Uvulopalatal flap for snoring on an outpatient basis

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OBJECTIVE: **Snoring is now seen as one end of a spectrum of sleep-related breathing disorders, and in its extreme form, snoring can cause obstructive sleep apnea syndrome. Since the introduction of uvulopalatopharyngoplasty, many other procedures have been introduced to alleviate palatal abnormalities seen in patients with obstructive sleep apnea syndrome. A reversible uvulopalatal flap (UPF) achieves the same results as the uvulopalatopharyngoplasty but with less postoperative discomfort. The purpose of this study was to assess the safety and efficacy of UPF for the treatment of simple snoring on an outpatient basis.**

METHODS: **UFP was performed on an outpatient basis under local anesthesia. The mucosa on the lingual surface of the uvula and soft palate was removed with cold knife dissection. The uvular tip was amputated. The uvula was reflected back toward the soft palate and sutured. Most of the patients were male with simple snoring by history and confirmed by polysomnographic study. Data on patients were compared from preoperative to postoperative assessment points. Statistic analysis was performed.**

RESULTS: **Fifty-six patients tolerated the procedure well, and it was performed in an average of 20 minutes. Patients had a mean age of 48 years and a mean body mass index of 26.5 kg/m^2. The mean follow-up was 14 months (range, 12 to 20 months). Significant improvement was observed in snoring scale (8.2 ± 3.4 versus 2.6 ± 1.4, $P < 0.05$). Mean snoring index decreased from 245.8 ± 40.8 to 42.5 ± 20.7 events/hr ($P < 0.001$). The correlations between the changes in the subjective and objective snoring assessments were statistically significant. Postoperative complications included transient nasal regurgitation (4%) and foreign body sensation (2%). Bleeding, dysphagia, infection, and nasopharyngeal stenosis were not observed. Most patients had mild to moderate pain (visual analog scale, ≤7) for 5 to 7 days after the procedures. The overall success rate was 88%.**

CONCLUSION: **Snoring, as reported by subjective and objective results, decreased after UPF. It appears to be a safe and effective procedure, which can be easily performed under local anesthesia on an outpatient basis, in carefully selected patients.**
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Snoring is caused by partial upper airway collapse usually created by vibration of the velopharynx. Interpersonal disharmony and enormous nuisance are brought about by this distressing symptom. It disturbs the sleeping pattern and robs the snorer of appropriate rest. Snoring is now seen as one end of a spectrum of sleep-related breathing disorders (SRBDs), and in its extreme form, snoring can cause obstructive sleep apnea syndrome (OSAS). It has also been associated with medical conditions such as hypertension, coronary disease, and cerebrovascular disease.[1,2] An increasing number of patients who snore are being referred to sleep disorders services for evaluation and possible treatment recommendations. Once OSAS has been ruled out, the question of how best to treat the socially disruptive snoring must be addressed. There are both medical and surgical treatments for people who snore; when medical treatment fails, surgical treatment is the alternative.

Since the introduction of uvulopalatopharyngoplasty (UPPP),[3] many other procedures have been introduced to alleviate palatal abnormalities in patients with snoring and OSAS. A reversible uvulopalatal flap (UPF) introduced by Powell et al[4] also achieves the same results as the UPPP but with less postoperative discomfort, less risk of developing velopalatal insufficiency, and fewer complaints of a thickened secretion or foreign body sensation. However, significantly associated morbidity and factors relating to general anesthetic cost and recovery time make it difficult to

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justify performing this palatal surgery for snoring alone. The purpose of this study was to assess the safety and efficacy of UPF for the treatment of simple snoring under local anesthesia on an outpatient basis.

MATERIALS AND METHODS

One hundred fifty consecutive adult patients were evaluated for treatment of SRBDs at Vajira Hospital over a 12-month period. A complete history was taken of each patient, and thorough physical and otolaryngologic examinations were performed. The nasopharynx, hypopharynx, and larynx were visualized with the use of flexible nasopharyngoscopy with Muller's maneuver performed at the levels of the nasopharynx and the base of the tongue. A lateral cephalogram was undertaken to assess bony and soft tissues measurements for baseline data and inclusion and exclusion purposes and to compare changes in the soft palate length and width after treatment. The traditional measurements to evaluate the airway in SRBDs included the angle between the sellar point to nasion line and maxillary point A (SNA) and mandibular point B (SNB), posterior airway space (PAS), distance between the posterior nasal spine and uvula (PNS-P), length between mandibular plane and hyoid bone (MP-H),[5] and soft palate width (PW).[6]

Patients were advised of conservative treatments to reduce snoring (ie, lose weight, avoid sleeping supine, develop regular sleeping patterns, consider nasal or dental appliances, and avoid alcohol, sedatives, and tobacco). The patients who had failed to respond to the conservative treatments were counseled about the benefits and risks of surgical procedures. Informed consent was provided by all patients. The study was an open, prospective design and was approved by the hospital ethics and research committee.

Sixty patients (40%) who had a primary complaint of snoring were found to be suitable for UPF performed in an outpatient setting. Patients with a primary complaint of apneic events and patients with severe nasal obstruction were excluded. Only patients with elongated uvula or thick soft palate had UPF performed. Polysomnography was performed to rule out OSAS if the patients or bed partners reported any doubtful signs or symptoms of daytime sleepiness, restless disturbed sleep, or observed apnea. OSAS was diagnosed in patients who experienced daytime sleepiness or disturbed sleep and had more than 5 respiratory disturbances per hour of sleep on their polysomnogram. Polysomnography was performed in the sleep laboratory with full monitoring that included an electroencephalogram, electro-oculogram, chin and leg electromyograms, electrocardiogram (modified V_2 lead), airflow, thoracic and abdominal efforts, pulse oximetry, and snoring sound (Alice 3 System; Healthdyne; Atlanta, GA). Snoring sound was measured with a microphone placed at the trachea. The snoring events per hour (snoring index) and the percentage of sleep time in which snoring was loud, soft, or absent were counted. The polysomnogram was analyzed according to the standards of the American Thoracic Society.[7] Baseline information was collected. The patient's bed partner or observer used a 10-cm visual analog scale (VAS) to grade the severity of snoring before the procedure and postoperative treatment. "No snoring" occupied the far left portion of the scale, whereas "severe snoring" occupied the far right portion of the scale. An Epworth Sleepiness Scale (ESS), which reflected the chance of dozing in specific situations as well as daytime sleepiness,[8] was completed at baseline.

Uvulopalatal Flap under Local Anesthesia

UPF was performed as described originally by Powell et al,[4] using the modification in which the procedure was performed under local anesthesia on an outpatient basis, instead of general anesthesia. It was performed with the patients sitting upright. The soft palate was anesthetized with lidocaine 10% topical dispersion, and 5 to 10 mL lidocaine 1% with epinephrine solution was additionally injected at 3 points 1 cm from the lower rim of the palatal arch. The mucosa, submucosa with glands, and fat on the lingual surface of the uvula and soft palate were removed with scalpel. The uvular tip was amputated, and bleeding was controlled with bipolar electrocoagulation.

The uvula was reflected back toward the soft palate and fixated into its new position with multiple sutures of 3-0 polyglyclic acid (Fig 1). After

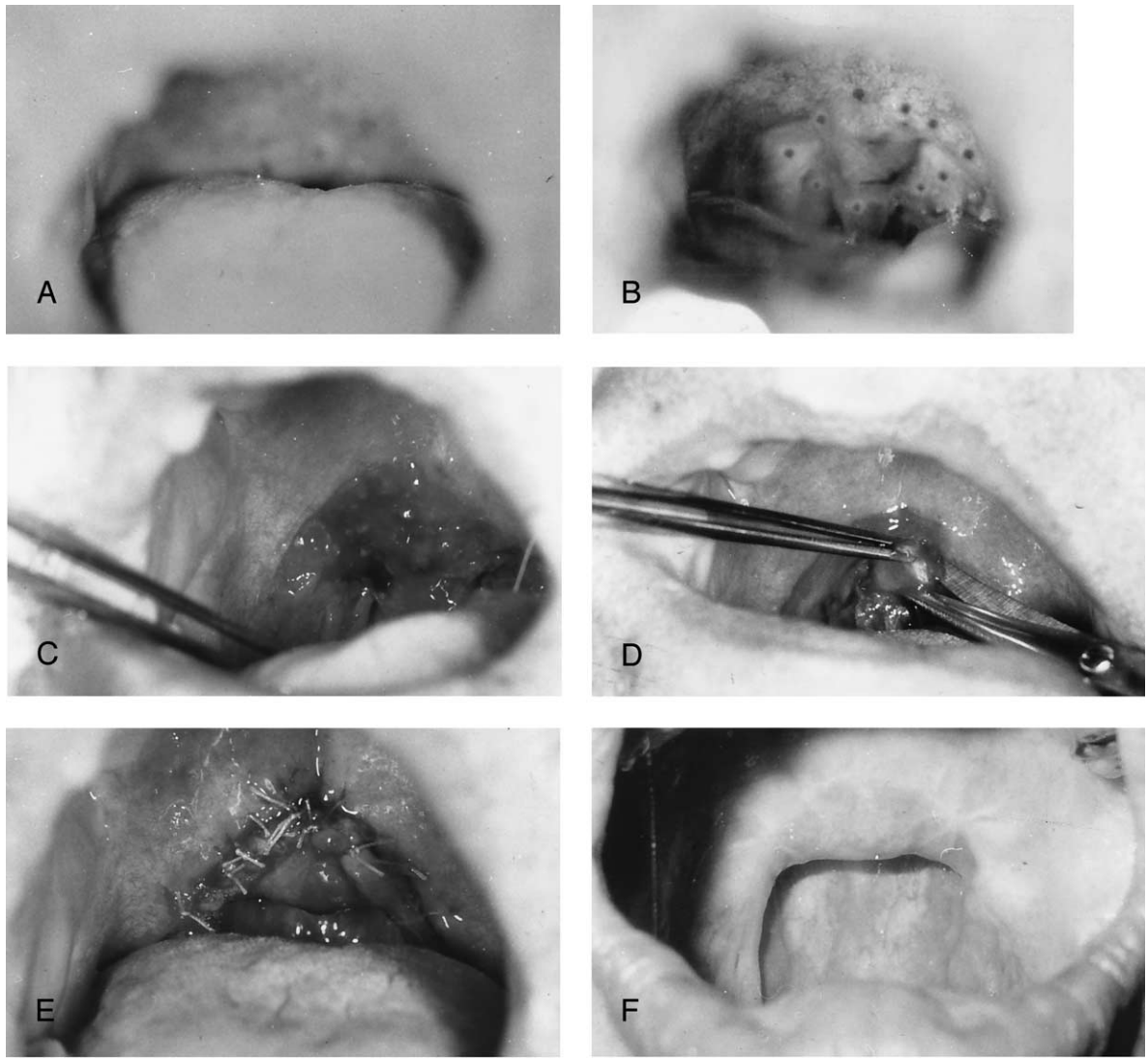

Fig 1. (A) Before uvulopalatal flap (UPF) procedure. **(B)** After the soft palate is anesthetized, an outline of the flap (dotted line) is made on the palatal mucosa. **(C)** The mucosal strip is then carefully dissected and removed with a scalpel. **(D)** A portion of the tip of the uvula is amputated. **(E)** The uvula is reflected back toward the soft palate and fixed into its new position. **(F)** One year after UPF procedure.

the procedure, patients were observed for 20 to 30 minutes. Postoperative medications included antibiotic suspension for 7 days and acetaminophen with codeine elixir and/or anesthetic lozenges as needed for pain relief. Patients were seen in follow-up at 1, 2, and 4 weeks and after a repeat polysomnogram was completed.

VASs for postoperative pain, difficulty in swallowing, and change in speech were completed once daily for 10 days after the procedure. The patients were asked to rate postoperative pain on a continuous scale from 0 (none) to 10 (excruciating or intense pain), speech problem from 0 (none) to 10 (extreme difficulty talking), and swallowing problem from 0 (none) to 10 (unable to swallow without pain even after analgesic medications). Data on the patients were compared from the preoperative stage to the postoperative assessment and analyzed by Student's *t* test, and Pearson's correlation.

RESULTS

Fifty-six (93.3%) patients completed the questionnaires, cephalogram, and polysomnogram at

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Table 1. Polysomnographic data before and after UPF procedure

Characteristic	Before	After	*P* value
RDI	3.2 ± 1.2	3.0 ± 1.8	NS
Sleep efficiency (%)	86.6 ± 8.6	87.5 ± 10.4	NS
LAST (%)	86.4 ± 9.6	88.2 ± 5.5	NS
Mean oxygen saturation (%)	95.2 ± 1.8	96.2 ± 2.1	NS
REM sleep (%)	14.1 ± 5.2	14.5 ± 2.5	NS
Snoring index (events/hr)	245.8 ± 40.8	42.5 ± 20.7	<0.05
Time spent during snoring (%)	10.2 ± 1.5	3.8 ± 2.8	<0.001

LAST, Nadir oxygen saturation; *RDI*, respiratory disturbance index; *REM*, rapid eye movement.

both preoperative and postoperative evaluations and were included in the analysis. The patients were examined between 12 and 20 months after the operation (mean ± SD = 14.2 ± 3.2 months). Ages ranged from 28 to 50 years (48.3 ± 10.2 years). Forty patients (71.4%) were married and 16 (28.6%) were single or divorced; 50 (89.3%) were male. Body mass index (BMI) at the time of surgery ranged from 25.2 to 28.2 kg/m^2 (26.5 ± 2.4 kg/m^2) and at postoperative period 25.3 to 28.9 kg/m^2 (26.8 ± 3.5 kg/m^2). There was no significant difference between preoperative and postoperative BMI. All patients tolerated the procedure well, and it was performed in an average of 20.2 ± 7.4 minutes (range, 15 to 30 minutes).

Significant improvement from the baseline (8.2 ± 3.4) was observed in the VAS at postoperative period (2.6 ± 1.4, $P < 0.05$). The average preoperative VAS was 8.2, 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. Based on this criterion for a cure of snoring, the problem was eliminated in 88% (49 of 56) of the patients. The subjective data measured with the ESS (0 to 24) showed significant improvement. The mean preoperative ESS scale was 8.1 ± 3.5, and the mean postoperative ESS scale was 5.2 ± 3.2 ($P < 0.001$).

The mean snoring index decreased significantly from 245.8 ± 40.8 events/h to 42.5 ± 20.7 events/h ($P < 0.001$). The mean percentage of time spent in loud snoring also decreased significantly from 10.2% ± 1.5% to 3.8% ± 2.8% ($P < 0.001$) (Table 1). The correlation between snoring measures following the UPF procedure, the changes in snoring index, and the changes in subjective snoring report (VAS) were positive and statistically significant ($r = 0.38$, $P < 0.05$). The correlation between the changes in percentage of time spent on snoring and the changes in VAS was also positive and statistically significant ($r = 0.42$, $P < 0.05$). There was a significant reduction in the distance between the posterior nasal spine and soft palate (PNS-P) from 45.7 ± 4.1 mm to 42.1 ± 2.8 mm ($P < 0.001$), and there was a significant reduction in the palatal width (PW) from 10.4 ± 2.1 mm to 8.4 ± 2.4 mm ($P < 0.05$). There were no changes in the skeletal (SNA, SNB), or soft tissues measurements at the tongue base (MP-H, PAS), because these areas were not treated or affected by the treatment (Table 2).

Table 2. Cephalometric data before and after UPF procedure

Measurement*	Before	After	*P* value
SNA (degrees)	80.5 ± 3.4	80.2 ± 4.5	NS
SNB (degrees)	79.2 ± 2.9	79.5 ± 3.4	NS
PAS (mm)	10.2 ± 2.4	10.4 ± 3.2	NS
PNS-P (mm)	45.7 ± 4.1	42.1 ± 2.8	<0.001
PW (mm)	10.4 ± 2.1	8.4 ± 2.4	<0.05
MP-H (mm)	18.5 ± 3.2	18.2 ± 4.1	NS

*Measurements described in text.
SNA, sella-nasion-point A angle; SNB, sella-nasion-point B angle; PAS, posterior airway space; PNS-P, length from posterior nasal spine to uvula; PW, palatal width; MP-H, length between mandibular plane and hyoid bone; NS, not significant

Postoperative complications included transient nasal regurgitation (4%; 2 of 56) and foreign body sensation (2%; 1 of 56). Bleeding, dysphagia, infection, and nasopharyngeal stenosis were not observed. There were no emergent airway complications in this study. Most patients (52 of 56) had mild-to-moderate pain (VAS ≤7) for 5 to 7 days after the procedure. There was minimal morbidity

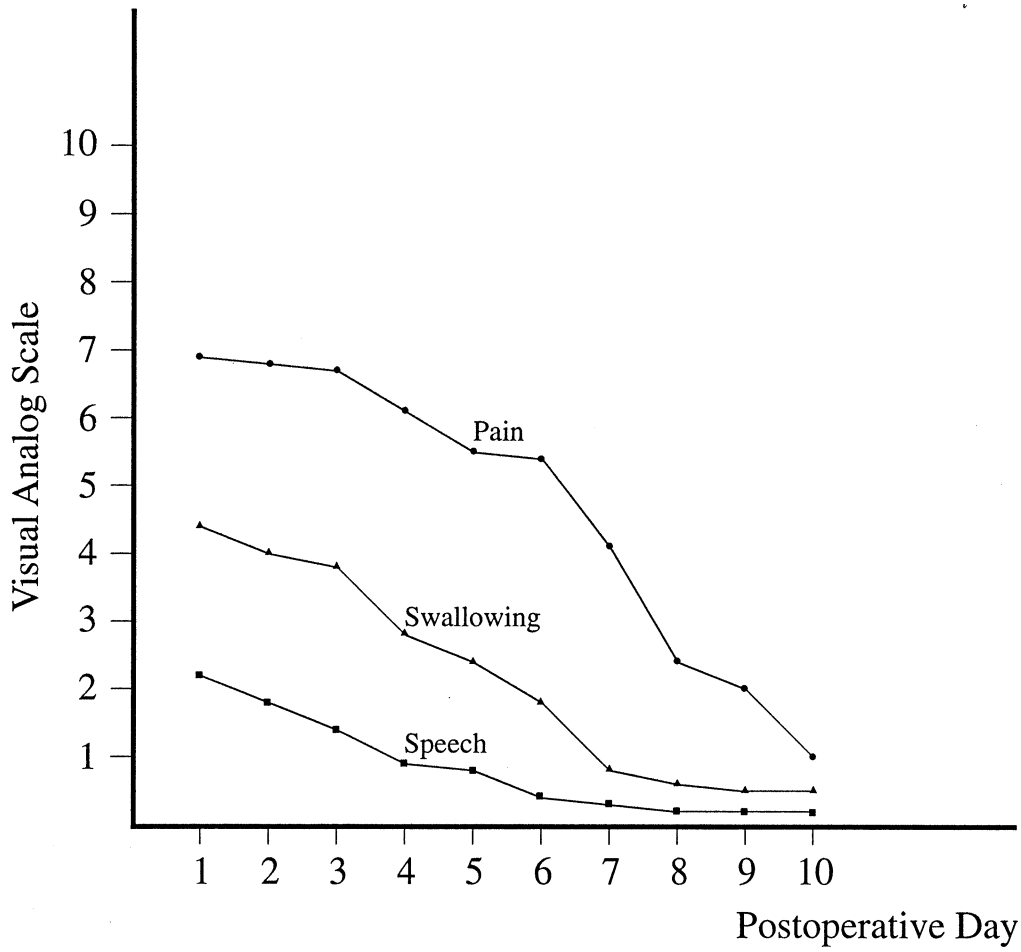

Fig 2. Mean VASs for pain, swallowing problem, and speech problem after UPF procedure.

associated with the treatment. VASs for pain, swallowing, and speech are shown in Figure 2.

DISCUSSION

Snoring is a common disorder that affects at least 30% of the adult population.[9,10] Snoring can have both social and medical effects. It can make the snorer an object of ridicule and cause others sleepless nights. When snoring is severe, it can cause serious long-term health problems. Many patients with simple snoring are satisfactorily treated with dietary measures and with attention to underlying conditions. For some the symptom is so distressing as to warrant consideration of surgical treatment. UPPP was introduced by Fujita et al[3] in 1981 for the treatment of OSAS. Subsequently it was used in patients with snoring alone, in the absence of OSAS. The surgical concept for treatment of snoring is to enlarge the upper airway, thereby restoring its patency during sleep. Palatal surgery is now the largest established surgical approach to snoring.

The UPF procedure described by Powell et al[4] provides the same anatomic results as the UPPP but with less postoperative pain, less risk of developing velopharyngeal insufficiency, and fewer complaints of foreign body sensation. The excess palate and uvula were tacked up to the remaining function palate. If the reduction was too extreme, the flap could be released in the postoperative period. This procedure was reversible. However, significantly associated morbidity, as well as factors relating to general anesthesia cost and recovery time, makes it difficult to justify performing the UPF for snoring alone. In this study, the UPF was performed as a one-stage surgery under local anesthesia on an outpatient procedure. 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 20 minutes.

There was a significant reduction in the distance between posterior nasal spine and soft palate and a significant reduction in the palatal width. The reposition and stabilization of the uvula on the soft palate were responsible for the wide opening of the retropatatal airway space. Postoperative scarring additionally stabilized the soft palate and thus prevented vibration and snoring. These UPF results were comparable to the UPPP and laser-assisted uvulopalatoplasty (LAUP) subjective results. The UPPP literature showed that short-term improvement in snoring occurred in 76% to 95%[11-13] of treated patients. The LAUP success rates for snoring relief ranged from 77% to 85%.[14-16] In this study the UPF success rate for snoring was 88%. The ESS improved in this study from a preoperative mean of 8.1 ± 3.5 to a postoperative mean of 5.2 ± 3.2 ($P \leq 0.001$). These scales were compared with reported mean ESS scales of Johns[8] for normal control subjects, primary snoring, and OSAS of 5.9 ± 2.2, 6.5 ± 3.0 and 11.7 ± 4.6, respectively. The preoperative mean ESS scales were consistent with a low level but present sleepiness, and they declined after treatment to a normal level.

Subjective measurements were widely conducted to assess postoperative results of snoring surgeries. However, there were few studies about objective assessments of palatal surgery for snoring. Weingarten[17] found that there was a significant decrease in snoring loudness and that there was an elevation in the fundamental frequency after snare uvulopalatoplasty. Schafer[18] had reported from his 20 patients that sound pressure level and low frequency content of the spectrum below 400 Hz were reduced after UPPP. Walker et al[19] found that the maximum average loudness and velum-like respiratory noise loudness showed a statistically significant decrease when comparing the preoperative snoring to the final recording after LAUP treatment was completed. They also found that the velum-like relative loudness correlated best with the subjective perception of snoring. Again, objective evidence of improvement in snoring after UPF treatment has not been previously described. This study demonstrated a significant improvement in the snoring index (245.8 ± 40.8 versus 42.5 ± 20.7 events/h, $P < 0.001$) and the percentage of sleep time spent in loud snoring (10.2% ± 1.5% versus 3.8% ± 2.8%, $P < 0.001$). It also appeared that the changes in both parameters correlated significantly with the changes in the subjective perception after UPF treatment of snoring.

This technique was a mucosal procedure thus speech disturbance, swallowing problem, and swelling were moderate and transient. Postoperative bleeding was not encountered because the UPF lacked deeper musculature cutting. There was a reduction of pain and a decrease risk of wound contracture because sutures were not placed on the free edge of the palate.

Snoring, as reported by subjective and objective results, decreased following this procedure. UPF aims at shortening and tightening the soft palate to increase the retropalatal upper airway patency. Postoperative scarring may also stabilize the soft palate and thus prevent vibration and snoring sound generation at this site. It appears to be a safe and effective procedure that can be easily performed under local anesthesia on an outpatient basis in carefully selected patients using inexpensive instrumentation. However, follow-up studies are needed to determine the long-term outcomes of UPF for the treatment of snoring.

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