

SUBMUCOSAL RADIOFREQUENCY UVULOPALATOPLASTY WITHOUT TEMPERATURE CONTROL FOR THE TREATMENT OF SNORING

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Submucosal radiofrequency uvulopalatoplasty is a technique for the treatment of snoring which utilizes predetermined and fixed parameters of application, instead of temperature control, to selectively ablate the soft palate submucosally. Submucosal radiofrequency uvulopalatoplasty has been shown to be as effective and safe as techniques using temperature control and does not require the expensive technology needed to monitor tissue temperature during ablation.

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Submucosal radiofrequency ablation of the soft palate has been shown to be an effective treatment for socially disruptive snoring without the associated postoperative pain of a standard uvulopalatoplasty or laser-assisted uvulopalatoplasty.¹⁻⁶ The radiofrequency ablation causes volumetric reduction and tightening of the soft palate as the injured tissue is replaced by fibrosis and the absence of mucosal injury minimizes postoperative pain.³ Radiofrequency ablates tissue not by heating the electrode but by heat generated as a byproduct of ionic agitation to the high frequency alternating current as it flows from the electrode tip into the surrounding tissue. This technology was first evaluated by Harvey Cushing and W. T. Bovie for cutting and coagulation in the 1920s. Most radiofrequency generators are essentially the same as a Bovie electrocautery generating a frequency of around 500kHz. Thus the term "electrocautery" is often used synonymously with "radiofrequency" although in the past electrocautery implied a technique in which the needle electrode itself was heated to ablate or coagulate tissue. The histological change after ablation using radiofrequency or techniques that directly heat the electrode are the same.^{7,9}

The factors that control lesion dimension and heat generation during radiofrequency ablation are the needle electrode configuration (diameter and length), wattage applied, time of power application, and the electrical and conductive properties of the tissue ablated.^{7,8} Similar tissue, which does not have significant physiologic variation, treated with the same parameters of application (needle electrode configuration, wattage, and length of power application) will have similar lesion dimensions. This can be demonstrated by applying fixed parameters to similar tissue and measuring the heat generated, which correlates

with lesion dimension, and should be the same with each application. Thus the monitoring of tissue temperature during radiofrequency ablation of similar tissue without significant physiologic variation (ie, soft palate) is logically not necessary once the appropriate parameters of application have been determined since the lesion dimension and heat generated will be the same with each application. The use of a thermocoupler to measure tissue temperature during radiofrequency ablation adds significantly to the cost of the procedure because of the additional technology required.

The described technique of submucosal radiofrequency uvulopalatoplasty (SRUP) uses predetermined and fixed parameters of application without concomitant temperature monitoring to selectively ablate the submucosal soft palate for the treatment of socially disruptive snoring. This and similar techniques have been shown to be as effective and safe as the techniques which utilize the concomitant monitoring of tissue temperature to control lesion dimensions, and are faster and less expensive to perform.^{1,2} The technique utilizes a relatively inexpensive high frequency radiofrequency generator (Ellman IEC; Ellman International Inc, Hewlett, NY) (Fig 1) and specialized submucosal needle electrodes (Figs 2, 3). The needle electrode is designed with proximal insulation to prevent mucosal injury at the insertion site.

PROCEDURE

Patients with chronic socially disruptive snoring without relative contraindications such as significant obstructive sleep apnea, tonsillar hypertrophy, palatal deformities, or a pacemaker are candidates for the procedure. All patients have a preoperative assessment to rule out significant obstructive sleep apnea. In general, 2 to 4 treatments can be anticipated and are scheduled at 4 to 6 week intervals. The risks of postoperative mucosal ulceration with associated pain, and rare but possible complications of palatal fistula and velopalatal insufficiency are explained. The patient is scheduled for a 15 minute office visit and no preoperative medications are prescribed. The patient is placed in a reclined sitting position and the oral cavity is topically anesthetized with 20% benzocaine to control the

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FIGURE 1. Radiofrequency generator- Ellman IEC 4.0 Dual RF



FIGURE 3. Submucosal needle electrode.

gag reflex and minimize the discomfort of the infiltration of local anesthesia. The periphery of the soft palate is then infiltrated with 3 cc of 1% xylocaine with 1:100,000 epinephrine. The area for ablation is not directly infiltrated, as the change in tissue fluid content is a variable that will alter lesion dimension. Anesthesia at the treatment site is then confirmed. The antennae plate (grounding plate) is placed behind the neck. A specially designed needle electrode (submucosal needle electrode, Ellman International Inc, Hewlett, NY) (Figs 2, 3) with a 2 cm length—the proximal 1 cm is insulated—and a 22 gauge tip is used to perform the ablation. The needle electrode is initially inserted midline in the soft palate, approximately 2 cm anterior to the base of the uvula so that, when fully inserted, the tip of the needle electrode is in the base of the uvula (Fig 4). It is important to maintain the tip of the needle electrode at a median depth between mucosal surfaces to minimize the incidence of mucosal ulceration (Fig 5, 6). Err on the side of the posterior soft palate mucosa, as mucosal ulceration on this surface rarely leads to pain or discomfort.¹⁰ Once the needle electrode is fully inserted and proper placement is confirmed, the power is applied for 20 seconds and then discontinued prior to withdrawal of the needle electrode. Radiofrequency energy is applied via an Ellman IEC radiofrequency generator (Ellman) at a setting of 35 (approximately 17 watts) in the coagulation mode. After removal from the initial treatment site, the

needle electrode is reinserted approximately 1 cm anterior and another treatment is performed. In patients with a long soft palate (ie, most men) a third treatment is applied another 1 cm anterior. The overlying mucus membranes are observed during the power application and the treatment is terminated if any mucosal changes are noted. Mucosal changes during the treatment are associated with mucosal injury and ulceration.

Subsequent treatments are performed with follow up in a similar fashion 2 to 4 mm paramedian, avoiding previously treated areas of the soft palate. Comparable results have been obtained treating the base of the uvula and then paramedian to the base of the uvula on the initial treatment,² but care must be taken not to devascularize the posterior medial soft palate. Increasing the power settings, time of power application, or number of ablation sites during a treatment should be done with caution because this will increase postoperative edema and devascularize more of the soft palate. No postoperative medications are prescribed and patients are scheduled for follow up in 4 to 6 weeks. They are told to expect some swelling and associated mild discomfort but are to contact the surgeon

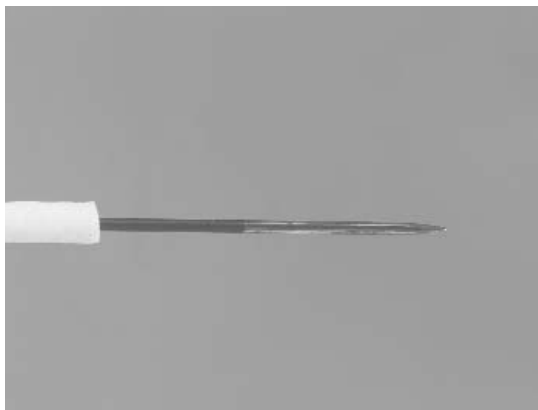


FIGURE 2. Submucosal needle electrode (Ellman International) 2 cm tip with proximal 1 cm insulated to prevent mucosal injury at insertion site.

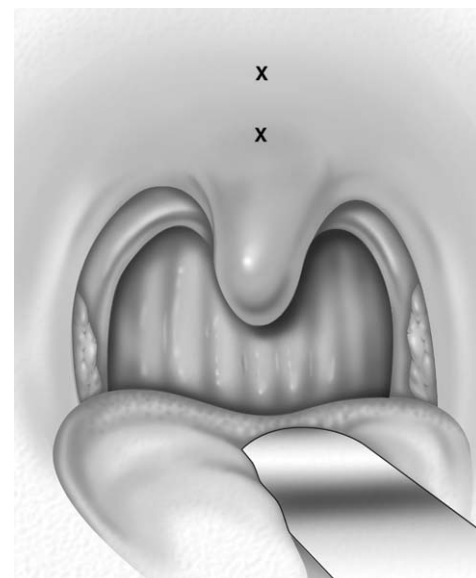


FIGURE 4. Initial needle insertion sites. The tip of the needle electrode should be in the base of the uvula when fully inserted with first ablation and then removed and reinserted approximately 1cm anterior for the subsequent ablation site.

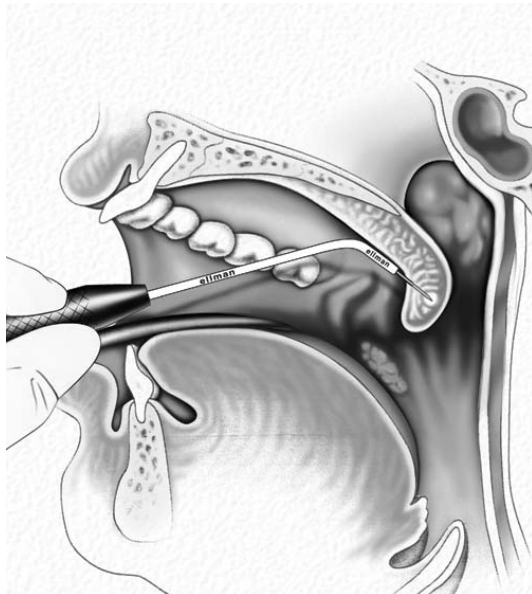


FIGURE 5 and 6. Maintain needle electrode midway between mucosal surfaces to prevent mucosal injury. Err on the side of the nasopharyngeal mucosa as mucosal injury here usually is not associated with discomfort. When the needle electrode is fully inserted pull it forward to help in confirming the appropriate depth of insertion. Discontinue power application if any mucosal blanching is noted during the ablation.

regarding any significant pain. Pain usually indicates that a mucosal ulceration has occurred, and these patients are then placed on antibiotics and asked to gargle a 50:50

solution of hydrogen peroxide and water. The incidence of mucosal ulceration should be less than 15% and decreases significantly with experience. The patient's bedmate is to assess the snoring just prior to follow up to determine if any further treatments are indicated. Treatments are terminated with resolution of snoring, diminution in snoring to a point no longer bothersome to the bedmate, or if there is no improvement in snoring after 3 treatments. No more than 4 treatments should be performed. The success rate in resolving snoring or improving it to the point where the bedmate no longer perceives it to be a problem is 80% to 85%.^{1,2}

CONCLUSION

SRUP using the described technique is an effective, safe, well-tolerated, and relatively inexpensive treatment for socially disruptive snoring in appropriately selected patients. The efficacy and associated morbidity are similar to techniques that measure tissue temperature during ablation (ie, somnoplasty) and the SRUP technique is significantly less expensive to perform.

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