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Obstructive Sleep Apnea, Gender, and Tone

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Abstract: Medical options for the assessment then treatment of Obstructive Sleep Apnea are time-consuming and expensive.

Conventional chiropractors are able to assess for this clinical problem and prescribe conservative vocal and muscle-training exercises to support spinal correction by adjustment where indicated.

We recommend this should be the first line of assessment in patients with indications of Obstructive Sleep Apnea.

Indexing Terms: Chiropractic; Obstructive Sleep Apnea; Speech muscle exercises.

Introduction

Modifiable and Non-Modifiable Risk Factors

According to a 2020 review of the literature, obstructive sleep apnea (OSA) affects an estimated 17% of adult women, with the prevalence among men being twice as high at 34%. (1) Along with age, male gender is clearly a major non-modifiable risk factor for OSA. In addition to these non-modifiable risk factors, several modifiable risk factors are well-established, including smoking and obesity. (2)

> *... assessment by a Conventional Chiropractor in a patient with Obstructive Sleep Apnea can lead to low cost, low-intervention resolution to increase tone'*

At least one case report suggests a link between long COVID and OSA, although epidemiological statistics concerning this relationship are not yet available. (3).

Applied anatomy

The anatomical basis of OSA is a loss of tone in the tissues of the mouth, tongue, and pharynx (Figure 1). During inspiration, these poorly toned tissues create transient blockage of the airway during sleep. The resulting apnea is a risk factor for arterial hypertension, myocardial infarction, stroke, and traffic accidents. (2)

The musculature of the tongue, and soft palate is innervated by branches of the *vagus*, *hypoglossal*, and *trigeminal* nerves (see Tables I and II). All three of these nerves are vulnerable to cervical subluxation.

Undoubtedly, the power and coordination of the muscles of inspiration play a role in OSA. This involves a widespread innervation. For example, the diaphragm alone is innervated by almost ⅓ of the spinal nerves. (4)

Restoring tone: Oropharyngeal exercise

Once a diagnosis of OSA is made, the first priority is reduction of known risk factors. In particular, smoking cessation and weight loss should be undertaken if appropriate.

The next most important priority is restoring tone to the tissues of the mouth, throat and pharynx. A Brazilian research group found oropharyngeal exercises to be effective in reducing OSA symptoms. (5) The patients in this study had mild to moderate OSA verified by sleep studies. The *oropharyngeal* exercises were originally part of speech therapy. A 2013 study noted that these exercises could be helpful even for patients already on continuous positive airway pressure (CPAP) therapy. (6) I have been teaching a series of 6 oropharyngeal exercises modified from this research and give them in Appendix I. This can be downloaded and given to patients.

If weight loss, smoking cessation and *oropharyngeal* exercises fail to produce sufficient clinical improvement, medical interventions include CPAP and surgery can then be considered. (1, 2)

Restoring tone: Chiropractic Adjustments

At least two case reports demonstrate improvement in OSA symptoms following a course of chiropractic adjustments. (7, 8) Correction of vertebral subluxation complex is thought to improve tone and coordination of the *oropharyngeal* muscles.

It should also be noted that chiropractic adjustments have been shown to improve breathing capacity in several studies (9, 10, 11, 12, 13, 14). Some of this improvement may be the result of improved power and coordination of the muscles of inspiration.

Clinician-Scientists: Sleep Lab not required

While the case reports published so far are encouraging, additional outcome measures are called for. The Gold Standard for diagnosing and following OSA is an overnight sleep study. (1, 2) I doubt that there are many chiropractic offices equipped with sleep labs. However, there are well-studied pencil-and-paper instruments that can be very helpful in following the effects of chiropractic adjustment on the well-being of the OSA patient. One of these is the *Berlin* questionnaire. (15) Additional outcome measures can include various methods of following breathing capacity, (4) and blood pressure monitoring.

Now more than ever

Even if long COVID turns out to not be an independent risk factor for OSA, these two clinical problems are undoubtedly mutually exacerbating. Now more than ever, the men and women suffering from OSA can use our help.

Please remember the founding precept of our profession: the restoration of tone.

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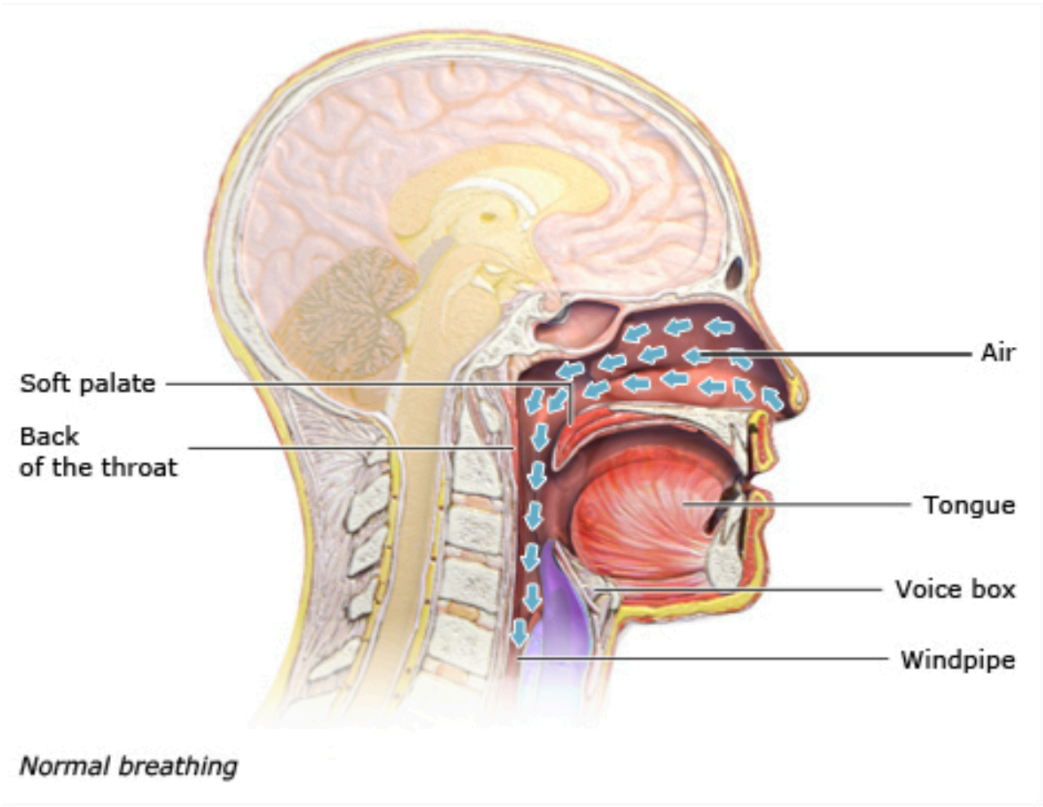
Figure 1: From NIH, Obstructive Sleep Apnea: Overview: https://www.ncbi.nlm.nih.gov/books/NBK279274/.



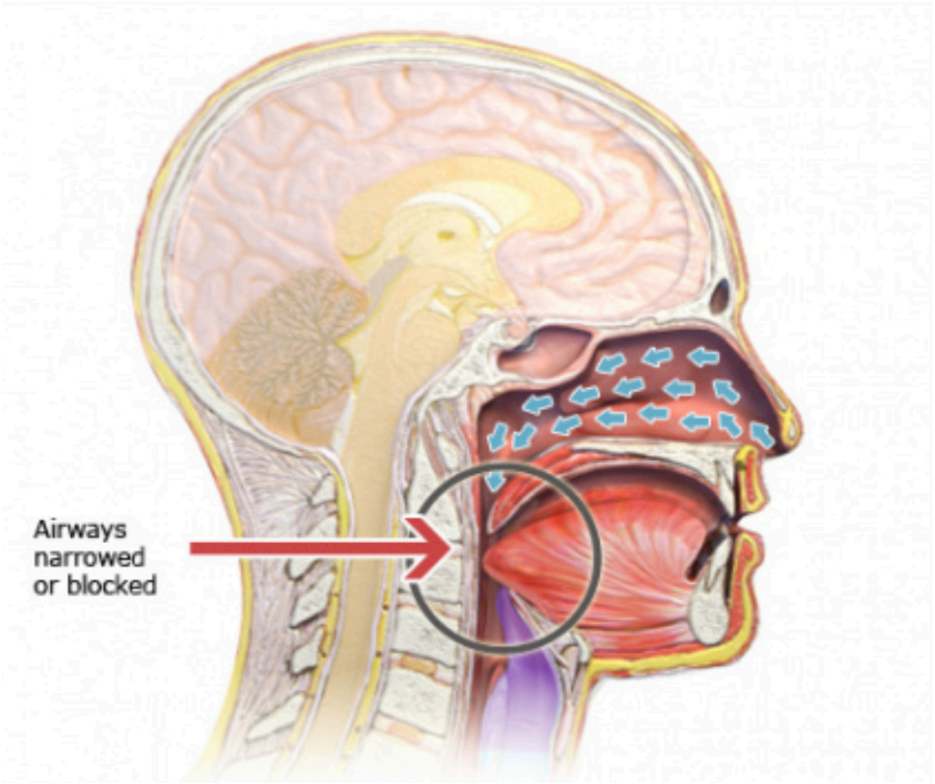


Table 1: Major muscles of the tongue

MUSCLE	POA	ACTION	INNERVATION
Genioglossus	Inner surface of mandible; hyoid; entire bottom of tongue	protrusion & depression of tongue	*Hypoglossal n.*
Hyoglossus	Hyoid; lateral surface of the tongue	Depression and retraction of tongue; side-to-side movement	*Hypoglossal n.*
Styloglossus	Styloid process of sphenoid; lateral surface of tongue	Elevation of sides of tongue during swallowing; retraction of tongue; side-to-side movement	*Hypoglossal n.*
Palatoglossus	Palatine aponeurosis; lateral surface of tongue	Elevation of posterior tongue; aids in swallowing	*Vagus n.*
Superior longitudinal muscle of the tongue	Length of lateral tongue on the dorsum	Bilateral: tongue retraction; unilateral: side-to-side movement of tongue; makes dorsum of tongue concave	*Hypoglossal n.*
Inferior longitudinal muscle of the tongue	Length of the lateral tongue on the underside	Bilateral: tongue retraction; unilateral: side-to-side movement of tongue; makes dorsum of tongue convex	*Hypoglossal n.*
Vertical muscle of the tongue	Anterior tongue, from superior to inferior	Flattens and broadens tongue	*Hypoglossal n.*
Transverse muscle of the tongue	Median fibrous septum to lateral aspects of tongue	Narrows and elongates tongue	*Hypoglossal n.*

Table 2: Major muscles of the soft palate

MUSCLE	POA	ACTION	INNERVATION
Tensor veli palatini	Medial and lateral sphenoid bone; Eustachian tube; aponeurosis of soft palate	Tenses and elevates soft palate; opens Eustachian tube during swallowing/ yawning	*Trigeminal n.*
Palatoglossus	Tongue; aponeurosis of soft palate	Elevates posterior tongue; helps initiate swallowing	*Pharyngeal plexus* of the *vagus n.*
Palatopharyhngeus	Thyroid cartilage and aponeurosis of pharynx; aponeurosis of soft palate	Elevates pharynx-larynx during swallowing	*Pharyngeal plexus/vagus n.*
Levator veli palatine	Temporal bone; Eustachian tube; aponeurosis of soft palate	Elevates soft palate; opens Eustachian tube during swallowing/yawning	*Pharyngeal plexus/vagus n.*
Musculus uvulae	Palatine bone; uvula	Elevates uvula	*Pharyngeal plexus/vagus n.*

Appendix: Exercises for patients with Obstructive Sleep Apnea

A publication by a Brazilian research group found a series of oropharyngeal exercises effective in reducing the clinical manifestations of obstructive sleep apnea (Guimaraes et al, 2009). The following exercises are based in part on the Guimaraes et al paper. In addition, any respiratory exercise mentioned in this section can help the respiratory muscles overcome oropharyngeal obstruction while improving FVC to reduce episodes of hypoxia. When appropriate, smoking cessation and weight control are of critical importance for these patients.

Say '*Ah*'

When an examining doctor looks into your mouth and asks you to say, "Ah," they look for elevation of the soft palate. The same vocalisation can be used as an exercise to tone the soft palate.

Say, "Ah" for 10-60 seconds, according to comfort. Alternate staccato vocalisation ('*Ah-ah-ah-ah…*' etc.) with longer efforts of holding the note ('*Ahhhhhhhh…*'). Shoot for a total of at least 3 minutes per day.

Variations: You can say, '*Ah*' with your mouth wide open and your tongue all the way out and down. This recruits additional throat and tongue muscles. For those familiar with yoga, this somewhat resembles the '*lion*' pose. Also, instead of just saying, '*Ah*' you can sing something, with '*Ah*' as the lyric.

Resisted Tongue Thrust (Forward)

Press your lips together, and press your tongue forward against the resistance. Do this for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Variation: You can open your mouth and press your tongue against your fingers or a spoon.

Tongue to the Roof

Press your tongue to the roof of your mouth. Assist the pressure with suction, so your tongue is actually being sucked upward against your palate. Hold for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Tongue to the Floor

With the tip of your tongue touching your lower teeth, press the rest of your tongue down against the floor of your mouth. Hold for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Tongue to the Cheek

Press your tongue against your right cheek, with the tongue and cheek resisting each other. Hold for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day. Repeat with left cheek.

Variation: To emphasise the cheek muscles, your can place your fingertip in your mouth and use it for resistance rather than your tongue.

Back-Lick

Pressing your tongue against the roof of your mouth just behind your front teeth, move your tongue as far back as possible, licking the roof of your mouth from front to back. Then lick from back to front. Repeat for 10-60 seconds according to comfort, shooting for a total of at least 3 minutes per day.

Clinical guide: The Berlin Questionnaire to screen for obstructive sleep apnea

From: Thurtell M, Bruce B, Rye D, Newman N, Biousse V. The Berlin questionnaire screens for obstructive sleep apnea in idiopathic intracranial hypertension. J Neuroophthalmol. 2011 Dec; 31(4): 316–319. Full Text: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3433717/

CATEGORY 1

1 Complete the following:

height_____ age_____

weight_____ sex_____

2 Do you snore?

- ☐ yes
- ☐ no
- ☐ don't know

If you snore:

3 Your snoring is?

- ☐ slightly louder than breathing
- ☐ as loud as talking
- ☐ louder than talking
- ☐ very loud, can be heard in adjacent rooms

4 How often do you snore?

- ☐ nearly every day
- ☐ 3-4 times a week
- ☐ 1-2 times a week
- ☐ 1-2 times a month
- ☐ never or nearly never

5 Has your snoring ever bothered other people?

- ☐ yes
- ☐ no

6 Has anyone noticed that you quit breathing during your sleep?

- ☐ nearly every day
- ☐ 3-4 times a week
- ☐ 1-2 times a week
- ☐ 1-2 times a month
- ☐ nearly or nearly never

CATEGORY 2

7 How often do you feel tired or fatigued after your sleep?

- ☐ nearly every day
- ☐ 3-4 times a week
- ☐ 1-2 times a week
- ☐ 1-2 times a month
- ☐ never or nearly never

8 During your wake time, do you feel tired, fatigued or not up to par?

- ☐ nearly every day
- ☐ 3-4 times a week
- ☐ 1-2 times a week
- ☐ 1-2 times a month
- ☐ never or nearly never

9 Have you ever nodded off or fallen asleep while driving a vehicle?

- ☐ yes
- ☐ no

If yes, how often does it occur?

- ☐ nearly every day
- ☐ 3-4 times a week
- ☐ 1-2 times a week
- ☐ 1-2 times a month
- ☐ never or nearly never

CATEGORY 3

10 Do you have high blood pressure?

- ☐ yes
- ☐ no
- ☐ don't know

BMI =

Berlin Questionnaire Scoring:

Scoring Questions:	Any answer within box outline is a positive response
Scoring Categories:	Category 1 is positive with 2 or more positive responses to questions 2-6
	Category 2 is positive with 2 or more positive responses to questions 7-9
	Category 3 is positive with 1 or more positive response and/or a BMI >30
Final Results:	2 or more positive categories indicates a high risk of obstructive sleep apnea