elimination or improvement of their snoring after nasal surgery.

The timing of concomitant nasal surgery in patients undergoing other operations for sleep-related breathing disorder, remains controversial. Patients with snoring pose a significant anesthetic risk and are generally deemed as difficult intubations. All types of nasal packing are to be avoided so as not to further compromise the airway. In snoring patients, if an obstruction is found at the nose and another site in the upper airway, the nasal condition may be addressed first. An additional surgery may be performed in the latter. However, in the present study, the laser procedures were performed concurrently with less morbidity. The advantages of laser procedure include less operative bleeding and less operative time. They were well tolerated under local anesthesia. No nasal packing was needed.

Correction of an obstructed nasal airway, along with LAUP for the treatment of palatal obstruction as a one-stage procedure, ameliorated symptoms in snoring patients with nasal obstruction. The success rate for the treatment of snoring in the present study was 91% and it was consistent with other reports. The LAUP success rates for snoring relief ranged from 77% to 85% and they were performed as multiple-stage procedures[8,17,18].

This minimally invasive surgical strategy can be applied to more limited septal deformities with

minimizing postoperative edema. The complications in the present study were less and were identified and addressed promptly through a careful postoperative care regimen that includes serial endoscopic examination. LAOS is an important adjunct to LAUP, not only for addressing functional symptoms of nasal obstruction but also for ensuring adequate relief of upper airway obstruction for treatment of snoring. However, follow-up studies are needed to determine the long-term outcomes of LAOS for the adjunctive treatment of snoring.

Acknowledgement

The author wishes to thank Somchart Maneenoy, MS. Biostatistics and Research Epidemiology, Sririraj Hospital, Bangkok, Thailand, for his assistance in the data analysis.

References

1. Miljetteig H, Savard P, Mateika S. Snoring and nasal resistance during sleep. Laryngoscope 1993; 103: 918-23.
2. Maurice JC, Marc I, Carrier G. Effects of mouth opening on upper airway collapsibility in normal sleep subjects. Am J Respir Crit Care Med 1996; 153: 255-9.
3. Young T, Finn L, Kim H. Nasal obstruction as a risk factor for sleep-disordered breathing. The University of Wisconsin Sleep and Respiratory Research Group. J Allergy Clin Immunol 1997; 55: 5757-62.
4. Blakely R, Mahowald M. Nasal resistance and sleep apnea. Laryngoscope 1987; 97: 752-4.
5. Series F, St Pierre S, Carrier G. Surgical correction of nasal obstruction in the treatment of sleep apnea: importance of cephalometry in predicting outcome. Thorax 1993; 48: 360-3.
6. Kamami YV, Pandraud L, Bougara A. Laser-assisted outpatient septoplasty: results in 703 patients. Otolaryngol Head Neck Surg 2000; 122: 445-9.
7. Kamami YV. Laser-assisted outpatient septoplasty results on 120 patients. J Clin Laser Med & Surg 1997; 15: 123-9.
8. Neruntarat C. Laser-assisted uvulopalatoplasty: short-term and long-term results. Otolaryngol Head Neck Surg 2001; 124: 90-3.
9. Maniglia AJ. Sleep apnea and snoring, an overview. Ear Nose Throat J 1993; 72: 16-9.
10. Lavie P, Fischel N, Zoner J, Eliaschar I. The effects of partial and complete machanical occlusion of the nasal passages on sleep structure and breathing in sleep. Acta Otolaryngol 1983; 95: 161-6.
11. Zwillich CW, Pickett C, Hanson FN, Weil JV. Disturbed sleep and prolonged apnea during nasal obstruction in normal men. Am Rev Respir Dis 1981; 124: 158-60.
12. Olsen K, Kern E, Westbrook P. Sleep and breathing disturbance secondary to nasal obstruction. Otolaryngol Head Neck Surg 1981; 89: 804-10.
13. Issa FG, Sullivan CE. Upper airway closing pressures in snorers. J Appl Physical 1984; 57: 528-35.
14. Hoijer U, Ejnell H, Hedner J, Petruson B, Eng LB. The effects of nasal dilatation on snoring and obstructive sleep apnea. Arch Otolaryngol Head Neck Surg 1992; 118: 281-4.
15. Gray LP. Deviated nasal septum. Ann Otol Rhinol Laryngol 1978; 87: 3-20.
16. Fairbanks DNF. Effect of nasal surgery on snoring. Southern Med J 1985; 78: 268-70.
17. Kamami YV. Laser CO_2 for snoring: preliminary results. Acta Otorhinolaryngol Belg 1990; 44: 451-6.
18. Krespi YP, Pearlman ST, Keider A. Laser-assisted uvulopalatoplasty for snoring. J Otolaryngol 1994; 23: 238-4.

การผ่าตัดผนังกั้นจมูกด้วยเลเซอร์แบบผู้ป่วยนอกและการผ่าตัดเลเซอร์เพดานอ่อนลิ้นไก่ในการรักษาจมูกอุดตันและการนอนกรน

ชัยรัตน์ นิรันตรัตน์

วัตถุประสงค์: จมูกอุดตันมักเกิดจากเทอร์บิเนตโตหรือผนังกั้นจมูกคด ผู้ป่วยมักมีอาการนอนกรนร่วมกัน การผ่าตัดผนังกั้นจมูกด้วยเลเซอร์แบบผู้ป่วยนอกมีรายงานว่าได้ผลดีในรายผนังจมูกคดทางด้านหน้า งานวิจัยนี้มีวัตถุประสงค์เพื่อประเมินความปลอดภัยและผลการผ่าตัดนี้เมื่อใช้ร่วมรักษาการนอนกรนซึ่งมีผลจากจมูกอุดตัน

วัสดุและวิธีการ: ผู้ป่วยจำนวน 35 คน มีผนังกั้นจมูกคดและนอนกรน ได้รับการตรวจบันทึกการนอนหลับเพื่อแยกออกจากผู้ป่วยโรคหยุดหายใจขณะหลับจากการอุดกั้น ผู้ป่วยรับการผ่าตัดผนังกั้นจมูกด้วยคาร์บอนไดออกไซด์เลเซอร์ ไม่ต้องใส่วัสดุห้ามเลือดไว้ในจมูก การผ่าตัดนี้ทำร่วมกับการผ่าตัดรักษานอนกรนวิธีอื่น (เลเซอร์ตกแต่งเพดานอ่อนลิ้นไก่ หรือ เลเซอร์ผ่าตัดเทอร์บิเนต) แบบผู้ป่วยนอกภายใต้ยาชาเฉพาะที่ ข้อมูลก่อนและหลังการรักษาได้รับการเปรียบเทียบและวิเคราะห์ด้วยวิธี Student's t test

ผลการศึกษา: ผู้ป่วยทนการผ่าตัดได้ดีเวลาที่ใช้รักษาเฉลี่ย 10 นาที อาการแน่นจมูกลดลงจาก 6.2 + 3.2 เป็น 1.6 + 0.8 ($p < 0.01$) และความต้านทานลำอากาศในจมูกลดลงอย่างมีนัยสำคัญ การนอนกรนลดลงอย่างมีนัยสำคัญจาก 8.8 + 2.2 เป็น 2.8 + 1.7 ($p < 0.05$) ไม่พบโรคแทรกซ้อนที่เป็นอันตราย ผู้ป่วยปวดแผลหลังผ่าตัดเล็กน้อย (VAS < 4) การติดตามผลหลังผ่าตัดช่วง 4-6 เดือน พบอาการแน่นจมูกและนอนกรนดีขึ้นในผู้ป่วยร้อยละ 90

สรุป: การผ่าตัดผนังกั้นจมูกด้วยเลเซอร์แบบผู้ป่วยนอกสำหรับผนังกั้นจมูกคดมีความปลอดภัย และได้ผลดีเมื่อใช้ผ่าตัดร่วมกับการผ่าตัดอื่นในผู้ป่วยนอนกรนที่มีจมูกอุดตัน