Comparison of two different surgical treatments for Obstructive Sleep Apnea (OSA)

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There are many different surgical approaches at the level of the palate for OSA. Since the first description of Uvulopalatopharyngoplasty (UPPP) this method has widely been modified using radiofrequency-tissue volume reduction (RF-UPPP). A new procedure, the functional expansion pharyngoplasty (FEP) used to expand the pharyngeal lumen, was first described 2013 as a modification of expansion sphincter pharyngoplasty (ESP) [1]. This paper describes our study with the objective to evaluate the efficiency of FEP in comparison with the established RF-UPPP.

Fig. 1: RaVoR™ bipolar electrode for the soft palate, single-use **(70 44 95)**

Introduction: An upper airway collapse during sleep causes OSA by producing hypoxaemia and sleep fragmentation. The consequence is daytime sleepiness with an increased risk of accidents as well as cardiovascular incidents [2, 3]. The gold standard of therapy is continuous positive airway pressure therapy (CPAP) but its effectiveness is limited by poor tolerance, low acceptance and suboptimal compliance.

UPPP was introduced as both a surgical treatment of OSA and an alternative therapy for patients not tolerating CPAP. Due to its diverse outcomes and side effects UPPP has widely been modified using RF-UPPP in combination with tonsillectomy (TE). However, computed tomography studies have shown that the collapse of the lateral pharyngeal wall plays a major role in obstruction at the velopharyngeal sphincter (4). Insufficient stabilization of the lateral pharyngeal wall may be the cause for failures after RF-UPPP. Several techniques to overcome these shortcomings of previous modifications of UPPP have been introduced such as expansion sphincter pharyngoplasty procedure (ESP) in 2007 [5]. A modification of the ESP, the FEP, has been described in 2013 [1].

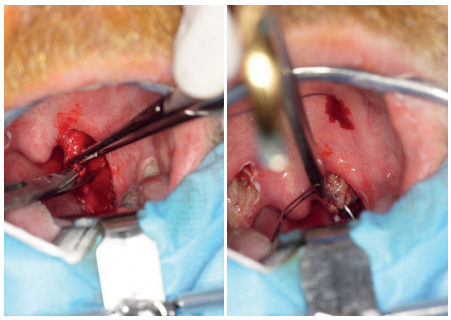


Fig. 2: Forming a flap of the superior part of palatopharyngeus muscle to anchor it to the hamulus pterygoideus for functional expansion pharyngoplasty (FEP).

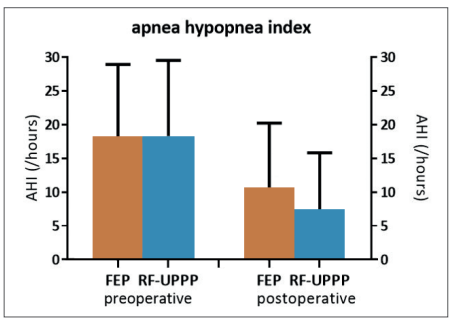


Fig. 3: Pre- and postoperative AHI

Methods: Patients in our clinic that had been diagnosed with a mild to severe OSA and CPAP intolerance or poor compliance received a detailed upper airway evaluation for the assessment of the site of obstruction, including a manometry of the upper airways (ApneaGraph®, MRA Medical Ltd, Gloucestershire, UK) and a respiratory polygraphy (Nox T3 Sleep Monitor™, Nox Medical, Reykjavik, Iceland). Additionally, nearly every patient received a Drug Induced Sleep Endoscopy (DISE). Only patients with tonsils and a primary upper airway obstruction at the level of the tonsils and soft palate were offered treatment with TE and FEP. Between May 2015 and February 2016 there were 40 such patients (group A). Data from the patients of group A were compared to a cohort of 40 patients from our database of patients (period 2005 -2016) who had TE and RF-UPPP because of OSA (group B). The patients were matched retrospectively for Apnea Hypopnea Index (AHI) primarily and for BMI secondarily.

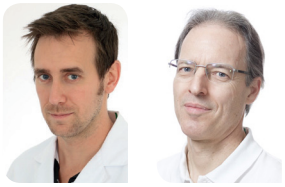
For FEP we used the technique described by Sorrenti [1]. The stabilization of the lateral pharyngeal wall is achieved by a superolateral repositioning of the palatopharyngeus muscle and the fixation of it to the hamulus pterygoideus after TE (Fig 2.). RF-UPPP was performed using the RaVoR™ system (Sutter Medizintechnik GmbH, Freiburg, Germany), including a CURIS® 4 MHz radiofrequency generator and a RaVoR™ bipolar electrode (Fig 1). The bipolar electrode was inserted 5-6 times in different locations at each side of the soft palate. The application of radiofrequency energy for thermal tissue volume reduction of the soft palate was controlled by the AutoRF™ function of the CURIS® 4 MHz radiofrequency generator.

Some patients also underwent a septoplasty and inferior turbinate reduction in case of impaired nasal breathing. Three months after surgery the patients were interrogated with a questionnaire and had a respiratory polygraphy to determine the postoperative AHI.

Results: Preoperative AHI for group A was 18.2/h and 18.1/h for group B, postoperative AHI for group A was 10.8/h and 7.5/h for group B. Comparison of pre- and postoperative AHI showed a significant reduction for both groups. However, the reduction of AHI was significantly higher for group B compared to group A (Fig 3). There was no significant difference of postoperative complications such as postoperative bleedings or globus sensation between the groups.

Fig. 4: CURIS® 4 MHz radiofrequency generator

Conclusions: After 3 months of follow-up, TE with RF-UPPP or FEP proved to be an effective treatment for OSA. In our study, no superiority of FEP over RF-UPPP could be demonstrated. On the contrary, improvement after RF-UPPP was significantly better compared to FEP. Randomized and prospective trials with long-term follow-up are needed to evaluate new operative methods such as FEP. We recommend RF-UPPP as treatment of choice in OSA patients until further evidence.



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References: **1.** Sorrenti G, Piccin O. Functional expansion pharyngoplasty in the treatment of obstructive sleep apnea. The Laryngoscope. 2013;123(11):2905-8. **2.** Marin JM, Carrizo SJ, Vicente E, Agusti AG. Long-term cardiovascular outcomes in men with obstructive sleep apnoea-hypopnoea with or without treatment with continuous positive airway pressure: an observational study. Lancet. 2005;365(9464):1046-53. **3.** Tregear S, Reston J, Schoelles K, Phillips B. Obstructive sleep apnea and risk of motor vehicle crash: systematic review and meta-analysis. Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine. 2009;5(6):573-81. **4.** Schwab RJ, Gefter WB, Hoffman EA, Gupta KB, Pack AI. Dynamic upper airway imaging during awake respiration in normal subjects and patients with sleep disordered breathing. The American review of respiratory disease. 1993;148(5):1385-400. **5.** Pang KP, Woodson BT. Expansion sphincter pharyngoplasty: a new technique for the treatment of obstructive sleep apnea. Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery. 2007;137(1):110-4.

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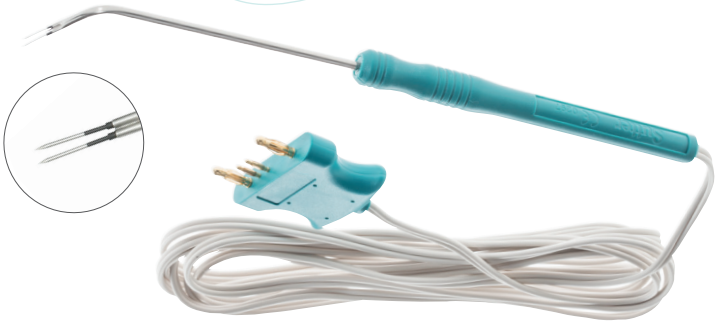
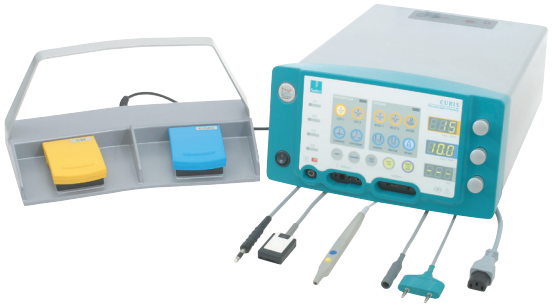


Qty.	REF	Description
1	**70 44 95**	**RaVoR™** bipolar electrode for the soft palate, single-use with protective insulation, working length 110 mm



[REF 87 00 10] CURIS® 4 MHz radiofrequency generator
basic set with single-use patient plates

Qty.	REF	Description
1	**36 01 00-01**	**CURIS®** 4 MHz radiofrequency generator (incl. main cord, user manual and test protocol)
1	**36 01 10**	Footswitch two pedals for CURIS® (cut & coag), 4 m cable
1	**37 01 54L**	Bipolar cable for CURIS®, length 3 m
1	**36 07 04**	Monopolar handpiece (pencil) cut & coag, shaft 2.4 mm, cable 3 m
1	**36 02 38**	Cable for single-use patient plates, length 3 m
1 (x50)	**36 02 22**	Safety patient plates, single-use, packing 5 x 10 pcs. (not shown)

Unit settings / Other accessories*

CURIS®
4 MHz radiofrequency generator

RaVoR™ bipolar electrode: Bipolar RaVoR™, AUTOSTOP
Power adjustment: 10 watts

Valid for the **CURIS®** with the orange label.

CURIS®
4 MHz radiofrequency generator

RaVoR™ bipolar electrode: Bipolar RaVoR™, AUTOSTOP
Power adjustment: 10 watts

* Please consider that this information is not meant to serve as a detailed treatment guide. Always adjust according to patient and application.

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