





Long-term Complications of Palate Surgery: A Multicenter Study of 217 Patients

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Objectives/Hypothesis: To investigate long-term complications of newer reconstructive palate surgery techniques.

Study Design: Retrospective case-series analysis.

Methods: Retrospective six-country clinical study of OSA patients who had nose and palate surgery.

Results: There were 217 patients, mean age = 43.9 ± 12.5 years, mean body mass index = 25.9 ± 4.7, mean preoperative apnea-hypopnea index [AHI] = 30.5 ± 19.1, follow-up 41.3 months. A total of 217 palatal procedures were performed, including 50 expansion sphincter pharyngoplasties (ESP), 34 functional expansion pharyngoplasties (FEP), 40 barbed reposition pharyngoplasties (BRP), 64 modified uvulopalatopharyngoplasties (mUPPP), 11 uvulopalatal flap procedures (UPF), nine suspension pharyngoplasties (SP), eight relocation pharyngoplasties (RP), and one z-pharyngoplasty (ZPP). Complications included were constant and/or felt twice per week; dry throat (7.8%), throat lump feeling (11.5%), throat phlegm (10.1%), throat scar feeling (3.7%), and difficulty swallowing (0.5%). Of the 17 patients who had a dry throat complaint, two were constant (one SP, one RP), 15 were occasional (10 mUPPP, three SP, two BRP). Of the 25 patients with the throat lump feeling, four were constant (three RP, one ZPP), 21 were occasional (10 mUPPP, five SP, five UPF, one BRP). Of the 22 patients with the throat phlegm feeling, four were constant (two SP, two RP), 18 were occasional (10 mUPPP, four BRP, two FEP, two SP). Of the eight patients with throat scar feeling, eight were occasional (four SP, two mUPPP, one FEP, one RP), none were constant. One patient had difficulty swallowing (RP procedure). There was no velopharyngeal incompetence, taste disturbance, nor voice change. Highest symptom complaints were mUPPP, SP, and RP, whereas the lowest symptom complaint was ESP.

Conclusions: Newer palatal techniques have shown to have less long-term complications compared to the older ablative techniques.

Key Words: Palate surgery, complications, obstructive sleep apnea.

Level of Evidence: 4

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INTRODUCTION

Obstructive sleep apnea (OSA) is due to the collapse of the upper airway during sleep. Due to negative pressure within the upper airway, this may lead to complete or partial collapse of the upper airway leading to stoppage of breathing resulting in sympathetic overdrive, hypertension, and hypoxemia. Collapse of the upper airway may occur at the level of the velopharynx, the base of tongue,

and/or the lateral pharyngeal walls; the collapse in OSA is often multilevel. Palatal collapse is the most common site of obstruction. Older palatal surgery techniques for OSA (namely the traditional uvulopalatopharyngoplasty) seem to be flawed, with a high incidence of postoperative uncomfortable complications (high morbidity after surgery). With better understanding of the pathophysiology of OSA, many patients with OSA are noted to have bulky thick lateral pharyngeal walls that contribute to the collapse and obstruction of the upper airway. To be successful in the treatment of OSA, these areas of collapse should be addressed. Older palatal surgery techniques were perennially based on ablative methods that removed the uvula and a significant amount of soft palate. These methods caused a thick fibrotic scar on the palatal edge that would touch and abrade the base of tongue and result in throat discomfort or lump in the throat sensation. Newer palatal surgery techniques that are based on more reconstructive principles that address the lateral pharyngeal walls and preserve some or part of the uvula appear to have lesser long-term postoperative morbidity. We investigated the long-term complications of newer palatal techniques in OSA surgery.

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MATERIALS AND METHODS

This was a nonrandomized, retrospective, multicenter clinical study of patients seen in the ear, nose, and throat office for snoring and/or symptoms of OSA. All met the selection criteria and had nose and palate surgery of the upper airway between 2009 and 2016. Patients were recruited from seven tertiary clinical centers from six countries, including Singapore, Canada, Italy, India, Hong Kong, and Korea.

The patients underwent a comprehensive clinical assessment including a thorough physical examination, flexible awake nasoendoscopy, and an overnight polysomnography (PSG) before and after surgery. For patients who had overnight PSG, apnea was defined as a >90% reduction in airflow persisting for >10 seconds, relative to basal amplitude. Hypopnea was defined as a >50% decrease in airflow amplitude relative to the baseline and associated with >3% desaturation of oxygen or arousal >10 seconds. Parameters collated were the duration of oxygen saturation <90%, apnea-hypopnea index (AHI), sleep latency, and lowest oxygen saturation (LSAT). All patients also completed the Epworth Sleepiness Scale and a visual analog scale (VAS) for snoring before and after surgery. The bed partner completed a similar VAS scale for snoring. The preoperative sleep test and postoperative sleep test were done at the same respective hospital/center.

Clinical examination included height, weight, neck circumference, body mass index (BMI), and blood pressure (systolic and diastolic), in addition to an endoscopic assessment of the nasal cavity, posterior nasal space, oropharyngeal area, soft palatal redundancy, uvula size and thickness, tonsillar size, and Mallampati grade. Flexible nasoendoscopy was performed for all patients, and collapse during a Mueller maneuver was graded for the soft palate, lateral pharyngeal walls, and base of tongue.

Inclusion criteria was adult patients (>18 years old), AHI > 5, all Friedman stage, all Mallampati grades, single or multilevel collapse, all BMI, and had nose and palate surgery. We excluded patients who had previous upper airway surgery and/or had any pillar implants or hypoglossal nerve implant inserted previously or currently.

All patients responded to a specific questionnaire based on their postoperative throat sensations (also known as symptom complaint), which included dry throat feeling, lump in the throat sensation/foreign body sensation, feeling of throat phlegm, feeling of throat scar sensation, difficulty swallowing, taste disturbance, and voice change. All patients rated the frequency of these sensations based on 1) constantly, felt almost all the time; 2) occasionally, felt at least twice per week; 3) rarely, felt once or twice per year only; and 4) never, never felt these symptoms before.

Surgeries were based on previously described palatal surgery techniques. The expansion sphincter pharyngoplasty (ESP) as described by Pang and Woodson,¹ the functional expansion pharyngoplasty (FEP) as described by Sorrenti and Piccin,² the barbed reposition pharyngoplasty (BRP) introduced by Vicini et al.,³ the modified uvulopalatopharyngoplasty (mUPPP) (uvular preservation or recreation surgically) as described by Li et al.,⁴ the uvulopalatal flap (UPF) as proposed by Neruntarat,⁵ the suspension palatoplasty (SP) described by Li et al.,⁶ the relocation pharyngoplasty (RP) as introduced by Li and Lee,⁷ and the Z-palatoplasty (ZPP) as described by Friedman et al.⁸

The study protocol and methodology were reviewed and approved by the respective hospital ethics committee/institutional review board.

RESULTS

There were 187 males and 30 females, mean age of 43.9 ± 12.5 years, mean BMI of 25.9 ± 4.7 . There were 65 Caucasian and 152 Asian patients. The mean

preoperative AHI was 30.5 ± 19.1 , whereas the mean preoperative LSAT was $75.2\% \pm 19.2\%$. All patients had nose and palate surgery (with or without tonsillectomy or tonsillotomy). There was a total of 217 palatal procedures including 50 ESPs, 34 FEPs, 40 BRPs, 64n mUPPPs, 11 UPF procedures, nine SPs, eight RPs and one ZPP. The mean follow-up was 41.3 months. The complications that were deemed clinically significant were those that occurred constantly (almost daily) and occasionally (at least twice per week), which were included as postoperative complications. These were dry throat in 17 patients (17/217, 7.8%), throat lump feeling in 25 patients (25/217, 11.5%), throat phlegm feeling in 22 patients (22/217, 10.1%), feeling of throat scar in eight patients (8/217, 3.7%), and difficulty swallowing food only in one patient (1/217, 0.5%). Of the 17 patients who had dry throat complaint, two were constant (one SP, one RP) and 15 were occasional (10 mUPPP, three SP, two BRP). Of the 25 patients with the throat lump feeling, four were constant (three RP, one ZPP), 21 were occasional (10 mUPPP, five SP, five UPF, one BRP). Of the 22 patients with the throat phlegm feeling, four were constant (two SP, two RP), 18 were occasional (10 mUPPP, four BRP, two FEP, two SP). Of the eight patients who had a feeling of a throat scar, eight were occasional (four SP, two mUPPP, one FEP, one RP) and none were constant (Table I). Only one patient had an occasional feeling of difficulty swallowing, and this patient had an RP done. There were no patients who reported taste disturbance or voice change.

The number of complication complaints (defined as a complaint of any one of the above symptoms) per procedure was as follows: 1) mUPPP, 64 procedures, 32 symptom complaints; 2) ESP, 50 procedures, zero symptom complaints; 3) BRP, 40 procedures, seven symptom complaints; 4) FEP, 34 procedures, three symptom complaints; 5) mUPVP, 11 procedures, five symptom complaints; 6) SP, nine procedures, 17 symptom complaints; 7) RP, eight procedures, eight symptom complaints; and 8) ZPP, one procedure, one symptom complaint. It appeared that the procedures with the highest symptom complaints were the mUPPP, the SP, and the RP, whereas the lowest symptom complaint was the ESP.

TABLE I.
Complications From the Various Surgical Techniques.

Surgery	N	Dry Throat	Throat Lump	Throat Phlegm	Throat Scar	Dysphagia	Symptom Complaint
mUPPP	64	10	10	10	2	0	32
ESP	50	0	0	0	0	0	0
BRP	40	2	1	4	0	0	7
FEP	34	0	0	2	1	0	3
UPF	11	0	5	0	0	0	5
SP	9	4	5	4	4	0	17
RP	8	1	3	2	1	1	8
ZPP	1	0	1	0	0	0	1

BRP = barbed reposition pharyngoplasty; ESP = expansion sphincter pharyngoplasty; FEP = functional expansion pharyngoplasty; mUPPP = modified uvulopalatopharyngoplasty; RP = relocation pharyngoplasty; SP = suspension palatoplasty; UPF = uvulopalatal flap; ZPP = Z-palatoplasty.

DISCUSSION

It is well accepted that the older palatal surgery techniques were focused on removing soft palate tissue, which is a more ablative philosophy compared to recent newer reconstructive palatal surgery techniques. Accompanying these ablative palatal techniques were common complications like velopharyngeal incompetence, constant lump in the throat sensation, persistent phlegm in throat, difficulty swallowing, dry throat sensation, and voice change. Post-UPPP long-term follow-up studies are not common. There have not been many articles that have reported long-term results and/or side effects of the older traditional UPPP technique. Two such papers showed an alarmingly high incidence of long-term complications following these older palatal techniques. Goh et al. reported in a small group of 49 OSA patients (10- to 17-year phone call follow-up) a high incidence of 28.5% of velopharyngeal incompetence (VPI) after the traditional ablative UPPP (from 1980 to 1983).⁹ Värendh et al.¹⁰ showed in 144 OSA patients who had the traditional UPPP done between 1985 to 1991, 20-year follow-up, that 14% had persistent VPI, 20% had swallowing issues, 12% had voice change, 12% had oral cavity pain. Although Tang et al.¹¹ performed a systemic review on 24 studies (1-year follow-up) with 191 OSA patients who had either the traditional UPPP or the mUPPP done; they showed a lower incidence of VPI (8.1%), difficulty swallowing (17.7%), dry pharynx (23.4%), voice changes (9.5%), and taste disturbances (8.2%), with the most common complication being foreign body sensation/lump in the throat sensation (31.2%). Choi et al.¹² showed in 87 OSA patients (5-year follow-up) who had the traditional UPPP and UVP done, a low incidence of VPI (4.6%), foreign body sensation (10.3%), dry throat (3.4%), voice change (2.3%), and speech change (1.1%). Friberg et al.¹³ had 65 OSA patients who were followed up for 2 years, and they reported taste disturbance at 4%, mild symptoms like throat phlegm or foreign body sensation in throat at 10%, and moderate symptoms in 15% and severe symptoms in 6%.

In our 217 OSA patients, we demonstrated the most common long-term complication (over a 41.3-month follow-up period) to be a lump in the throat sensation/foreign body sensation at 11.5%, throat phlegm feeling at 10.1%, dry throat feeling at 7.8%, and feeling of the throat scar at 3.7%. It appeared that the mUPPP had the largest contribution to the pool of complications. Hypothetically, if the mUPPP data were removed, the long-term complications were lower at lump in the throat sensation/foreign body sensation at 9.8%, throat phlegm feeling at 7.8%, dry throat feeling at 4.6%, and feeling of the throat scar at 3.9%.

Analyzing the individual symptom complaint per procedure, it appears that the highest symptom complaint per se would be the mUPPP, followed by the SP and RP.

Overall, it can be deduced that the newer reconstructive palatal techniques have much less short- and long-term side effects, compared to the older palatal ablative techniques that resect the uvula and soft palatal edges, resulting in a thick scar and/or hard band of fibrosed tissue. We attribute the lower incidence of long-term complications to the possibility that these newer techniques tend to

preserve more mucosa, preserve or create a new uvula, address the lateral pharyngeal wall muscles mainly (instead of the soft palate), and tend not to resect or ablate useful healthy soft tissue and mucosa. From our data, anecdotally, there is a suggestion that the less the resection of palatal soft tissue results in fewer complications, although there is no significant evidence of this, and it would be difficult to quantify or qualify.

We acknowledge and recognize some short comings of this paper. The numbers are relatively small, and individual procedure numbers are even smaller; hence, some procedures that may not seem to have had any symptom complaints may not be representative. As with most multicenter surgical studies, the surgeon performing the procedure is slightly different and may contribute to the complications. There are many techniques illustrated in this article, and with different techniques there will be different complications rates. With multiple procedures combined, the numbers of each procedure are even smaller; hence, the percentage of each complication per procedure may not be fully representative. We had to arbitrarily select the newer palatal surgery techniques based on the fact that most reconstructive palatal techniques and lateral pharyngeal wall techniques were introduced after the years 2006 to 2007 onward. Although the mean follow-up time was 42 months, which is fairly long but could be longer, further follow-up studies may be required to answer some of these questions. Because this study was not designed to report efficacy of each individual procedure, it was not reported. Moreover, the numbers in each arm are relatively small and would not make meaningful data.

CONCLUSION

With the introduction of newer reconstructive palatal surgery techniques, the incidence of long-term complications and side effects are much reduced compared to the older palate surgery techniques; hence, sleep specialists need to be updated and understand that surgical techniques evolve with time and have improved, not only in terms of success rates but have much lower morbidity and side effects.

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