

# Short-term and Long-term Results of Soft-Palate and Tongue-Base RF Surgery in the Treatment of Obstructive Sleep Apnea (OSA)

By Chairat Neruntarat, MD, Suprapol Chantapant, MD, Bangkok, Thailand

OSA is the result of a narrow upper airway and its tendency to collapse during sleep. Such obstructions can occur at multiple sites. Radiofrequency has been reported to be a successful treatment for the soft palate and tongue base [1, 2]. Many centers have confirmed the treatment results [3-5]. However, little is known about the long-term results. This study compares short-term and long-term results and investigates factors that determine long-term efficacy.

**Materials and Methods:** Over a period of 10 months 245 patients were examined for OSA. The first visit included a physical and ENT examination, pharyngoscopy with Muller's maneuver at the level of nasopharynx and the tongue base as well as a lateral cephalometric radiograph. The complete history was recorded, the BMI was calculated, and bed partners were interviewed. Initially all patients were advised on various conservative treatment options. 80 patients (32.7%) with oropharyngeal obstruction (elongated soft palate according to a cephalometric analysis and 50% collapse with Muller's maneuver) and hypopharyngeal obstruction (narrow posterior airway space PAS according to cephalometric analysis and 50% collapse with Muller's maneuver), who had failed conservative treatment, were found suitable for soft-palate and tongue-base reduction and included in the study. Patients with hypertrophic tonsils or significant nasal obstructions were excluded.

Preoperative and postoperative polysomnography was performed to evaluate results. Patients with an apnea hypopnea index (AHI) > 40 and lowest oxygen saturation (LSAT) < 80% received CPAP treatment at least 2 weeks prior to surgery and had to continue CPAP until the polysomnogram outcome was documented. Moreover, before and after the treatment, an Epworth Sleepiness Scale (ESS 0-24) was established while the bed partner evaluated the snoring on a visual analog scale (VAS). Short-term results were measured 3 months postoperatively and long-term results at least 1 year postoperatively.

**Intervention:** RaVoR™ was performed with a Sutter generator (CURIS®, Sutter Medizintechnik GmbH, Freiburg, Germany) and the corresponding re-usable soft-palate and tongue-base probes. The treatment was performed in stages, with at least 2 sessions and a minimum of 2 weeks between the sessions. The procedure was performed with patients sitting upright. The treatment was repeated until the sleep-related breathing symptoms did not bother the patient and the bed partner any more.

10% xylocaine was applied topically and 5-10 ml xylocaine 1% with adrenaline was injected into the soft palate and the tongue base. In each session the middle part of the soft palate between the base of the uvula and the posterior nasal spine was treated with 3 lesions (1 midline and 2 paramedian). The tongue area along the midline, anterior and posterior to the circumvallate papillae, was treated with 3 lesions. After the procedure patients were observed

for 20 to 30 minutes and offered hospital admission for one day. Antibiotics were given for one week postoperatively as well as acetaminophen elixir and anesthetic lozenges, as needed.

Follow-up visits were scheduled 1 week, 2 weeks, 4 weeks and 3 months after the procedure. One repeat polysomnogram was completed. For 10 days postoperatively a VAS for pain was completed. Preoperative and 3 months postoperative (short-term) data was compared using the Student's t test and Mann-Whitney U test. A multiple logistic regression model was used to determine independent predictors for non-responders. 95% confidence intervals were calculated.  $P < 0.05$  was considered significant.

**Results:** 90 % of the patients (72, 69 male and 3 female), who completed the questionnaires as well as the short-term and long-term (12-16 months,  $14.2 \pm 1.8$ ) polysomnograms, were included. On average patients underwent  $3.5 \pm 0.7$  treatments for the soft palate and  $4.8 \pm 0.8$  for the tongue base. The BMI ( $\text{kg}/\text{m}^2$ ) was  $28.8 \pm 2.4$  at the time of surgery;  $29.1 \pm 2.8$  at short term and  $30.9 \pm 2.8$  at long term. No changes in the skeletal measurements were found. A reduction of distance between the posterior nasal spine and palate (PNS-P) from  $45.4 \pm 2.9$  mm to  $43.1 \pm 2.6$  mm ( $P < 0.005$ ) and an increase of the posterior airway space (PAS) from  $6.2 \pm 2.1$  mm to  $8.7 \pm 2.3$  mm were found.

Success was defined as 50% reduction of AHI and a final score of 20 or less. 48 (66.7%) patients responded in the short term. The AHI was reduced from  $35.6 \pm 9.2$  to  $12.5 \pm 4.8$  and the mean LSAT increased from  $85.6 \pm 3.4\%$  to  $88.7 \pm 2.9\%$ . 40 (55.6%) patients had long-term success with AHI  $16.8 \pm 3.2$  and LSAT  $88.2 \pm 2.4\%$ . Only BMI  $\geq 29 \text{ kg}/\text{m}^2$  and AHI  $\geq 30$  were independently associated with non-responders (odds ratio 2.76, 95% CI 1.3-2.9,  $P < 0.01$  and odds ratio 1.97, 95% CI 1.1-2.2,  $P < 0.05$  respectively). For patients who relapsed after initial success, the change in BMI was significantly different ( $2.8 \pm 1.8 \text{ kg}/\text{m}^2$ ) compared to long-term responders ( $0.3 \pm 0.2$ )  $P < 0.05$ . Compared to  $14.2 \pm 3.4$  baseline, postoperative evaluation of all patients showed an improved ESS;  $7.9 \pm 2.1$  in the short term and  $8.2 \pm 2.5$  in the long term ( $P < 0.001$ ). The difference between short-term and long-term results was significant  $P < 0.005$  and non-responders had a recurrence of daytime sleepiness (ESS  $7.2 \pm 1.8$  to  $13.1 \pm 2.9$ ,  $P < 0.01$ ). The success criteria for snoring was defined as 50% reduction on VAS ( $8.3$



Fig. 1: CURIS® RF unit (Sutter, Germany)

$\pm 1.6$  preoperatively). Short-term and long-term results show significant improvement ( $2.7 \pm 1.3$  and  $3.1 \pm 1.8$ ,  $P < 0.001$ ) in 56 (77.8%) and 50 (69.4%) patients respectively. 8 patients relapsed from  $2.2 \pm 1.2$  to  $7.1 \pm 2.5$  ( $P < 0.001$ ).

Complications included palatal (8.2%) and lingual (8.2%) ulcer, dysphagia (8.2%), swelling of the floor of the mouth (6.8%) and aspiration (6.8%). They were resolved within less than 3 weeks; no emergencies, bleedings, severe infections or nerve paralysis occurred. Most patients had mild to moderate pain (VAS  $\leq 5$ ) for a few days.

**Conclusion:** Radiofrequency surgery (RaVoR™) of the soft palate and the tongue base is a minimally invasive and safe treatment option for OSA. RaVoR™ is successful in the short and long term. The re-usable probes make the treatment affordable for more patients. Especially patients with a low BMI and moderate AHI can benefit. Patients with recurrence show a significant increase of BMI. This emphasizes the importance of weight control to achieve long-term success.



Chairat Neruntarat, MD  
Professor, Chair  
Department of Otolaryngology,  
Faculty of Medicine,  
Srinakharinwirot University,  
Bangkok/Thailand.

**Correspondence:** Chairat Neruntarat, MD, Department of Otolaryngology, Faculty of Medicine, Srinakharinwirot University, Sukhumvit 23, Bangkok 10110, Thailand

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**Further literature with the author.**

# Featured Product



**700495 – Bipolar needle electrode „Marinescu“ for the soft palate**

Qty.	REF	Description
1	700495	Bipolar needle electrode „Marinescu“ for the soft palate with protective insulation



**700499 – Bipolar needle tongue-base probe**

Qty.	REF	Description
1	700499	Bipolar needle electrode for the tongue base with protective insulation



**870010 – CURIS® basic set with single-use patient plates**

Qty.	REF	Description
1	360100-01	CURIS® radiofrequency generator (incl. mains cord, user's manual and test protocol)
1	360110	Footswitch two pedals for CURIS® (cut & coag), 4 m cable
1	370154L	Bipolar cable for CURIS®, length 3 m
1	360704	Monopolar handpiece (pencil) cut & coag, shaft 2.4 mm, cable 3 m
1	360236	Cable for single use patient plates, length 4.5 m
1 (x50)	360222	Safety patient plates, single use, packing 5 x 10 pcs. (not shown)

**\*Optional model**

CURIS® basic set with re-usable patient plate (REF 870020)



SUTTER MEDIZINTECHNIK GMBH

ALFRED-WALZ-STR. 22 · 79312 EMMENDINGEN/GERMANY · TEL. +49 (0)7641 96256-0 · FAX +49 (0)7641 96256-30  
WWW.SUTTER-MED.COM · WWW.SUTTER-MED.DE · E-MAIL : INFO@SUTTER-MED.DE