



# Uvula in Snoring and Obstructive Sleep Apnea: Role and Surgical Intervention

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## Abstract

**Objective:** Currently, the consideration of the enlarged uvula as a cause of snoring and Obstructive Sleep Apnea (OSA) lacks data for objective interpretation. This article focused on some concepts on how we can manage the enlarged uvula in cases of snoring and OSA. The purpose of the present article is to discuss the cost benefits of uvular surgery versus its preservation.

**Conclusion:** The direct correlation between the uvula and OSA needs to be reevaluated to maintain a balance between reserving its anatomical and physiological functions and surgically manipulating it as a part of palatopharyngeal surgery, yet further objective studies are needed to reach optimal results.

**Keywords:** Uvula; Snoring; Obstructive sleep apnea

## Introduction

The palatine uvula, usually referred to as simply the uvula, is that part of the soft palate that has an anatomical structure and serves some functions. Anatomically, the uvula, a conic projection from the back edge of the middle of the soft palate, is composed of connective tissue containing several racemose glands, and some muscular fibers, musculus uvulae muscle; arises from the posterior nasal spine and the palatine aponeurosis and inserts into the mucous membrane of the uvula. It contains many serous glands, which produce thin saliva [1]. Physiologically, the uvula serves several functions.

First during swallowing, the soft palate and the uvula move together to close off the nasopharynx and prevent food from entering the nasal cavity. It's also been suggested that your uvula may help to drain and direct the flow of mucus secreted from your nasal cavities, helping it to flow toward the base of your tongue and down your throat [2].

Second, researchers found that the uvula, after analyzing the frequency and distribution of immune cells in uvula tissue, may be a site for induction of mucosal tolerance to inhaled and ingested antigens [3]. Mucosal tolerance occurs only on mucosal surfaces and results in the suppression of your immune responses to inhaled or ingested antigens. The purpose is to prevent your body from launching an unnecessary immunological attack against harmless substances like pollen or foods [4]. Interestingly, your uvula also has its own protection against potential microbial pathogens, as researchers noted it contains a "subepithelial barrier of macrophages [3]. Third, it has also been proposed that the abundant amount of thin saliva produced by the uvula serves to keep the throat well lubricated [2]. Fourth, it has a function in speech as well. In many languages, the uvula is used to articulate a range of consonant sounds, known as uvular consonants. Due to the large amount of saliva produced from glands in the uvula that are not present in other mammals it has been suggested that the uvula is an accessory speech organ [5]. Lastly, the stimulation of the uvula also causes the gag reflex to be initiated.

The uvula as a component of the soft palate, from the volumetric soft tissue point of view, was previously linked to snoring and Obstructive Sleep Apnea (OSA) [6]. The uvula of OSA patients, which has a higher percentage of muscle and fat content, may contribute to pharyngeal narrowing and increased pharyngeal resistance during sleep. This in turn; decreases the retropalatal space leading to snoring and OSA [7]. Most studies identified for inclusion in previous reviews consistently demonstrated a direct relationship between an enlarged uvula and the presence of Sleep-Disordered Breathing (SDB) [8,9].

However, it is not clear whether an enlarged uvula is a causative or a result of SDB. Prior studies

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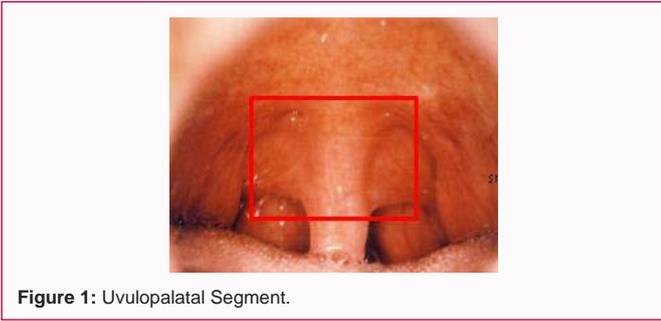


Figure 1: Uvulopalatal Segment.

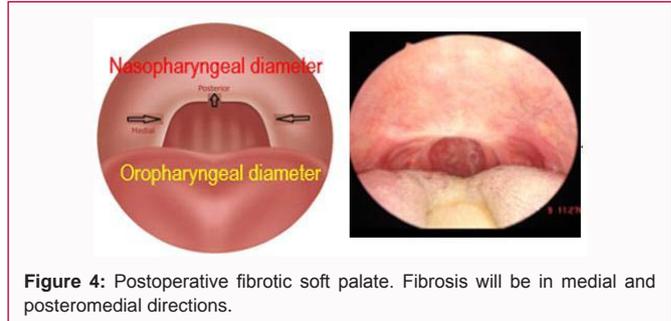


Figure 4: Postoperative fibrotic soft palate. Fibrosis will be in medial and posteromedial directions.

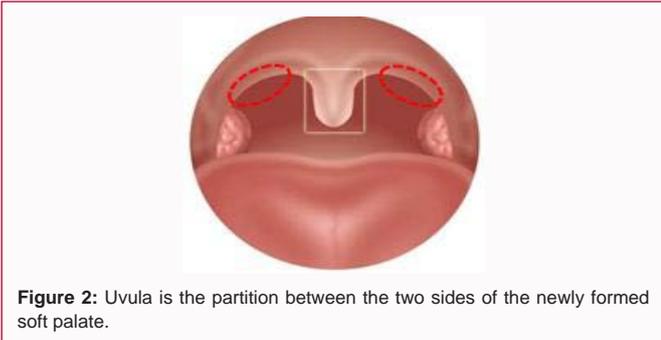


Figure 2: Uvula is the partition between the two sides of the newly formed soft palate.

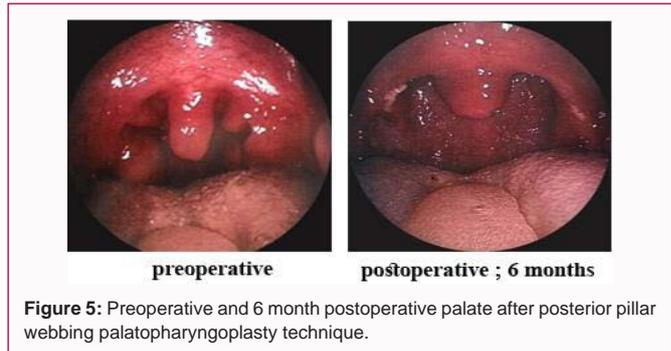


Figure 5: Preoperative and 6 month postoperative palate after posterior pillar webbing palatopharyngoplasty technique.

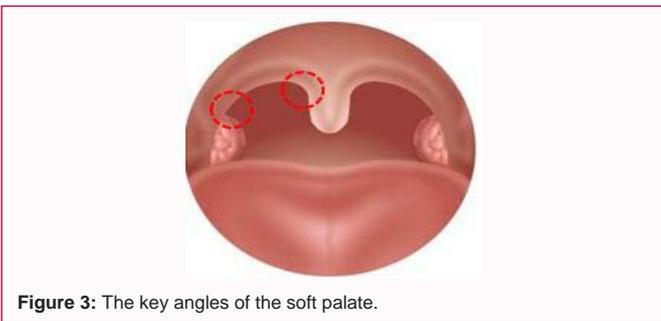


Figure 3: The key angles of the soft palate.

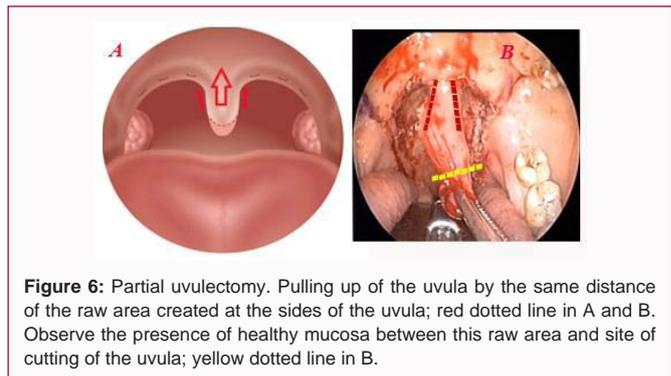


Figure 6: Partial uvulectomy. Pulling up of the uvula by the same distance of the raw area created at the sides of the uvula; red dotted line in A and B. Observe the presence of healthy mucosa between this raw area and site of cutting of the uvula; yellow dotted line in B.

documented histological changes in the tissue composition of patients with OSA [10], such as increased intercellular space (indicating edema), plasma cell infiltration, and epithelial hyperplasia. These factors appear indicative of an inflammatory process possibly because of trauma induced by snoring and a reasonable cause of changes that lead to SDB.

Although the volumetric soft tissue component has been widely accepted as the cause of upper airway narrowing and collapsibility, evidence has implicated a neurogenic component for the pathophysiology. Because snoring results from the turbulent flow of air vibrating the soft palate, it is possible that long-term vibratory trauma from snoring might result in alteration of neuronal activity of the soft palate, resulting in OSA. Supporting this, habitual snoring often leads to increasing obstructive events and obstructive sleep apnea if left untreated [11,12]. Numerous studies have begun to examine the relationship between neurologic dysfunction of the upper airway and obstructive sleep apnea. These seem to advocate a significant role of neurogenic activity in the multifactorial pathophysiology of OSA.

Formal research dedicated to the information related to the measurable characteristics of the uvula still few. The uvular size was described as a grading scale by multiple authors who were classifying the uvula as normal, long, wide, long & wide [13,14]. A uvula was often considered enlarged (i.e., longer, wider) if its length exceeded 15 mm or width exceeded 10 mm [15,16].

Treatment modalities may include surgical resection of the uvula. However, complete removal leaves patients with persistent globus, xerostomia, excessive postnasal discharge and dysphagia [17].

A clearer understanding of the potential role the uvula in the pathogenesis of SDB and how its surgical modification helps improve the outcomes of surgery for specific aspects of SDB such as OSA remains material for further research. The purpose of the present article is to discuss the cost benefits of uvular surgery vs. its preservation.

**Discussion**

The collapsible upper airway is a common cause of obstructive sleep apnea. The exact pathophysiology leading to a more collapsible airway is not well understood. Currently, the relationship between uvula size and sleep-disordered breathing lacks data for objective interpretation. Although the entire pathophysiology of OSA remains incompletely understood, it is becoming increasingly clear that there is more to this problem than simple structural obstruction of the airway due to excessive soft tissues or limited skeletal framework.

Chang et al. [18], in their systemic review, to evaluate the relationship of the uvula and snoring and obstructive sleep apnea, they raised four main findings. First, studies that demonstrated

a direct relationship between an enlarged uvula and the presence of SDB cannot conclude whether an enlarged uvula is causative or the result of SDB. Second, if indeed uvula size can predict surgical results, a standardized method of reporting uvula size could be a useful clinical tool to aid in the overall decision-making process for snoring procedure selection. However, until now this is not the case. Third, to make more generalizable statements regarding the specific relationship between elongated uvulas and SDB, a method for objectively evaluating SDB appears necessary. Lastly, more research is needed regarding the significance of the effect of the uvula size on sleep-disordered breathing.

After this review, before deciding on how a surgeon should deal with the uvula in cases of snoring and OSA, some questions and surgical concepts should be answered. First, what is the physical role of uvula as a single anatomical factor in snoring and OSA?

While examining patients referred for possible OSA surgery, ask the patient to produce snoring sound, you will observe that the uvula and the surrounding soft palate will move as one sheet of tissue for this I coined the nomenclature "Uvulopalatal Segment" (Figure 1). Cutting the continuity between the uvula and the adjacent parts of the soft palate will stop the vibration of this segment. Supporting this, habitual snoring was previously treated using a pharyngeal handpiece with the backstop attached to the articulating arm and the CO<sub>2</sub> laser, to create a full-thickness vertical trench measuring 1.0 cm to 1.5 cm were made on the free edge of the soft palate on either side of the uvula as an outpatients procedure (laser-assisted palatoplasty or uvuloplasty (LAP or LAUP) [19,20].

Sometimes the end of the uvula is also removed. With time and scarring, the palate stiffens and elevates. This should give the impression that removal of part or the whole uvula is not well anatomically sound and has no or minimal impact regarding case improvement. So, do not focus on the uvula as a major factor in treating snoring and OSA, The surrounding palatal muscles and soft tissue are the most important. Second, physiologically, you should respect the uvula as it has considerable functions as described earlier besides removal of the uvula has a lot of side effects, even if temporary, it is of considerable effect for most of the patients [21]. Third, pathologically, there is a documented uvular inflammatory reaction and neurophysiological changes, as described earlier, that occurred as a result of the physical trauma induced by vibration of the soft palate and uvula during sleep hours. Whether these changes are reversible or not, nobody can tell as there is no previous studies that have investigated this issue. So, the cost benefit for removal of the uvula depending on these inflammatory and neurophysiological changes is not physiologically sound. Finally, from my surgical point of view, some surgical concepts should be considered. 1) I believe that we should surgically respect the uvula, keeping in mind that if not done, the postoperative palate will become fibrotic and the patient's condition will become worse. The first and most important information is that the uvula is the area of the soft palate separating the two sides of the newly formed palate (Figure 2). When you have raw area throughout the newly formed soft palate and uvula, the process of fibrosis will start at two angles throughout the soft palate for I coined the nomenclature key angles (Figure 3).

Fibrosis will be in medial and posteromedial directions leading to the increased possibility to have postoperative fibrotic soft palate with a decrease of the postoperative oropharyngeal and nasopharyngeal dimensions and lastly worsening of the patient

condition (Figure 4). 2) Do not leave a raw surface area throughout the newly formed soft palate and uvula. This can be achieved by covering the raw area at the edge of the newly formed palate by normal palatal mucosa as described in my published posterior pillar webbing palatopharyngoplasty techniques [22-24]. The postoperative palate after this palatopharyngoplasty technique that aimed to cover the raw areas of the newly formed soft palate, showed excellent widening and preservation of the transverse diameter soft palate and nasopharyngeal dimensions (Figure 5). 3) Lastly, in my opinion, there is "No place for total uvulectomy in palatoplasty surgery". With partial uvulectomy, the postoperative palatal fibrosis will pull the newly formed uvula more up and you will have more shortening of the uvula, yet we should not ablate too much uvular tissue and always keep healthy mucosa on both sides of the uvula or use the fish-mouth technique. The uvula will be pulled up by the same distance of the raw area created at the sides of the uvula (Figure 6).

More studies are needed to improve the level of evidence and consistency. To make the findings more generalizable, the studies should evaluate consecutive patients and use prospective study designs.

## Conclusion

The direct correlation between uvula size and its relationship specifically to snoring and OSA remain as topics for future prospective research. The balance between uvular preservation and the actual need for surgical intervention must be considered for every patient.

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