Surgical treatment for obstructive sleep apnea syndrome in adults: pharyngeal techniques on the soft palate and lateral wall

Tratamento cirúrgico da síndrome da apneia obstrutiva do sono em adultos: técnicas faríngeas sobre o palato mole e parede lateral

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ABSTRACT
The treatment of choice for obstructive sleep apnea syndrome (OSAS) has been done with positive airway pressure devices, especially in moderate to severe cases. However, many patients do not adequately adhere to this therapy. Thus, other treatment modalities should be taken into consideration, including surgical procedures on the upper airway. This study describes the main techniques used on the soft palate and lateral pharyngeal wall to treat OSAS, as well as their indicators for success and their success rates. We also note the progress that has been made over the years in improving the surgical techniques that address the soft palate and lateral pharyngeal wall. We also highlight a critical selection of patients who have been treated using these procedures. When the indicators are carefully considered, surgical procedures may be beneficial in the treatment of OSAS.

Keywords: sleep apnea, obstructive; surgical procedures, operative; palate, soft; pharynx.

RESumo
O tratamento de escolha para a Síndrome da Apneia Obstrutiva do Sono (SAOS) tem sido o uso dos aparelhos de pressão aérea positiva, em especial nos casos moderados a graves, embora muitos pacientes não apresentem adesão satisfatória a esta terapia. Desta forma, outras modalidades de tratamento devem ser levadas em consideração, incluindo os procedimentos cirúrgicos na via aérea superior. O objetivo deste trabalho foi descrever as principais técnicas realizadas no palato mole e parede lateral da faringe, para o tratamento da SAOS, bem como suas indicações e taxas de sucesso. Ao longo dos anos, nota-se um progresso no aperfeiçoamento das técnicas cirúrgicas que abordam o palato mole e a parede lateral da faringe, bem como uma crítica seleção dos pacientes a serem tratados por estes procedimentos. Quando indicados de forma criteriosa, os procedimentos cirúrgicos podem trazer benefícios no tratamento da SAOS.

Palavras-chave: apneia do sono tipo obstrutiva; procedimentos cirúrgicos operatórios; palato mole; faringe.

INTRODUCTION
Obstructive sleep apnea syndrome (OSAS) is a prevalent disease, affecting 32.9% of the population of Sao Paulo¹. It is associated with several cardiovascular, cognitive, and metabolic consequences², and is currently considered a public health problem³.

The treatment of choice for moderate to severe OSAS is continuous positive airway pressure (CPAP) devices⁴, but patient adherence to these devices has been a limiting factor. In selected cases, surgical treatment on the upper airway (UA) or on the facial skeleton may be beneficial in alleviating this disease or improving the use of CPAP⁵.

Thus, the aim of this study was to describe the main techniques used on the soft palate and lateral pharyngeal wall to treat OSAS, as well as their indicators for success and their success rates.

ASSESSMENT OF THE UPPER AIRWAY: THE SOFT PALATE AND LATERAL PHARYNGEAL WALL
Upper airways can be examined using anterior rhinoscopy and oroscopy, and wherever possible, these exams should be complemented with a flexible, fiberoptic, endoscopic examination, which also allows the physician to evaluate the nasopharynx and hypopharynx²⁵.

Because the purpose of this study was to describe the surgical techniques that include the soft palate and lateral pharyngeal wall, we decided to describe the relevant findings for this region.

The tongue volume, soft palate, uvula, size of palatine tonsils and modified Mallampati index can be assessed using oroscopy.
The soft palate is considered to be in a posterior position when it is near the posterior oropharyngeal wall; a “web”, when there is a low insertion of the posterior tonsillar pillar into the uvula; and thick when presenting with edema. The tonsillar pillars are considered to be medialized when they are near the midline of the oropharynx. The uvula is considered to be elongated when it is near the base of the tongue and thick when presenting with edema.

Teeth marks on the tongue are a criterion used to characterize a voluminous tongue, which suggests that content (tongue) and containment (oral cavity) are not proportional.

A modified Mallampati index should be conducted, as proposed by Friedmann et al., in 1999, with the patient’s mouth open as wide as possible and with the tongue relaxed and positioned within the oral cavity. Patients are classified into four grades, with grade I being the best view of the oropharynx and grade IV being the worst view, in which only the hard palate and part of the soft palate are visible. Grades III and IV denote a poor relationship between the base of the tongue and the oropharynx.

The palatine tonsils are classified into four grades, with grade I being the smallest and with grade IV occupying over 75% of the oropharyngeal space. Tonsils in grades III and IV are considered to be obstructive.

Studies have shown that patients with OSAS have a higher prevalence of anatomical changes in the UA compared to control groups. However, several studies have been unable to predict the presence or severity of OSAS and were also unable to predict the success of surgical procedures despite their attempts to assess the location of the UA collapse.

The choice of a surgical procedure should be based on the presence of these anatomical changes. Concomitant factors, such as advanced age, the severity of OSAS, and obesity, can often limit the success of these procedures and should be taken into account as indicated.

PHARYNGEAL SURGICAL TECHNIQUES ON THE SOFT PALATE AND LATERAL PHARYNGEAL WALL

Uvulopalatopharyngoplasty

The first report of pharyngeal surgical procedures for snoring was published in 1964 in Japan by Ikematsu, who reported improvements in 82% of patients who snored. Uvulopalatopharyngoplasty (UPPP) was first described in 1981 by Fujita et al., who modified the Ikematsu technique, and it has become the most common surgery used to treat OSAS. The surgery consists of removing the uvula, the palatine tonsils and the redundant tissues of the soft palate. These soft tissues are removed, which reorient the tonsillar pillar toward the lateral pharynx, increasing the airspace and decreasing tissue collapse. Prompted by inconsistent surgical results, Sher, Schechtman, and Piccirillo published a meta-analysis that showed that the surgical success of this technique was 40.7%.

The immediate and long-term side effects of UPPP are considerable and should be explained to the patient before surgery. The most frequent side effects include odynophagia, bleeding, oronasal reflux of food and pharyngeal dryness. Velopharyngeal stenosis is observed less often.

In an attempt to obtain better surgical results with lower complication rates, several more conservative techniques have been proposed, including the one described by Fairbanks and the Z-plasty, which are intended to address primarily the lateral wall and to spare the soft palate.

Currently, more conservative techniques that primarily address the lateral wall and spare the midline of the pharynx are recommended, regardless of the technique.

The site of UA obstruction in OSAS patients is a very important indicator for UPPP and surgical success because this procedure only addresses one specific area of the pharynx, and, as we know, the site of obstruction in these patients is variable.

In an attempt to identify the patients best suited for UPPP, Friedman, Ibrahim, and Bass classified the patients into four stages, taking into consideration the modified Mallampati index, size of the palatine tonsils and body mass index (BMI). Patients in stage 1 (patients with grade III or IV palatine tonsils, with a class I or II Mallampati index and with a BMI <40 kg/m²) would benefit most from this surgical technique (success rate greater than 80%), and those patients in stage 3 (patients with grade I or II palatine tonsils, with a class III or IV Mallampati index and with a BMI <40 kg/m²) would benefit least (success rate less than 10%). Stage 4 refers to patients with a BMI >40 kg/m² or with an evident craniofacial abnormality, independent of the size of the tonsils or modified Mallampati index classification; for these patients, the author does not recommend the procedure.

Thus, conservative techniques that work primarily on the lateral pharyngeal wall are recommended, and the best results are seen in young patients who are not obese, who present with anatomical changes in the oropharynx (especially grade III and IV palatine tonsils) and who do not have changes in any other anatomic sites.

CO₂ laser–assisted uvulopalatoplasty

This technique was introduced by Kamami in 1990 for the treatment of snoring. The technique is performed under local anesthesia and aims to reduce excessive, redundant tissue in the uvula and soft palate region. The continuous-wave
CO₂ laser, used at between 15 and 20 W, reduces the tissue by carbonization, which excises part of the soft palate and uvula. This technique can be applied in two to five sessions over a six-week interval. It can be performed under local anesthesia, and because it does include a tonsillectomy, it should be performed only in patients with normotrophic tonsils and who present with oropharyngeal changes, such as a redundant, “web”, thick or posterior position soft palate.2

In the literature, the effectiveness of this procedure for treating snoring varies between 24 and 86% for treating OSAS.18-20

Based on a review of the literature, the American Academy of Sleep Medicine has developed a practical guide for the use of laser-assisted uvulopalatoplasty (LAUP), which recommends the use of this technique only in the treatment of snoring and not in the treatment of OSAS.21

Pain has been the most reported of the complications of this procedure, whereas velopharyngeal stenosis is the most feared.21

Thus, patients who could benefit from this procedure are those who present a pattern of snoring without OSAS and with oropharyngeal anatomical alterations without tonsil hypertrophy and who are non-obese and do not have any changes in other anatomical sites.2

Radiofrequency ablation of the soft palate

Studies on the ablation of soft tissue to correct breathing problems had their beginnings in 1995, but only after 1998 was there a greater demand for studies to improve surgical treatment for OSAS using this technique.22

Radiofrequency ablation creates a self-controlled thermal lesion in the submucosa with cell death and tissue replacement by fibrosis, causing stiffness and anteriorization of the soft palate. The treatment can be performed under local anesthesia, at different points on the soft palate and over several monthly sessions. There is no tissue resection.

This procedure is recommended for patients who have pharyngeal changes on the soft palate, such as a redundant, thick or posterior position or a soft palate and clinically normal tonsils. As with LAUP, the procedure does not include a tonsillectomy.22

The patients did not experience bleeding, crusting or infections. The postoperative pain is mild and can be controlled with common analgesics and a light diet. The pain does not interfere with swallowing or with speech.18,23-25

Studies have shown success rates ranging from 30 to 86%18,23-25, and the best results are seen in patients with mild OSAS.26

Thus, patients who have better results with this surgical technique are patients who have mild OSAS, oropharyngeal changes without hypertrophy of the palatine tonsils and no additional changes at other anatomical sites and who are not obese.

Lateral pharyngoplasty

This technique was described by Cahali in an attempt to increase the latero-lateral space of the pharynx and optimize the outcome of UPPP, without compromising the midline of the palate.

The technique begins with a tonsillectomy and includes a craniocaudal section of the pharyngeal constrictor muscle, with subsequent closure of the mucosal and muscular planes of this region. With this technique, a remodeling of the oropharynx with a latero-lateral extension is proposed.

In an initial series of 10 cases, the apnea-hypopnea index (AHI) fell from 45.8/hour to 15.2/hour (after 6 months), with a 60% success rate (50% reduction in AHI and AHI <20/hour)27. It should be taken into consideration that the patients lost a statistically significant amount of weight during the postoperative period, when the control polysomnography was performed, which could have influenced this improvement.

In a subsequent study, Cahali, in a series of cases, compared the results for lateral pharyngoplasty (15 patients) with UPPP (12 patients). The authors observed that lateral pharyngoplasty had better results than UPPP when comparing clinical and polysomnographic parameters. However, in this study, the patients who underwent lateral pharyngoplasty also lost a significant amount of weight during the postoperative period.

Because the technique is new, there is still no evidence indicating which findings are relevant when examining the UA and whether they can predict an increased benefit for this surgical technique.

Palatal implants

The placement of palatal implants consists of submucosally inserting three rigid polyester implants in the midline of the soft palate tissue without resection. The goal is to make the soft palate stiffer and consequently reduce the vibration and improve snoring.29

The benefit in controlling OSAS is limited, with success rates ranging between 40 and 45%.30,31 Thus, the indication for treatment is preferentially made for patients who snore and have mild to moderate OSAS.29-31. Because this technique focuses on the midline of the palate, its indication for treatment is similar to that of radiofrequency ablation for patients with clinically normal palatine tonsils and who have pharyngeal changes on the soft palate.31

Complications are rare, with implant extrusion being the most common.29
Application of sclerosing substances

The application of sclerosing substances into the soft palate attempts to induce a chemical tissue injury with subsequent local fibrosis, stiffness and consequent reduction of vibration and snoring. Its mechanism of action is much like radiofrequency ablation, except that the latter causes a thermal injury to the tissue.

The most commonly used substance in the few existing studies is Sotradecol® (sodium tetradecyl sulfate), which may need more than one application to achieve the desired result, namely the control of snoring.

Brietzke and Mair15, in a series of cases with 27 patients with AHI less than 10/hour, observed an improvement in snoring in 92% of patients, reinforcing the idea that this technique is affordable and relatively painless and that it has a low likelihood of complications. In 2003, the same authors16 published another study with the same patients, which included long-term follow-up data (mean — 19 months). In this study, the authors reported that the success rate (improved snoring) fell to 75%, with an 18% recurrence rate. They suggested “injection snoreplasty” for the name of the procedure in question, a term that was recognized in Brazil by Lorenzetti, Formigoni, and Cahali17 in 2008.

To determine whether any other sclerosing agents would work better, Brietzke and Mair18 used another sclerosing agent, 50% ethanol. They reported that the effects were similar to 3% Sotradecol®, but with an increased likelihood of developing fistulas as a postoperative complication.

Because the treatment indicators and mechanism of action appear to be similar to radiofrequency, Iseri and Balcioglu19 published a series of cases (70 snorers), comparing the 2 techniques, and they reported an improvement in snoring in 87.5% of patients undergoing radiofrequency and 76.7% for patients undergoing injection snoreplasty.

These data were confirmed by Al-Jassim and Lesser20, who demonstrated a 60% reduction in snoring in 3 months and 48.3% in 12 months for a series of 60 patients who received a single session of injection snoreplasty.

Thus, these data suggest that injection snoreplasty may be a technique used to help control snoring. However, there are no studies that have evaluated its impact on OSAS.

CONCLUSIONS

Although CPAP is the primary and most effective form of treatment for OSAS, especially for moderate to severe cases, we know that adherence to this therapy is a limiting factor, such that other treatment options should be considered.

Over the years, there has been notable progress in improving surgical techniques that address the soft palate and lateral pharyngeal wall, when combined with a critical selection of patients who are to be treated with these procedures.

We believe that, used with care, these surgical procedures may be beneficial in the treatment of OSAS and that additional scientifically accurate studies are needed to aid in the proper treatment selection for these patients.

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