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Uvulopalatoplasty (UP2): A Modified Technique for Selected Patients

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Objectives: **The goal of uvulopalatopharyngoplasty (UP3) in the treatment of obstructive sleep apnea–hypopnea syndrome (OSAHS) is to reduce obstruction by eliminating redundant tissue in three areas: the soft palate, tonsils, and pharynx. However, some OSAHS patients may present with tonsil hypertrophy and elongated soft palate without redundant pharyngeal folds. We treated this group of patients with tonsil reduction using radiofrequency coblation combined with uvulopalatoplasty (UP2) using a palatal flap technique without pharyngoplasty. Morbidity and outcome was then compared with a group of patients who underwent classic UP3.** ***Study Design:*** **A retrospective, nonrandomized study comparing morbidity and outcomes of the modified technique (UP2) with patients who underwent standard UP3.** ***Methods:*** **Patients were all staged according to the previously described Friedman staging system. Those with redundant pharyngeal folds were treated with UP3 (n = 33), and those without redundant pharyngeal folds were treated with tonsil coblation and UP2 (n = 30). Charts of patients undergoing UP2 and UP3 between July 1, 2001 and July 1, 2002 were reviewed. Thirty-three consecutive patients who underwent UP3 were selected for study as well as 30 consecutive patients who underwent UP2. Pre- and postoperative quality of life questionnaires and patient questionnaires focusing on diet, pain, and return to activity were reviewed to assess subjective morbidity and elimination of symptoms. Objective measurements include preoperative and postoperative (6–18 months) polysomnography (PSG).** ***Results:*** **Symptom elimination and objective PSG results were compared. There was no statistical difference in results between the UP3 group and the UP2 group. Morbidity, however, was significantly more prominent, and recovery was more prolonged, in the UP3 group. Patients undergoing UP2 had fewer pain days, less narcotic use, quicker return to solid diet, and less long-term complaints of globus sensation.** ***Conclusions:*** **UP2 with tonsil coblation offers some reduction in postoperative morbidity without affecting outcome for selected patients with OSAHS. Pain levels, however, are still very significant.** ***Key Words:*** **Uvulopalatoplasty, modified uvulopalatoplasty, OSA treatment, radiofrequency for OSA treatment.**

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INTRODUCTION

The goal of uvulopalatopharyngoplasty (UP3) in the treatment of obstructive sleep apnea–hypopnea syndrome (OSAHS) is to reduce obstruction through elimination of redundant mucosal folds, obstructing tonsils, and excess soft palate. The "pharyngoplasty" component of classic UP3 specifically addresses redundant loose mucosal folds in the pharynx. Although this portion of the procedure theoretically widens the pharyngeal air space, it may also be responsible for significant morbidity. Morbidity of UP3 is significant both in the early postoperative period as well as in the permanent sequelae often associated with the procedure.[1–3] Early morbidity, including pain and dysphagia, is at least partially caused by the pharyngoplasty component.[2,4,5] In addition, permanent complaints of abnormal sensations in the throat, such as "inability to clear the throat" and dysphagia, are also likely caused by the pharyngeal component of the surgery.[3,6] Logic would also suggest that the pharyngeal component of the surgery exposes the patient to increased risk of postoperative bleeding.

Pharyngeal obstruction can be attributed to various factors, including tonsil size, redundant folds in the pharynx, tongue-base position and size, and other factors. However, many patients have tonsillar hypertrophy without redundant pharyngeal folds and, therefore, may not benefit from the pharyngoplasty component of classic UP3. Obstructing tonsillar tissue can be eliminated by subcapsular tonsil coblation technique, and when no redundant pharyngeal folds are present, pharyngoplasty can be eliminated. Soft palate reduction can be performed as needed to widen the retropalatal space. Thus, a uvulopalatoplasty (UP2) might be more appropriate for these patients and might spare them the discomfort

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and possibly permanent morbidity associated with the pharyngoplasty.

This study was designed to assess a modified technique of UP2 combined with subcapsular tonsil coblation with respect to early and late morbidity and success in eliminating symptoms and normalizing polysomnographic findings in selected OSAHS patients. The experimental group was compared with a group of patients treated with standard UP3.

MATERIALS AND METHODS

Since 2001, patients who had no redundant pharyngeal folds have been treated with a modified technique including tonsil coblation and UP2. Institutional review board approval was obtained to conduct a retrospective study comparing morbidity and success of patients treated with UP2 with tonsil coblation technique (UP2 group) versus with a standard UP3 technique (UP3 group). All patients had complaints of loud snoring and excessive daytime somnolence. All patients were extensively questioned on symptoms indicative of OSAHS, including restless sleep, loud and heavy snoring, daytime sleepiness, decreased daytime alertness, irritability and short temper, morning headaches, forgetfulness, mood or behavior changes, anxiety or depression, or a decreased interest in sex. Patients were asked to rate these symptoms on the basis of the pattern of occurrence: always, frequent, or rare. Those patients who described loud snoring and the occurrence of at least two other of the above symptoms as "always" or "frequent" fulfilled the basic criteria for further investigation, including physical examination, quality of life (QOL) survey, and polysomnography.

The charts of patients treated during a 1 year period between July 1, 2001 and July 1, 2002 were reviewed. Thirty-three patients who underwent UP3 were identified. Although more than 33 UP3 procedures were performed during this time span, this group represented a consecutive series of patients undergoing this procedure who fulfilled the inclusion criteria listed below and for whom complete data were available. These patients comprised the control group. The charts of 30 additional patients who fulfilled the inclusion criteria and underwent UP2 with tonsillar coblation were also identified. This group comprised the experimental group.

Inclusion Criteria

All prospective patients who underwent surgical treatment of OSAHS had fulfilled previously reported criteria by the authors.[7,8] In addition, selection criteria for the present study included 1) no previous surgical treatment for OSAHS, 2) significant symptoms of snoring or daytime somnolence, 3) documented failure of continuous positive airway pressure (CPAP) trial, 4) documented failure of attempts at conservative measures, such dental appliances, change in sleeping position, and sleep hygiene, 5) proof of medical fitness adequate for surgery, and 6) a clear understanding and expectations of the risks, morbidity, and likely outcomes of surgery.

Preoperative Quality of Life Evaluation

Candidates for surgical treatment of OSAHS were evaluated on the basis of history. Patient histories included assessment of snoring level (0–10) described by the bed partner, Epworth Sleepiness Scale (ESS) (0–24),[9] and the SF-36 v2 QOL score (0–100). The SF-36 v2 Health Survey (QualityMetric, Lincoln, RI) is a 36 item, well-documented survey that has previously been used to evaluate patients with OSA.[10–13] The survey consists of eight multi-item health domains: 1) physical functioning (PF), (2) role limitation because of physical health problems (RP), (3) bodily pain (BP), (4) general health (GH), (5) vitality (energy/fatigue) (VT), (6) social functioning (SF), (7) role limitation because of emotional problems (RE), and (8) mental health (psychologic distress and psychologic well-being) (MH).[8] A score of 0 to 100 is calculated for each domain on the basis of patient responses. A score of 100 represents the best possible health.

Physical Examination Parameters

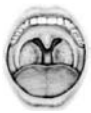
Chart review recorded significant physical findings. Patients underwent preoperative physical examinations that included a full assessment of the upper airway with nasopharyngolaryngoscopy, Mueller maneuver, and standard examination. In addition, patients were staged according to the previously described Friedman staging system on the basis of the Friedman palate position (FPP), tonsil size, and body mass index[8] (BMI) (Table I). Weight and height were recorded at the initial visit, and the BMI (kg/m^2) was calculated.

Stage I disease was defined as those patients with FPP I or II, tonsil size 3 or 4, and BMI of less than 40 kg/m^2 (Table I). Stage II disease is defined as FPP I or II and tonsil sizes 0, 1, or 2 or FPP III and IV with tonsil sizes 3 or 4 and BMI of less than 40 kg/m^2. Stage III disease is defined as FPP III or IV, tonsil sizes 0, 1, or 2, and BMI less than 40 kg/m^2. All patients with a BMI greater than 40 kg/m^2, regardless of FPP or tonsil size, as well as those patients with significant craniofacial or other anatomic abnormalities, were designated as Stage IV[8] (Table I).

Polysomnography

An all-night attended, comprehensive sleep study was performed using a computerized polygraph to monitor electroencephalogram (C3-A2, C4-A1), left and right electro-oculogram, electrocardiogram, chin and anterior tibialis electromyogram, abdominal and thoracic movement by inductive plethysmograph, nasal oral airflow, oxygen saturation by pulse oximetry (SaO_2), and throat sonogram. Apnea was defined as cessation of breathing for at least 10 seconds. Hypopnea was a decreased effort to breathe at least 50% less than the baseline and with at least a 4% decrease in SaO_2. Airflow was measured by a thermister (Protech model

TABLE I.
Friedman Staging System based on Friedman Palate Position, Tonsil Size, and Body Mass Index (BMI).[8]

	Friedman Palate Position	Tonsil Size	BMI
Stage I	1	3, 4	<40
	2	3, 4	<40
Stage II	1, 2	0, 1, 2	<40
	3, 4	3, 4	<40
Stage III	3	0, 1, 2	<40
	4	0, 1, 2	<40
Stage IV	1, 2, 3, 4	0, 1, 2, 3, 4	>40
	All patients with significant craniofacial or other anatomic deformities		

From: Friedman M, Ibrahim I, Joseph NJ. Staging of Obstructive Sleep Apnea/HypopneaSyndrome: A Guide to Appropriate Treatment. Laryngoscope 2004;114:454–459.

1222, Mukilteo, WA) in all patients. All patients were tested in the same sleep laboratory. The apnea–hypopnea index (AHI) was calculated as the sum of total events (apneas and hypopneas) per hour.

Surgical Techniques

In many patients, surgical consents were obtained for both UP2 and UP3 because the final decision for UP2 versus UP3 was not made until after examination under anesthesia. At the time of surgery, the surgeon assigned patients who had redundant pharyngeal mucosal folds or buried tonsils to UP3 and patients without redundant mucosal folds and protruding tonsils to UP2.

The surgical technique for the UP3 group has been previously described by the senior author.[14] The surgical technique for the UP2 group is illustrated in Figures 1 to 3. Tonsillar tissue was ablated using the coblation technique previously described.[4] The ENTec Coblator Plasma Surgery System (ArthroCare, Corp, Sunnyvale, CA) was used to eliminate tonsillar tissue from the surface down to the capsule. The goal of the coblation technique was to preserve a small amount of tonsillar tissue on the capsule to avoid exposure of the muscle.

The palatoplasty performed with tonsillar coblation was, in principle, similar to that performed as part of the classic UP3. With the goal of widening the anterior–posterior dimension of the retropalatal area, releasing incisions in the posterior tonsillar pillar were performed to help with "squaring off" the palate. To achieve this, special attention was directed at the superior poles of the tonsils to assure complete coblation of tonsillar tissue in the areas to be included in the palatal closure. Unlike the UP3 technique, below the level of the palatal closure, the tonsillar fossae were left open. The palatal closure was two-layered, and 2.0 Vicryl (polyglactin 910, Ethicon, Inc, Somerville, NJ) suture was used submucosally and 3.0 Chromic suture to approximate the mucosal edges. Before discharge, all patients were prescribed acetaminophen with codeine elixir 12 mg/5 mL and directed to self administer at 15 mL every 4 hours as needed for pain.

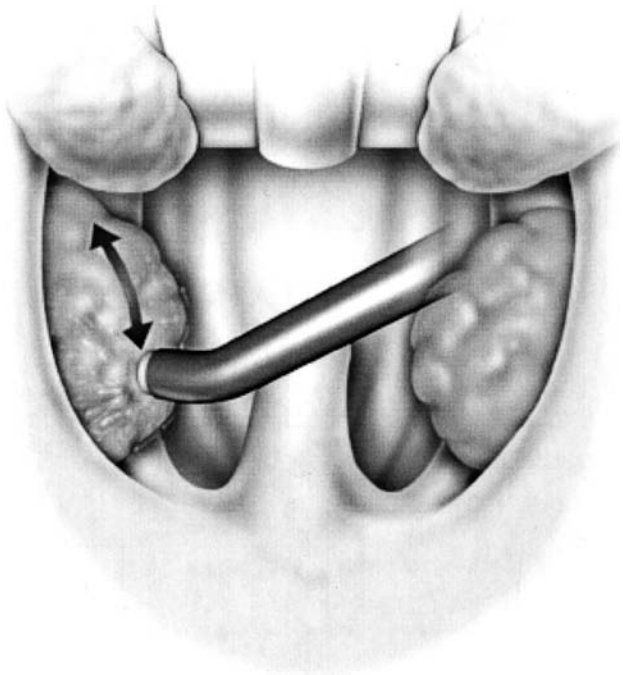


Fig. 1. Tonsillar coblation (From Friedman M, LoSavio P, Ibrahim H, Ramakrishnan V). Radiofrequency tonsil reduction: safety, morbidity. and efficacy. Laryngoscope 2003;113:882–887.

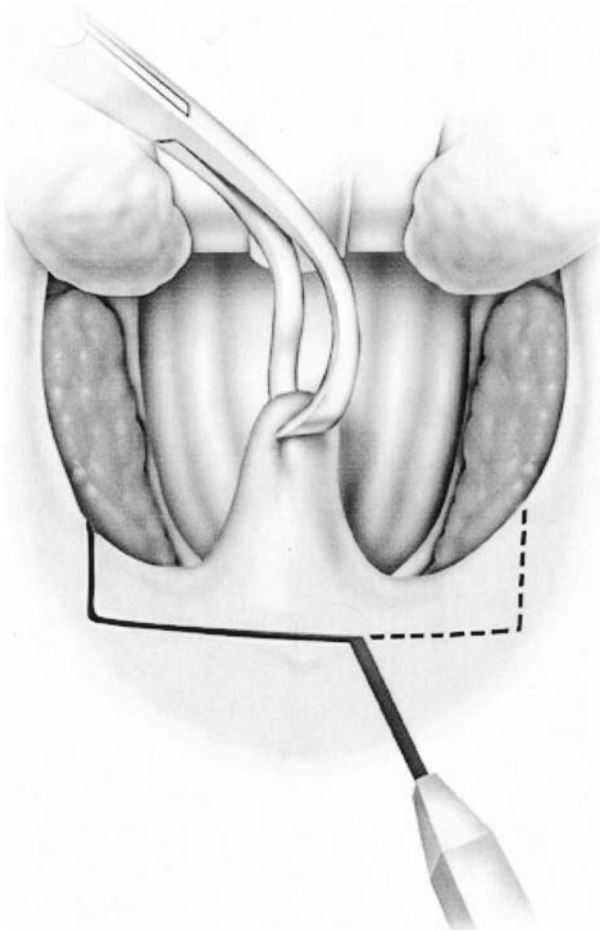


Fig. 2. The modified uvulopalatoplasty. Incision of the palatal flap after completion of tonsillar coblation. Usually, the flap is beveled, with a longer nasopharyngeal surface of the palate that is rolled over toward the oral surface of the palate to recreate the new free-edge of the palate. Standard releasing incisions at the corners of the posterior tonsillar pillars may be required to decrease mobilization of the flap.

Adjunctive Surgical Procedures

Patients with stage I disease were treated with UP3 or UP2 only. All patients with stage II disease or greater also underwent serial tongue-base reduction with radiofrequency (Somnoplasty system, Gyrus, Inc. Memphis, TN). In most circumstances, patients discontinued treatment when they achieved subjective improvement. Often, this preceded normalization of the polysomnogram.

Postoperative Follow-Up

Each patient's postoperative course was followed in a daily log recording the number of days that narcotic medications were issued and number of days until return of solid food. Postoperatively, patients were seen in the office at 1 week, at 1 month, and at 6 months. At each interval examination and interview, the patients were queried concerning any complications, other adverse effects, and complaints. A postoperative polysomnogram was scheduled at 6 months. At the 6 month follow-up, patients were reassessed for snoring level (0–10) as described by the bed partner, ESS (0–24), and the SF-36 v2 QOL survey (0–100).

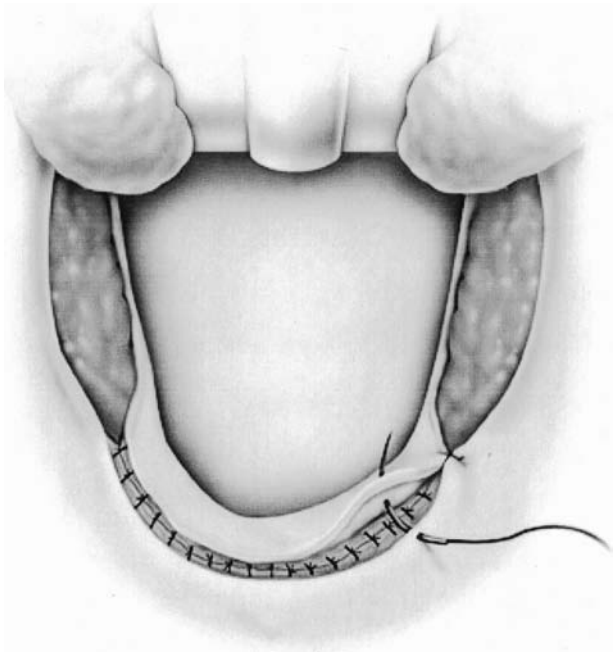


Fig. 3. The modified uvulopalatoplasty. Two-layer closure of the palate.

Statistical Analysis

All statistical analyses were performed using SPSS Version 11.0.1 (SPSS, Inc., Chicago, IL). Continuous data are displayed as mean ± standard deviation (SD). Statistical significance was accepted when $P < .05$. The Student t test and the Mann-Whitney *U* test were used to evaluate significant differences between UP2 and UP3 treated patients. The Levine test for equality of variances was used to determine statistically significant variances. The paired Student t test was used to compare preoperative versus postoperative mean values within each group. The chi-square test was used to test the association between categorical variables.

RESULTS

Sixty-three patients (UP2 = 30, UP3 = 33) were reviewed for the study. Table II compares demographic data, including mean age, sex distribution, mean BMI, and OSAHS stage as described by Friedman et al.[8] There were no statistical differences between the two groups with regard to mean age, Friedman stage distribution, or mean preoperative BMI. The UP3 group had a slightly higher proportion ($P = .48$) of males (84.8%) in comparison with the UP2 group (63.3%).

Adjunctive Treatment

All stage II and III patients in both groups (29 UP2 patients, 30 UP3 patients) received additional treatments to the tongue base with radiofrequency reduction. The total energy delivered was 3,258 ± 1,840.1 J in UP2 patients and 3,532.3 ± 1,755.6 J in UP3 patients. These values were not different from each other.

Morbidity

Postoperative. The number of days of narcotic pain medication usage and return to normal diet were used as indices of recovery from surgery. Patients undergoing UP2 used narcotic pain medication for significantly fewer days as compared with UP3 patients (5.1 ± 1.8 versus 7.6 ± 3.7 days, respectively). Similarly, after UP2, return to normal diet was significantly earlier than after UP3 (4.6 ± 2.0 versus 8.7 ± 3.3, respectively) (Table III) (Fig. 4).

Complications and long-term morbidity. Perioperative complications were rare in both groups. Bleeding requiring definitive treatment, but no blood transfusion, occurred in three patients who underwent UP3. Only temporary postoperative velopharyngeal insufficiency (VPI) was reported, again, all in the UP3 group. In all three patients, the VPI lasted for 1 month and completely resolved by the third postoperative visit 2 months after surgery.

TABLE II.
Demographic Data for 63 Patients Who Underwent Either Uvulopalatoplasty (UP2) orUvulopalatopharyngoplasty (UP3) for the Treatment of Obstructive Sleep Apnea–HypopneaSyndrome.

	UP2 (n = 30)	UP3 (n = 33)	*P* Value
Age (yr)	44.2 ± 12.1	44.7 ± 12.4	NS
Sex			
Male	19	28	.48
Female	11	5	
Stage*			
I	1	3	NS
II	7	7	
III	19	21	
IV	3	2	
BMI (kg/m^2)	32.2 ± 5.0	32.6 ± 5.7	NS
RFBOT (total Joules delivered)	3258.6 ± 1840.1	3532.3 ± 1755.6	NS

Statisticalsignificance accepted when $P < .05$.
*Staging system for grading obstructive sleep apnea/hypopnea syndrome as previously describedby Friedman et al.[8] RFBOT = base of tongue reduction by radiofrequency;NS = not significant; BMI = body mass index.

TABLE III.
Comparison of Subjective Indices of Disease Severity (Snoring Level and EpworthSleepiness Scale) and Postoperative Course (Narcotic Medication Days, Return to Normal Diet, andMorbidity) in Patients Undergoing Uvulopalatoplasty (UP2) and Uvulopalatopharyngoplasty(UP3).

	UP2 (n = 30)	UP3 (n = 33)	*P* Value
Snoring level (1–10)			
Preoperative	9.21 ± 1.8	9.47 ± 1.6	NS
Postoperative	2.7 ± 2.3†	3.1 ± 1.5†	NS
Epworth Sleepiness Scale (1–20)			
Preoperative	13.2 ± 4.5	14.8 ± 5.4	NS
Postoperative	9.33 ± 4.0*	10.0 ± 3.5†	NS
Narcotic pain meds use (days)			
Postoperative	5.1 ± 1.8	7.6 ± 3.7	.003
Return to normal diet (days)			
Postoperative	4.6 ± 2.0	8.7 ± 3.3	<.001
Bleeding			
Postoperative	0 (0%)	3 (9.1%)	.045
Dysphasia			
Postoperative	3 (10%)	6 (18.2%)	NS
Foreign body sensation			
Postoperative	7 (23.3%)	19 (57.6%)	.006
Velopharyngeal insufficiency			
Postoperative	0 (0%)	3 (9.1%)	.45

Statistical significance accepted when $P < .05$.
*Signifies statistical significance from thepreoperative value.

The majority of complications and long-term "sequelae" encountered in both groups were related to postoperative throat discomfort, including globus sensation, mild dysphagia, dry throat, and inability to clear the throat (Table III). This is an extremely common complaint after classical UP3.[6] In fact, all our patients are counseled to expect a permanent globus sensation after surgery. The incidence of this complaint was significantly less common in the UP2 group versus the UP3 group. Seven such complaints were reported in the UP2 group (23.3%) and 19 in the UP3 group (57.6%).

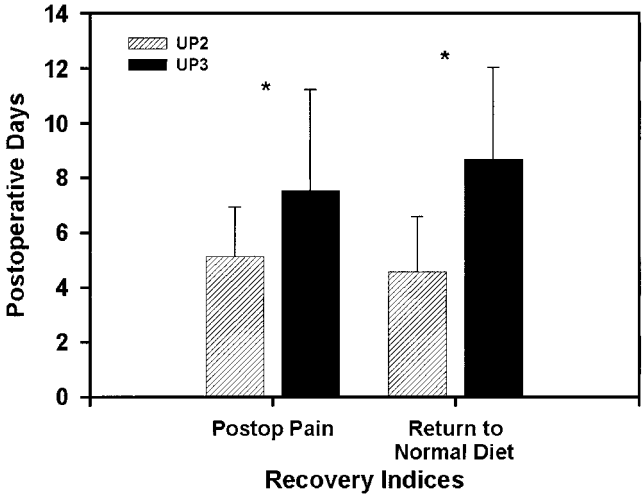


Fig. 4. Comparison uvulopalatoplasty (UP2) versus uvulopalatopharyngoplasty (UP3) for the treatment of obstructive sleep apnea–hypopnea syndrome on postoperative pain days requiring narcotic medication usage and postoperative days before return to normal diet. Statistical significance accepted when $P < .05$. *Significant difference between UP2 and UP3 groups.

Subjective Symptom Elimination

Patients' or bed-partners' subjective assessment of disease severity (snoring level and ESS) were collected preoperatively and at the time of the 6 month postoperative follow-up examination. There were no differences in either preoperative or postoperative snoring level or ESS between the two groups (Table III). However, postoperative values for both snoring level and ESS were significantly lower than their respective preoperative values (Table III). To more easily compare subjective assessments of improvement in symptom severity between the two groups, the percent change in snoring level and ESS was calculated using the following formula:

$$\left[\%\ \text{Change} = \left(\frac{(\text{Postop} - \text{Preop})}{\text{Preop}}\right) \times 100\right] \qquad (1)$$

There were no differences in percent change in snoring level or ESS between patients treated with UP2 or UP3 (Fig. 5).

Because nearly all the patients originally sought treatment for loud snoring, we also determined subjective improvement of the patients' symptoms using a strict criteria, which required a 50% decrease in snoring level postoperatively and a postoperative snoring level of 5 or less. Table IV compares the subjective improvement of surgical treatment of OSAHS with either UP2 or UP3 in

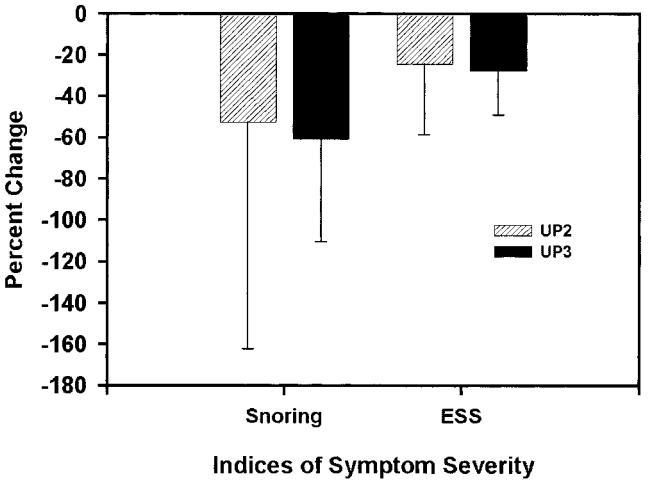


Fig. 5. Comparison uvulopalatoplasty (UP2) versus uvulopalatopharyngoplasty (UP3) for the treatment of obstructive sleep apnea–hypopnea syndrome on percent change of postoperative versus preoperative values in snoring level and Epworth Sleepiness Scale (ESS).

selected patients. Subjective improvement was encountered in 26 (86.7%) of UP2 patients and 32 (97%) of UP3 patients. There was no significant difference between the two groups in subjective improvement of symptoms.

SF-36 v2 Quality of Life Health Survey

Sixty patients had completed the SF-36 v2 Health Survey both pre- and postoperatively, totaling 120 surveys. Thirty of these patients underwent UP2 and 30 underwent UP3. Scores from 0 to 100 (100 being the best health) were calculated for all 60 patients in each of the eight domains both pre- and postoperatively. Figure 6 displays the preoperative versus postoperative mean scores (±standard deviations) for each of the eight domains for the UP2 (Fig. 6A) and UP3 (Fig. 6B) groups. In addition, the difference in mean score (±SE), postoperative versus preoperative, for each of the eight health domains in both groups were calculated. A positive mean difference in mean score represents improvement, whereas a negative mean difference in mean score represents deterioration in QOL.

In the UP2 group, postoperative improvement in mean scores was statistically significant ($P < .05$) for six of the eight domains. Only PF and GH were not significantly improved. The greatest degrees of improvement were seen in the VT, RP, and RE domains with increases in mean scores equal to 21.0 ± 5.1, 23.1 ± 4.6 and 23.0 ± 4.7, respectively. In addition, positive mean differences were also seen in the MH, SF, and BP domains (Fig. 6A).

TABLE IV.
Comparison of Successful Surgical Treatment and Improvement of Symptoms of OSAHSbetween Uvulopalatoplasty (UP2) and Uvulopalatopharyngoplasty (UP3) in Selected Patients.

	UP2 (n = 30)	UP3 (n = 33)	*P* value
Objective success	21 (70%)	19 (55.9%)	.242
Subjective improvement	26 (86.7%)	32 (97%)	.119

Statistical significance accepted when $P < .05$.
OSAHS = obstructive sleep apnea–hypopneasyndrome.

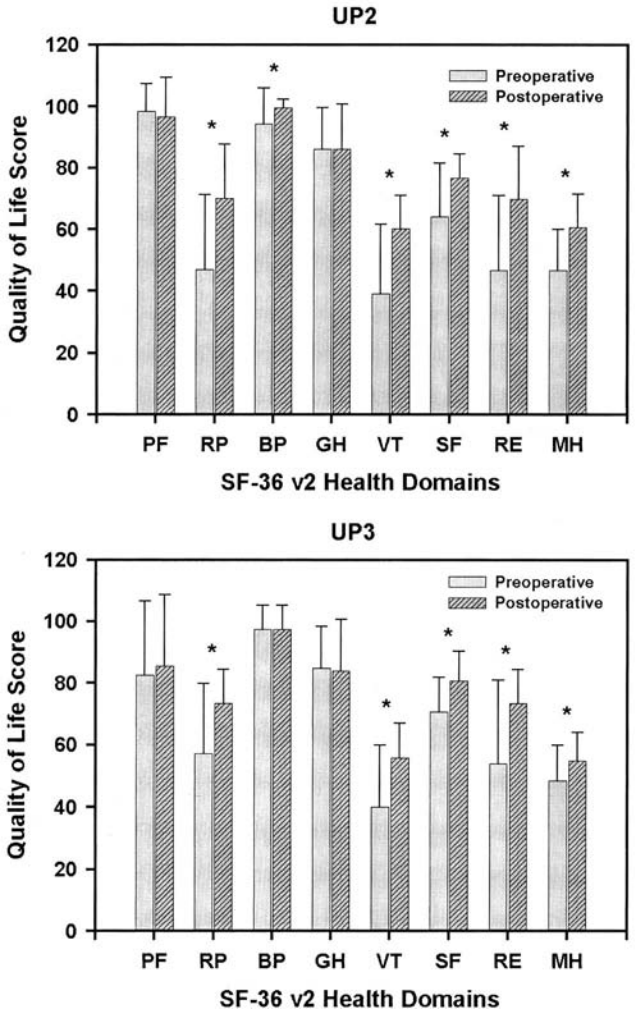


Fig. 6. Comparison of postoperative versus preoperative quality of life values for each of the eight SF-36 v2 health domains in 30 selected patients treated with uvulopalatoplasty (UP2) (A) and 33 selected patients treated with uvulopalatopharyngoplasty (UP3) (B). A score of 0 to 100 is calculated for each domain based on patient responses. A score of 100 represents the best possible health. Statistical significance accepted when $P < .05$. *Significant difference between preoperative and postoperative values. PF, physical function; RP, physical role; BP, bodily pain, GH, general health; VT, vitality/energy; SF, social functioning; RE, emotional role; MH, mental health.

In the UP3 group, postoperative improvement in mean scores was statistically significant ($P < .05$) in five of the eight domains, including RP, VT, SF, RE, and MH. There were no changes in the PF, BP, and GH domains. As in the UP2 group, the greatest degrees of improvement were seen in RE, RP, and VT, with positive mean differences of 16.9 ± 3.7, 16.1 ± 3.6, and 15.7 ± 4.1, respectively. Positive changes in MH and SF were also significant but to a lesser extent (Fig. 6B).

To compare the degree of improvement in QOL in the UP2 group versus the UP3 group, the mean percent

change in scores was calculated for each of the eight domains for both groups and are displayed in Figure 7. A positive percent change represents improvement, whereas a negative percent change represents deterioration in QOL. The UP2 group had significantly greater improvement in BP (7.8 ± 19.9 vs. 0.295 ± 8.0) and MH (39.1 ± 41.9 vs. 18.7 ± 30.5) as compared with the UP3 group (Fig. 7).

Objective Surgical Success

Objective measure of clinical improvement of OSAHS was based on data collected during polysomnography. General indicators to document an acceptable test included the percent of total sleep time (TST) spent in stages III and IV (%III/IV), and the percent of TST spent in REM (%REM). Specific indicators included the apnea index (AI), the AHI, and the minimum recorded arterial oxygen saturation (Min SaO_2). Figure 8 compares mean (±SD) preoperative versus postoperative values for the UP2 patients and UP3 patients. In the UP2 patients, mean AHI values decreased and mean Min SaO_2 increased postoperative as compared with their preoperative values (Fig. 8A). In the UP3 patients as well, AHI decreased and mean Min SaO_2 increased postoperatively as compared with their preoperative values (Fig. 8B).

To compare the degree of clinical improvement OSAHS in the UP2 group versus the UP3 group, the mean percent change in scores was calculated for two of the polysomnographic variables considered for both groups and are displayed in Figure 9. A negative percent change in AHI and a positive percent change in Min SaO_2 represent clinical improvement, whereas the opposites represent clinical deterioration. There were no significant differences between the UP2 and UP3 groups in percent change of AHI or Min SaO_2 (Fig. 9).

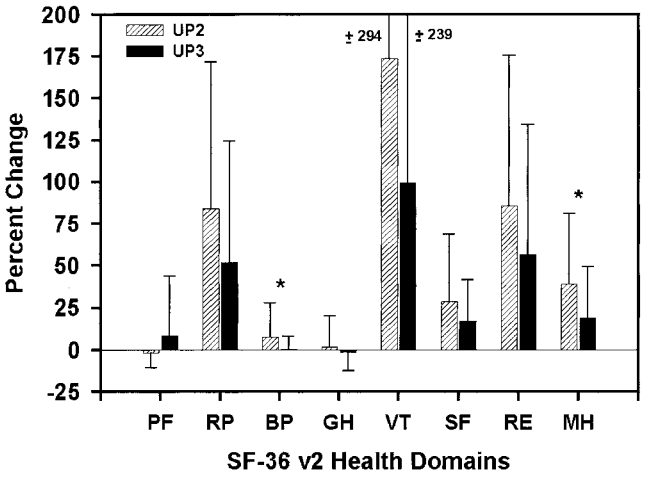


Fig. 7. Comparison uvulopalatoplasty (UP2) versus uvulopalatopharyngoplasty (UP3) for the treatment of obstructive sleep apnea–hypopnea syndrome on percent change of postoperative versus preoperative quality of life values for each of the eight SF-36 v2 health domains. A positive mean difference in mean score represents improvement, whereas a negative mean difference in mean score represents deterioration in quality of life. Statistical significance accepted when $P < .05$. *Significant difference between UP2 and UP3 groups. PF, physical function; RP, physical role; BP, bodily pain, GH, general health; VT, vitality/energy; SF, social functioning; RE, emotional role; MH, mental health.

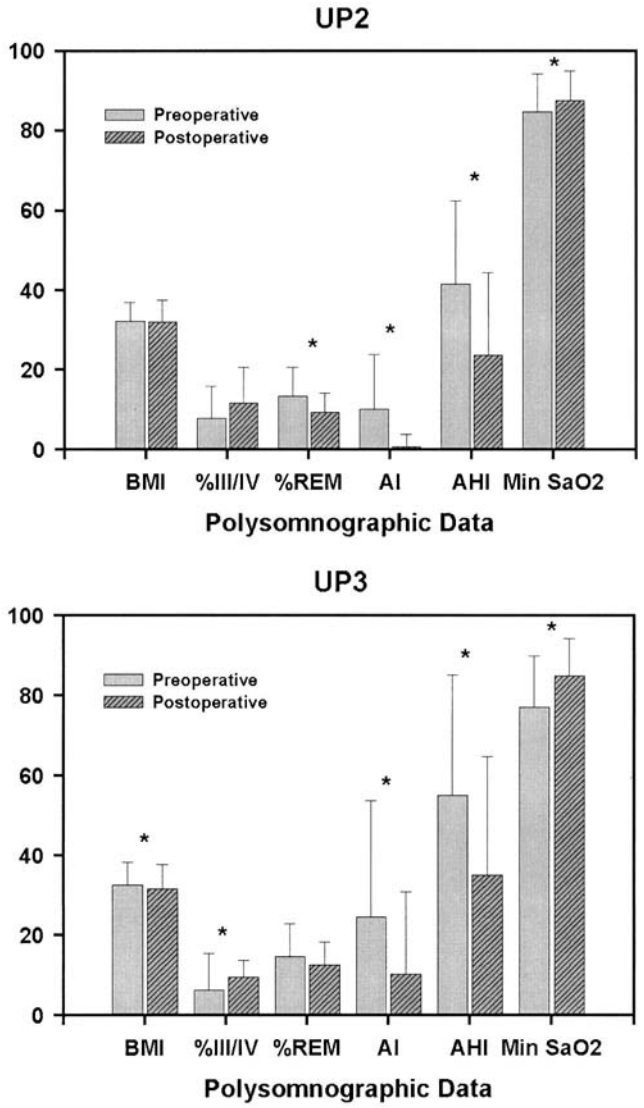


Fig. 8. Comparison postoperative versus preoperative polysomnogram values as measures of clinical improvement of obstructive sleep apnea–hypopnea syndrome in 30 selected patients treated with uvulopalatoplasty (UP2) (A) and 33 selected patients treated with uvulopalatopharyngoplasty (UP3) (B). Statistical significance accepted when $P < .05$. *Significant difference between preoperative and postoperative values. %III/IV, percent of total sleep time (TST) spent in stages III and IV; %REM, percent of TST spent in REM; AI, apnea index; AHI, apnea–hypopnea index; Min SaO_2, minimum recorded arterial oxygen saturation.

Using the classic definition of successful surgical treatment of OSAHS, which requires a 50% or greater reduction in postoperative AHI as compared with the preoperative value and a postoperative AHI of less than 20, we determined the success or failure of UP2 or UP3 in each patient. Surgical treatment of OSAHS with UP2 resulted in successful treatment in 21 (70%) as compared with 19 (55%) patients treated with UP3. There was no significant difference between the two groups with regards to surgical success rate.

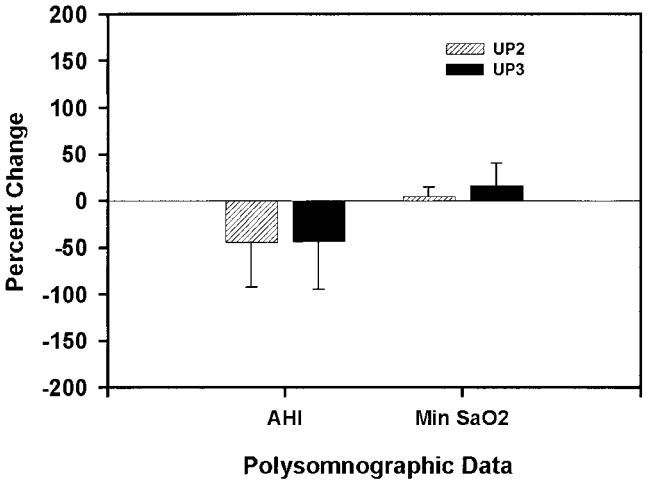


Fig. 9. Comparison uvulopalatoplasty (UP2) versus uvulopalatopharyngoplasty (UP3) for the treatment of obstructive sleep apnea–hypopnea syndrome on percent change of postoperative versus preoperative polysomnogram values as measures of clinical improvement. A negative percent change in apnea–hypopnea index (AHI) and a positive percent change in minimum recorded arterial oxygen saturation (Min SaO_2) represent clinical improvement, whereas the opposites represent clinical deterioration. Statistical significance accepted when $P < .05$. *Significant difference between UP2 and UP3 groups.

DISCUSSION

UP3 is the most common, and in many situations, the only surgical procedure performed by most otolaryngologists for the treatment of OSAHS. Classical UP3 is a surgery designed to correct upper airway narrowing at three levels: the soft palate, the tonsils, and the pharynx. The classic UP3 includes a "pharyngoplasty" that specifically addresses redundant mucosal folds in the pharynx. We suggest that although pharyngoplasty theoretically widens the pharyngeal air space, the resultant exposure of pharyngeal musculature and nervous tissue may contribute to both short- and long-term postoperative morbidity.[1–3] Pain, dry throat, VPI, and difficulty swallowing are the most common short-term morbidities.[2,4,5] The most common long-term morbidity is classified as "abnormal sensation" in the throat, described in various ways by the patients including complaints of a "lump" in the throat, an inability to clear phlegm, or difficulty swallowing.[3,6] Additional surgery on the pharynx probably increases the risk of bleeding as well.

Both groups received comparable adjunctive treatment to the tongue base using a radiofrequency technique. The total energies (in Joules) delivered to two groups were quite similar (Table II), and thus we considered base of tongue reduction by radiofrequency a constant in the two groups, which affected neither subjective nor objective results.

Given that some of the postoperative morbidities associated with UP3 are secondary to pharyngoplasty and that some patients may not need pharyngoplasty, we hypothesized that removing the pharyngeal aspect of the operation for these selected patients may improve objective and subjective results. The design of our study was a retrospective analysis of both objective and subjective measures of success in patients who underwent UP2 versus UP3. We attempted to demonstrate that patients without redundant mucosal folds can undergo submucosal UP2 without compromising objective success compared with UP3 (and perhaps even increasing subjective success compared with UP3).

In UP2, radiofrequency reduction of tonsillar tissue (tonsil coblation) is used to eliminate tonsil tissue so as to avoid surgery on the pharynx. We have previously shown that patients who undergo tonsil coblation have minimal postoperative pain, which is limited to the first 48 hours after surgery. In addition, they have an earlier return to normal diet and activity than patients who undergo classic tonsillectomy.[15] Therefore, we used submucosal palatoplasty combined with tonsil coblation for patients without redundant pharyngeal folds.

Objective measures of successful treatment included data obtained during polysomnography and the incidences of complications and morbidities. Our results showed similar success rates with both UP2 and UP3 for the treatment of OSAHS, albeit in patients deliberately assigned to each type of surgery. Obviously, the palatal surgery adds morbidity. Although the mean number of days of narcotic use of the UP2 group (5.1 ± 1.8 days) was significantly less than the UP3 group (7.6 ± 3.7 days), the procedure can hardly be called painless.

Analysis of complications and postoperative morbidities denoted that patients who underwent UP2 with tonsil coblation had fewer days of postoperative pain (average = 5 days) than those who underwent UP2 with classic tonsillectomy (average > 7 days). Similarly, patients in the UP2 group returned to a normal diet in 4 days versus 9 days in patients who underwent UP3. Unfortunately, our patients had considerably more and longer-lasting pain than anticipated on the basis of the results in tonsil coblation studies.[4] "Abnormal sensation" in the throat was a significant problem in the UP3 group (57.6%) versus the UP2 group (23.3%). The probable reason for the postoperative pain and pain during swallowing is that UP3 exposes underlying musculature and nerve endings, which get triggered once the patient resumes eating. Tonsil coblation, a subcapsular dissection, leaves the underling neurovascular bundle intact. Three cases of VPI were reported in the UP3 group versus none in the UP2 group, although this result was not statistically significant. Dysphagia was present in 18.2% of UP3 patients versus 10% in UP2 patients; however, this result was also not statistically significant. Lastly, postoperative bleeding occurred in three patients assigned to UP3, whereas there were no cases of postoperative bleeding in the UP2 group. This finding likely results from the fact that classic tonsillectomy exposes a vascular rich tonsillar bed, whereas tonsil coblation has the benefit of coagulating blood during the process of tissue reduction.

Subjective measures included pre- and postoperative comparisons in QOL (as measured by the SF-36 v2 Health Survey), ESS, and snoring level. The options available for evaluating QOL in patients with OSAHS include disease-specific tools, such as the Calgary Sleep Apnea Quality of Life Index (SAQLI), and generic tools, such as the SF-36

v2.[16] Lacasse et al.[17] demonstrated that although the SAQLI has strong content and construct validity and is more responsive to changes in QOL than the SF-36 v2, it has to be administered by an interviewer, is time consuming, and demonstrates redundancy. After an initial trial of the SAQLI, we found that it was indeed too sophisticated and time consuming for good compliance from our patients. Thus, we abandoned the SAQLI in favor of the SF-36 v2 Health Survey, a shorter, generic self-completed questionnaire with well-documented validity and previous use in patients with OSAHS.[17,18]

The SF-36 v2 is designed to evaluate patients' QOL in eight domains of health. Using a scale of 0 to 100, patients with high scores in a particular domain have a better QOL in that domain. The SF-36 v2 is designed so that raw scores can be used in isolation or be compared with national norms.[19] In our study, we used the raw scores alone because each patient was compared pre- and postoperatively against him or herself. Using the raw data to compute scores in each of the eight domains, we were able to compare pre- and postoperative QOL (in each of the eight domains) within the UP2 and UP3 groups separately. We then compared the changes in QOL (in each of the eight domains) between the UP2 group and UP3 group so that we could determine whether one procedure caused a more profound improvement in QOL scores.

The UP2 group showed a greater degree of improvement in QOL than did the UP3 group. Specifically, UP2 patients reported greater improvement in BP and MH than UP3 patients. We speculate that the greater degree of improvement in QOL seen with UP2 may relate specifically to less short- and long-term morbidity, as discussed above, including fewer days of pain, fewer days before returning to normal diet, and less incidence of abnormal throat sensation.

One weakness of our study is that it is not randomized in terms of the selection criteria used to assign patients to UP2 or UP3. In other words, patients without pharyngeal folds who had protruding tonsils underwent UP2, whereas those with pharyngeal folds and buried tonsils had UP3. The modified technique is not suitable for all patients. A minimally invasive technique, however, that limits the extent of surgery is inherently better as long as the results and morbidity are comparable or better than a more invasive procedure.

CONCLUSION

In summary, both UP2 and UP3 were successful procedures as indicated by pre- and postoperative improvements in polysomnography, ESS, snoring level, and QOL. However, between the two groups, UP2 resulted in less postoperative morbidity and a greater degree of improvement in QOL than UP3. In selected patients, given the equal success rates between the UP3 and UP2 groups, decreased postoperative morbidity is a possible advantage of the UP2 procedure.

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