Sleep Surgery: A Solution for for Obstructive Sleep Apnea

Welcome to our presentation on sleep surgery for obstructive sleep apnea (OSA). apnea (OSA). We'll explore various surgical procedures, patient selection, benefits, benefits, and considerations to help you understand this innovative approach to approach to treating sleep disorders.

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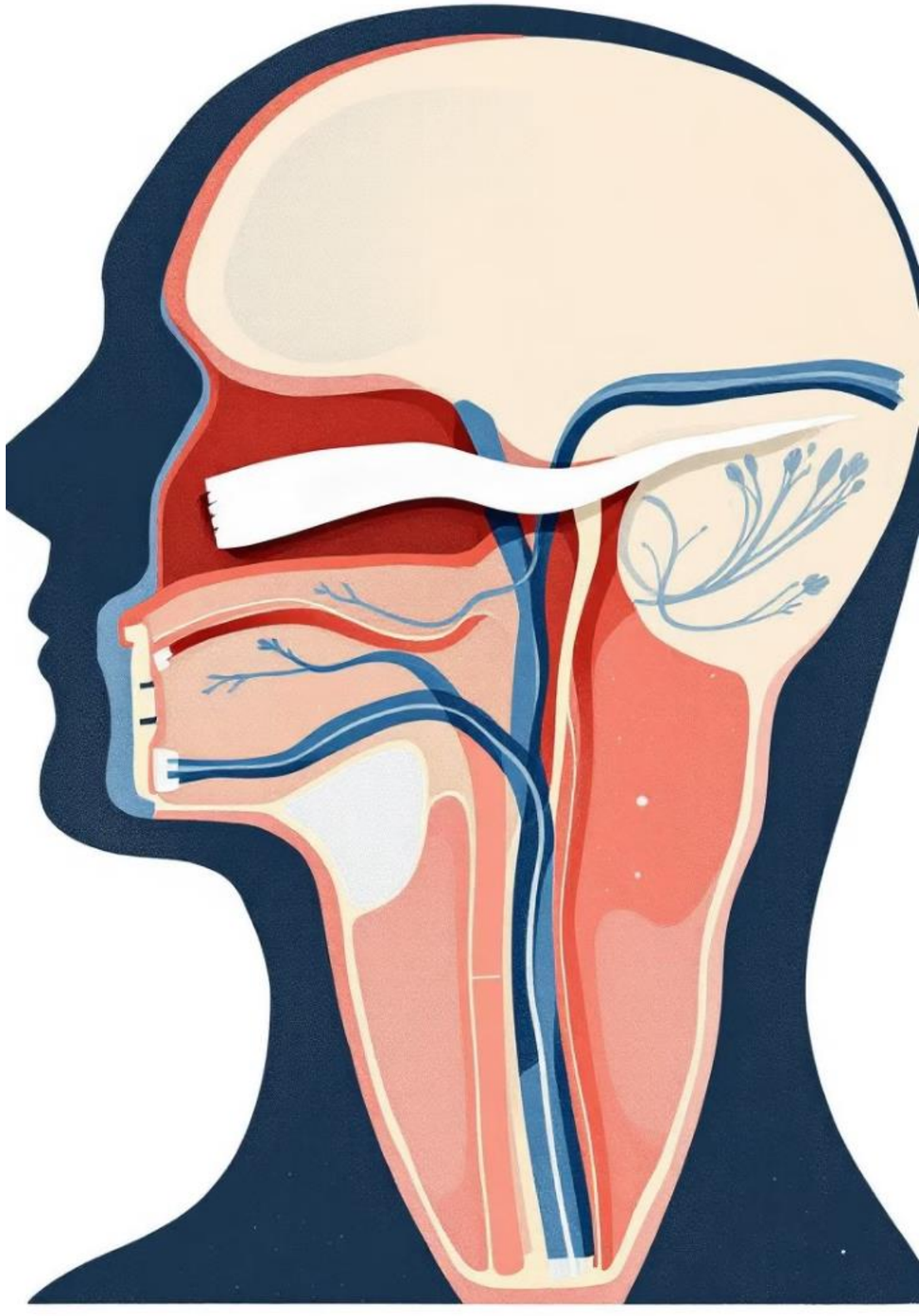
Background

Four key patho-physiologic causes seen in patients with OSA are: PALM

1. An anatomically compromised or collapsible upper airway(high Pcrit)
2. Waking up prematurely to airway narrowing(low arousal threshold)
3. Having an oversensitive ventilator control system(high loop gain)
4. Inadequate responsiveness of the upper airway dilator muscles during *sleep (muscle* responsiveness)



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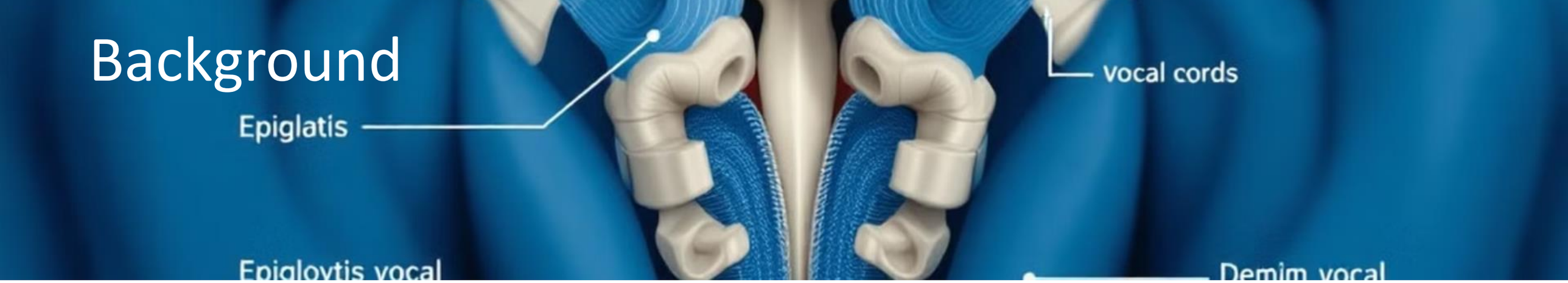


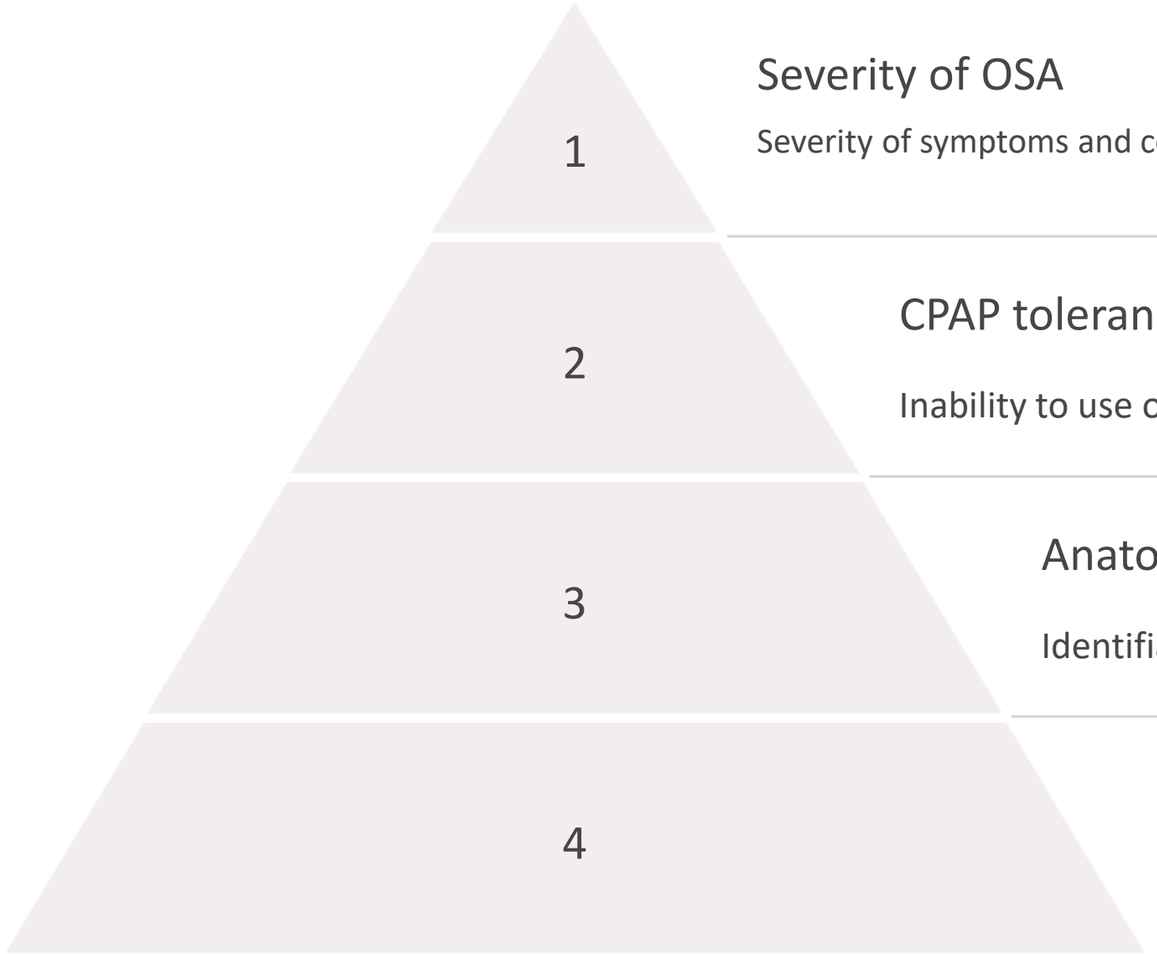
- During inspiration, negative pressure is created within the intra-pleural space (e.g., negative 8 cmH_2O) in order to distend the alveoli and to suck in or inhale air from the atmosphere into the lungs for gaseous exchange and oxygenation of the blood.

- This act of inhalation exerts a negative pressure on the entire upper airway, including the hypopharyngeal, retro-glossal and retro-palatal space.

- If there were any form of upper airway blockage , the lungs would have to work “harder” in order to create a “more negative pressure” (e.g., negative 30 cmH_2O), to inhale air from the atmosphere.

- Result : greater negative pressure on the hypopharyngeal, retro-glossal and retro-palatal space, leading inevitably to collapse and obstruction of the upper airway .

Patient Selection for Sleep Surgery



Severity of OSA

Severity of symptoms and comorbidities

CPAP tolerance

Inability to use or benefit from CPAP therapy

Anatomical Factors

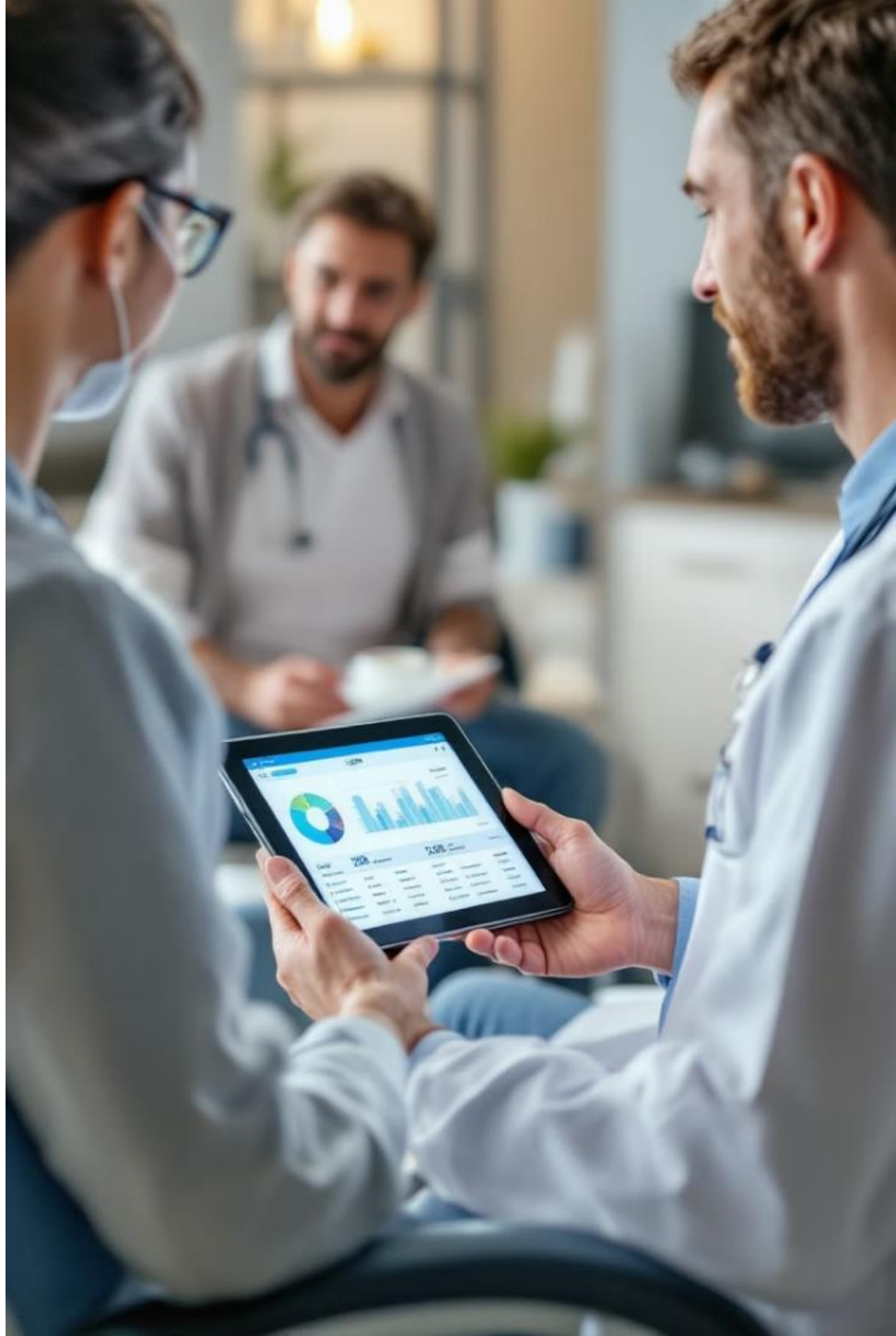
Identifiable obstructions in the upper airway

Patient s wishes

Good surgical candidates with minimal comorbidities

Surgical planning

- The most crucial factor : selecting the correct procedure to perform on the correct patient
- Upper airway evaluation of the anatomy is vital.
- The physical examination during the awake state includes both static anatomic elements and dynamic physiologic compensation.
- During sleep, compensation becomes unstable in patients with snoring and OSA and the dynamic variability further increases and differs by sleep stage during sleep.
- Hence, one must attempt to examine the upper airway, keeping in mind its dynamic nature.



Mallampati classification

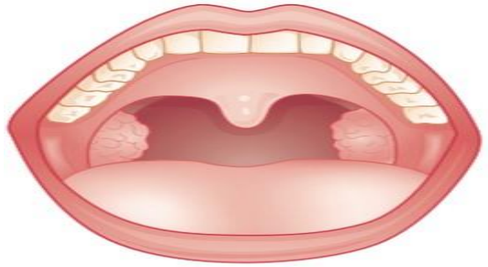
Figure 59-25 Mallampati class I. (From Kryger MH. *Atlas of clinical sleep medicine.* 2nd ed. Philadelphia: Saunders; 2014: Fig. 13.1-28.)

Figure 59-26 Mallampati class II. (From Kryger MH. *Atlas of clinical sleep medicine.* 2nd ed. Philadelphia: Saunders; 2014: Fig. 13.1-29, A.)

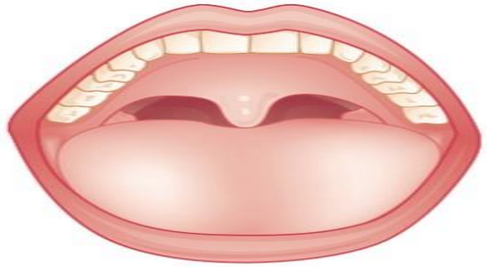
Figure 59-27 Mallampati class III. (From Kryger MH. *Atlas of clinical sleep medicine.* 2nd ed. Philadelphia: Saunders; 2014: Fig. 13.1-30, A.)

Figure 59-28 Mallampati class IV. (From Kryger MH. *Atlas of clinical sleep medicine.* 2nd ed. Philadelphia: Saunders; 2014: Fig. 13.1-31.)

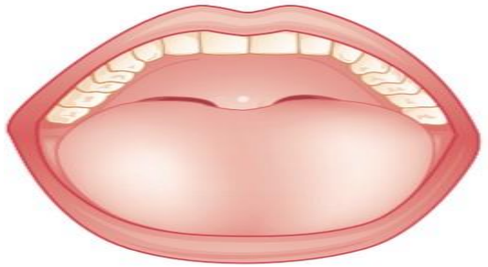
Freidman Classification



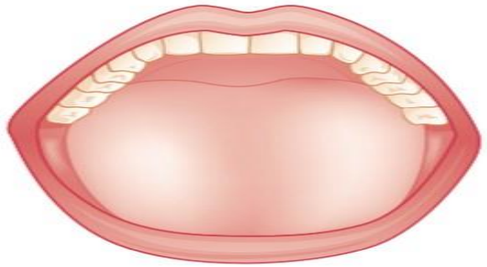
Friedman Palate Position I allows visualization of the entire uvula and tonsils/pillars.



Friedman Palate Position II allows visualization of the uvula but not the tonsils.



Friedman Palate Position III allows visualization of the soft palate but not the uvula.



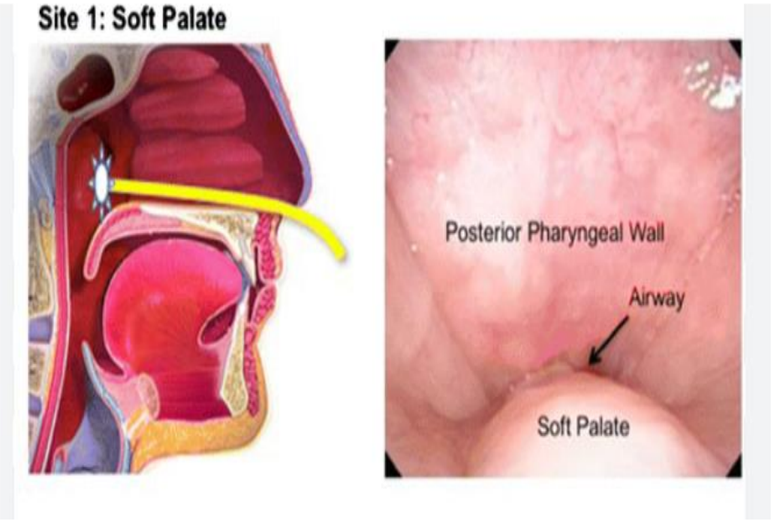
Friedman Palate Position IV allows visualization of the hard palate only.

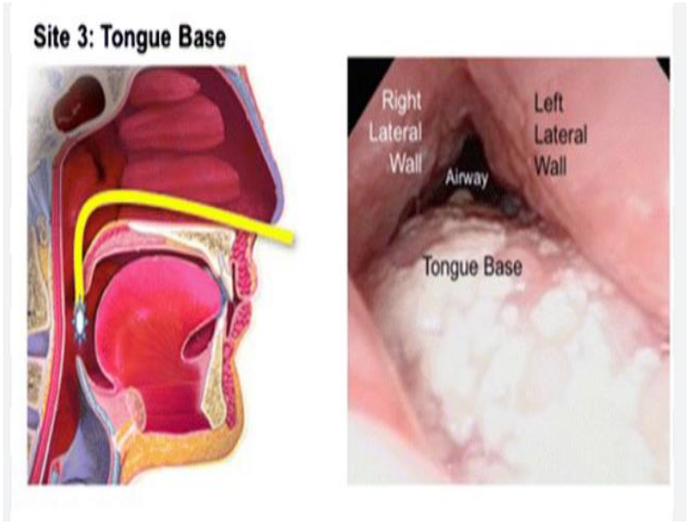
Stage	Tongue position[#]	Tonsil size[#]	BMI $kg \cdot m^{-2}$
I	1 or 2	3, 4	<40
II	1 or 2	0, 1, 2	<40
	3 or 4	3, 4	<40
III	3	0, 1, 2	<40
	4	0, 1, 2	<40
IV	1, 2, 3, 4	0, 1, 2, 3, 4	>40
	All patients with craniofacial or other anatomical deformities		

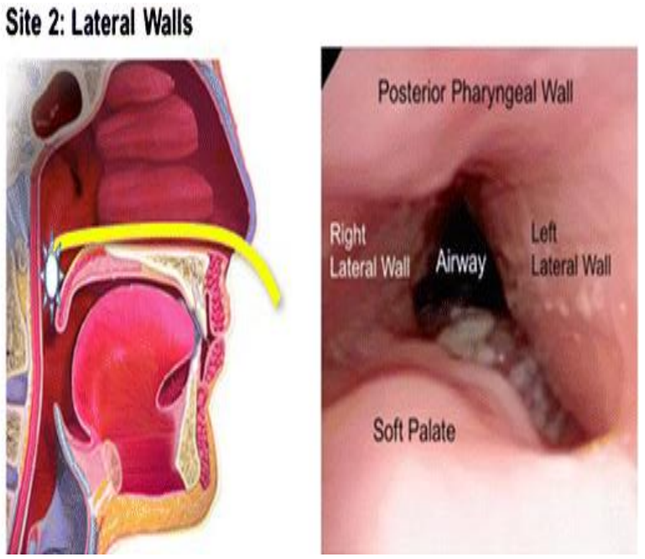
Data modified from [32]. BMI: body mass index. [#]: increasing values indicate higher tongue positions and larger tonsil sizes, respectively.

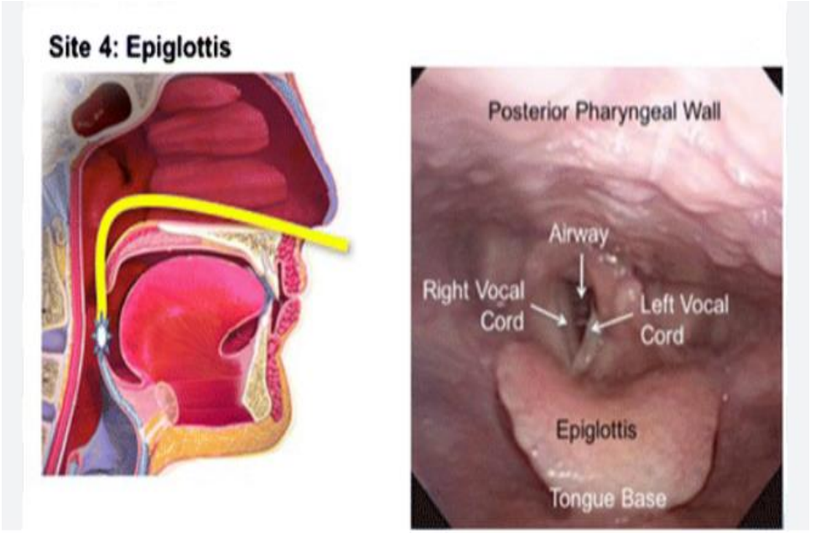
Drug induced sleep endoscopy(DISE)

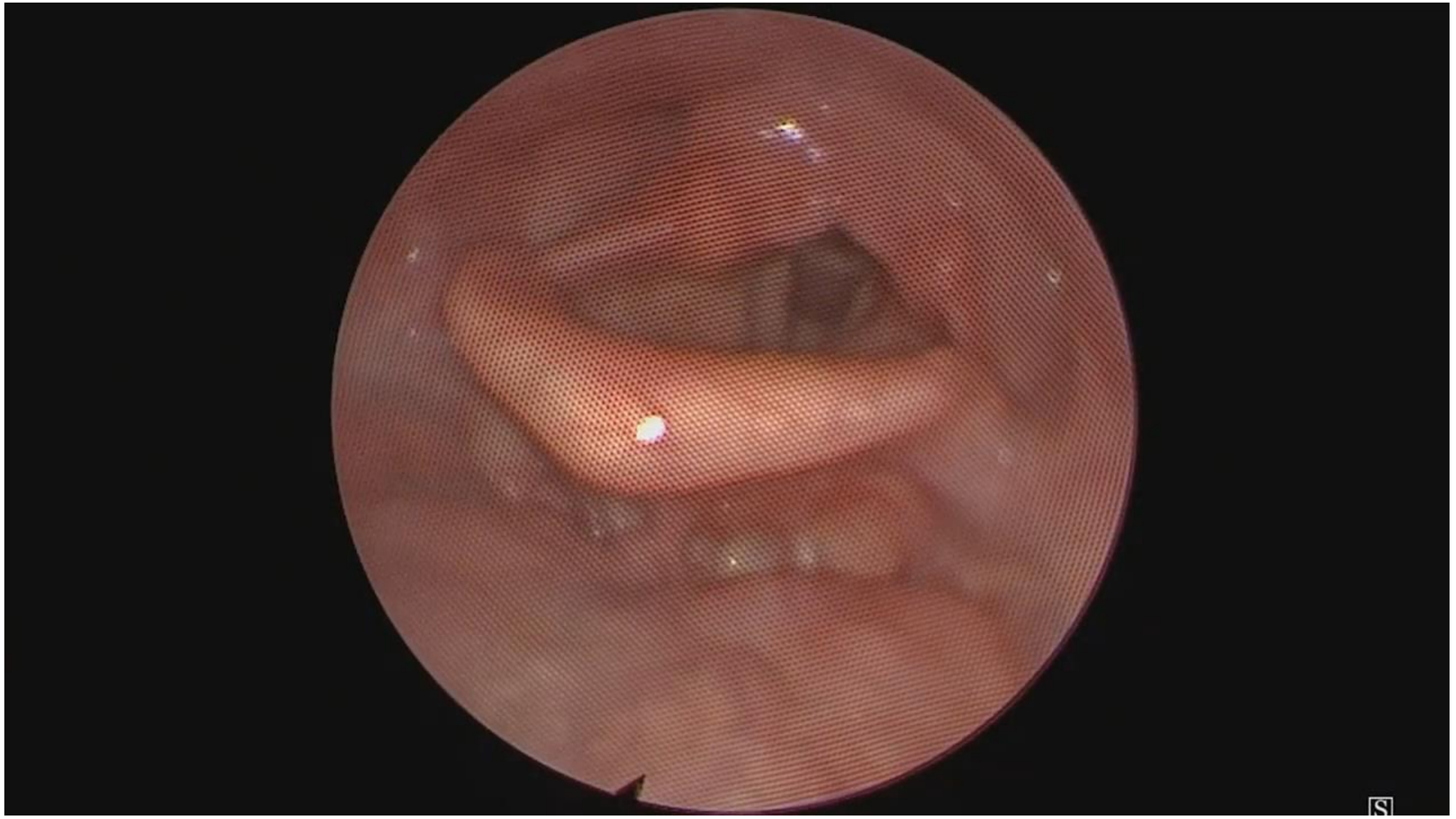
VOTE
VELUM
OROPHARYNGEAL WALL(TONSILS AND LATERAL PHARYNGEAL WALL)
TONGUE BASE
EPIGLOTTIS(HYPOPHARYNX)

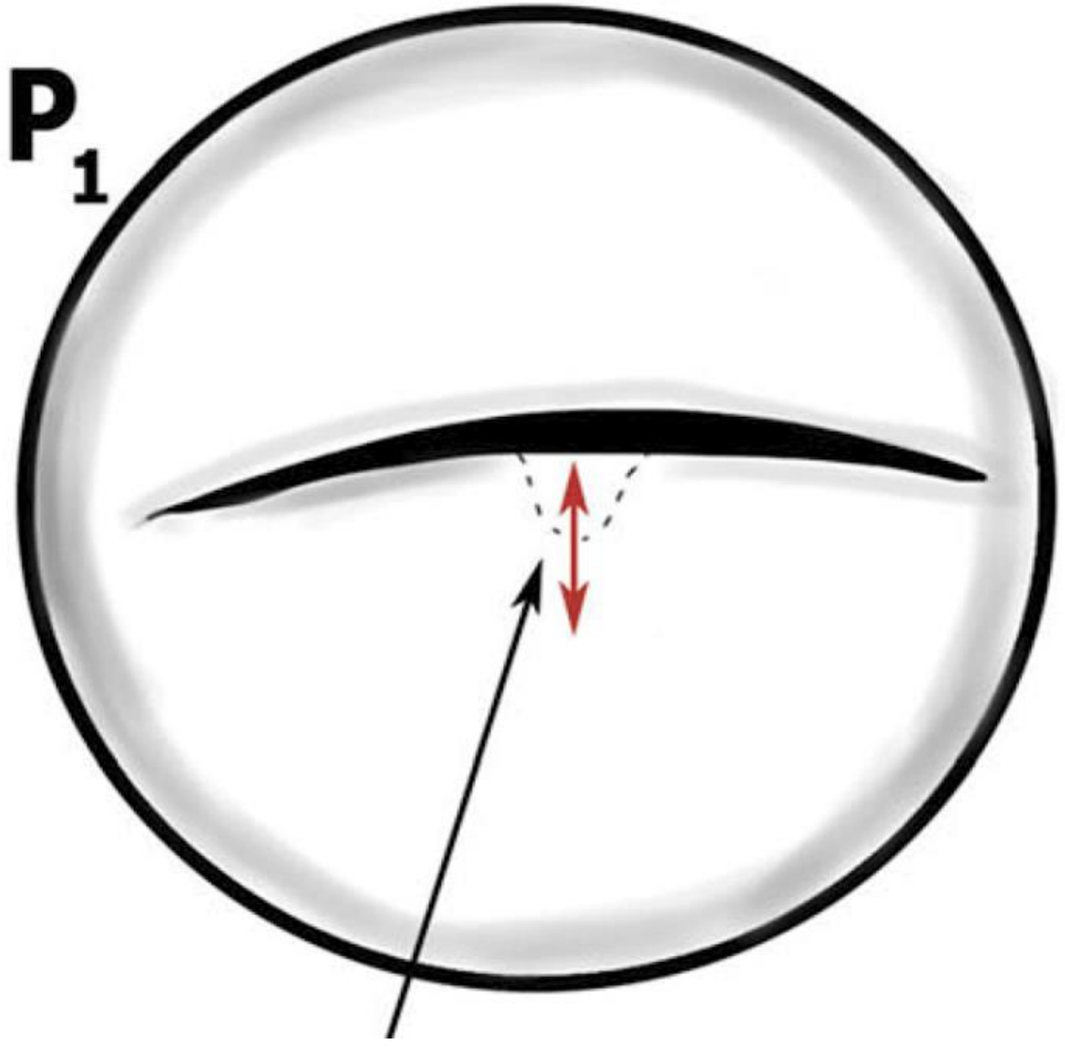








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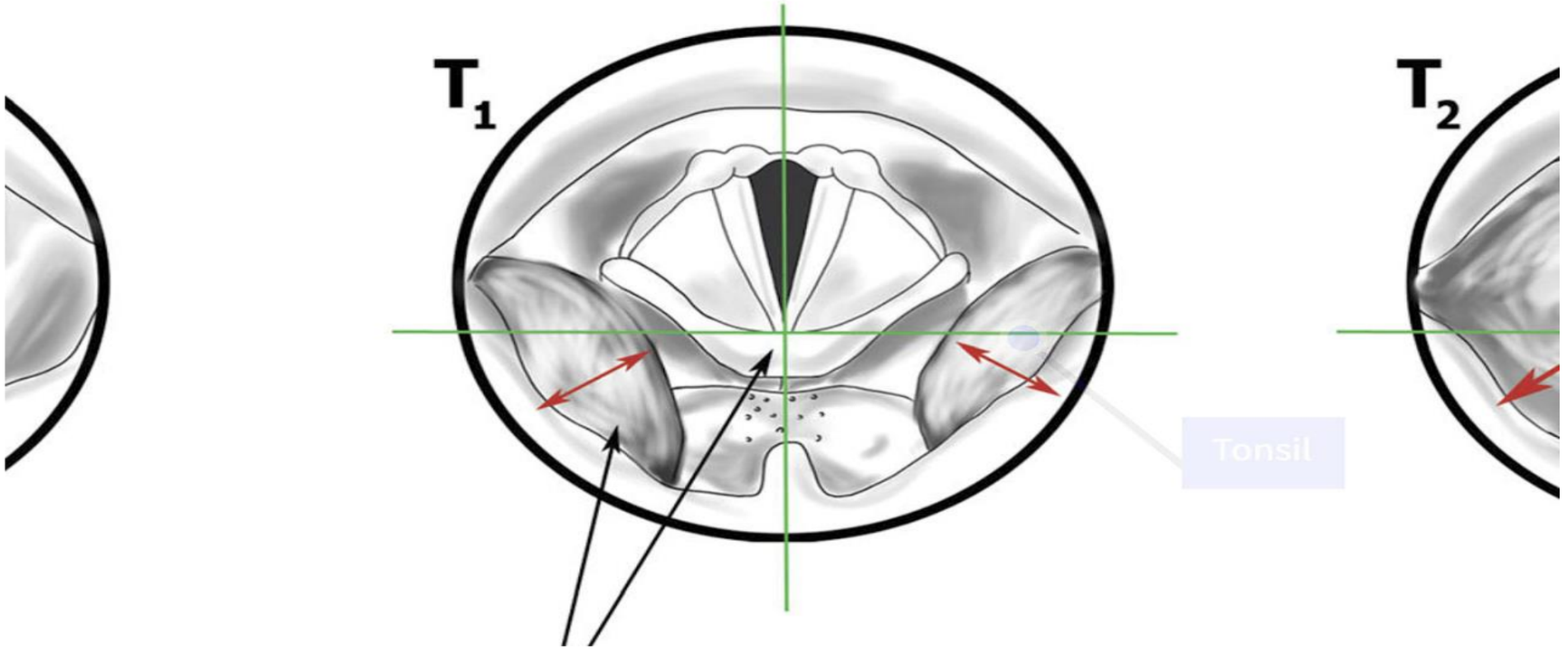

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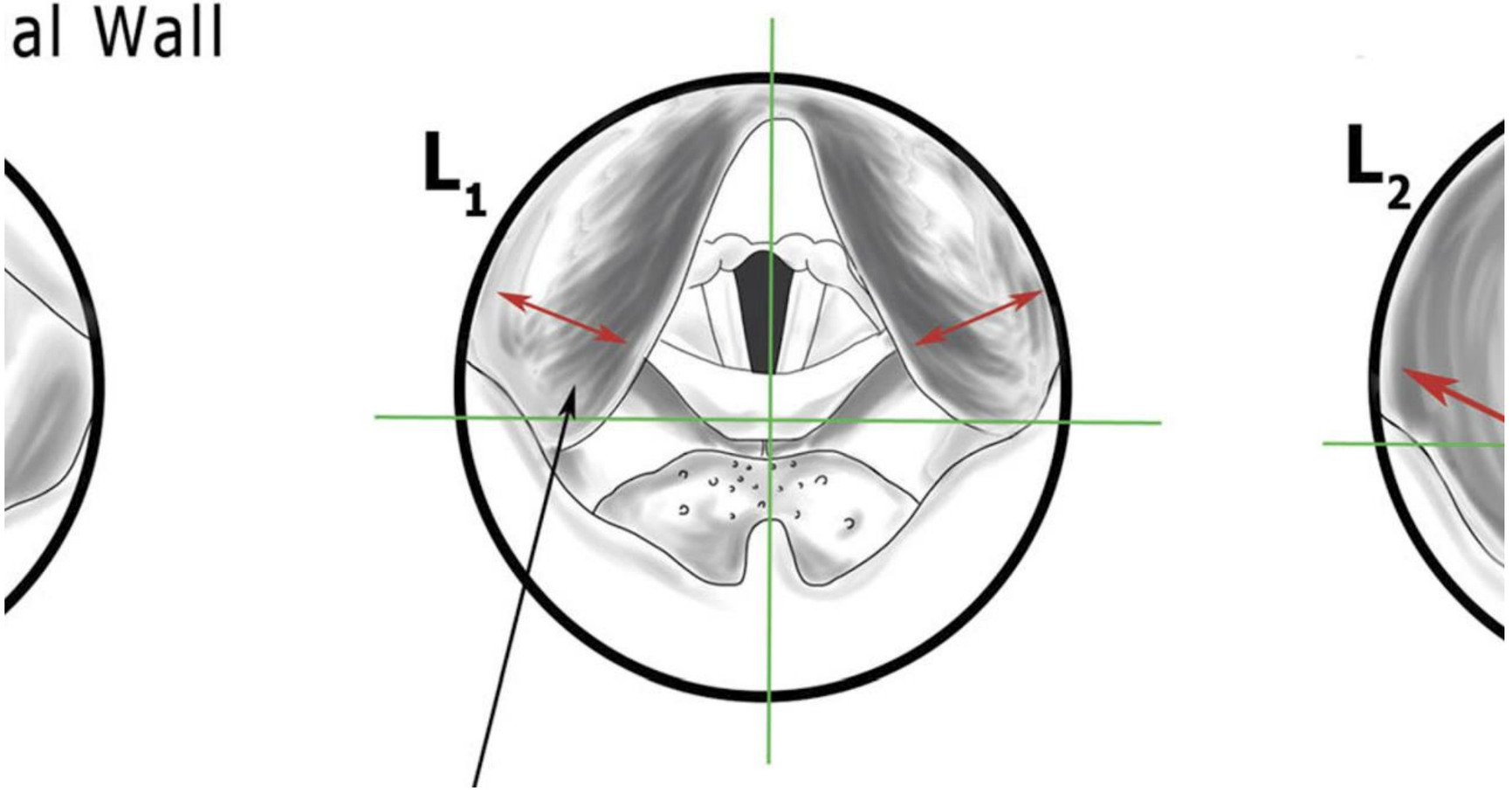
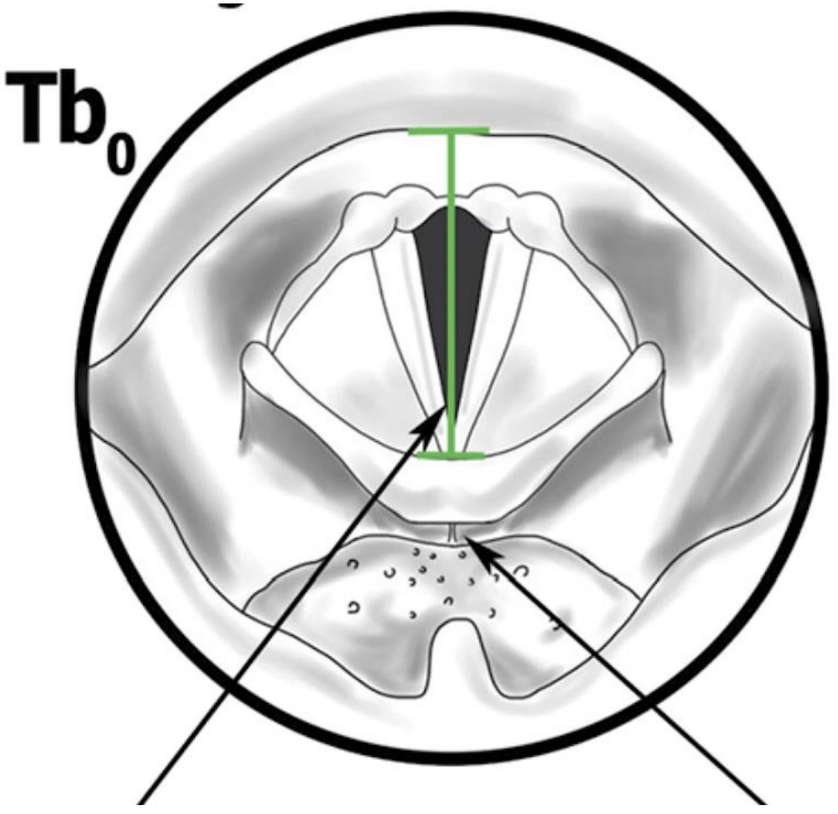
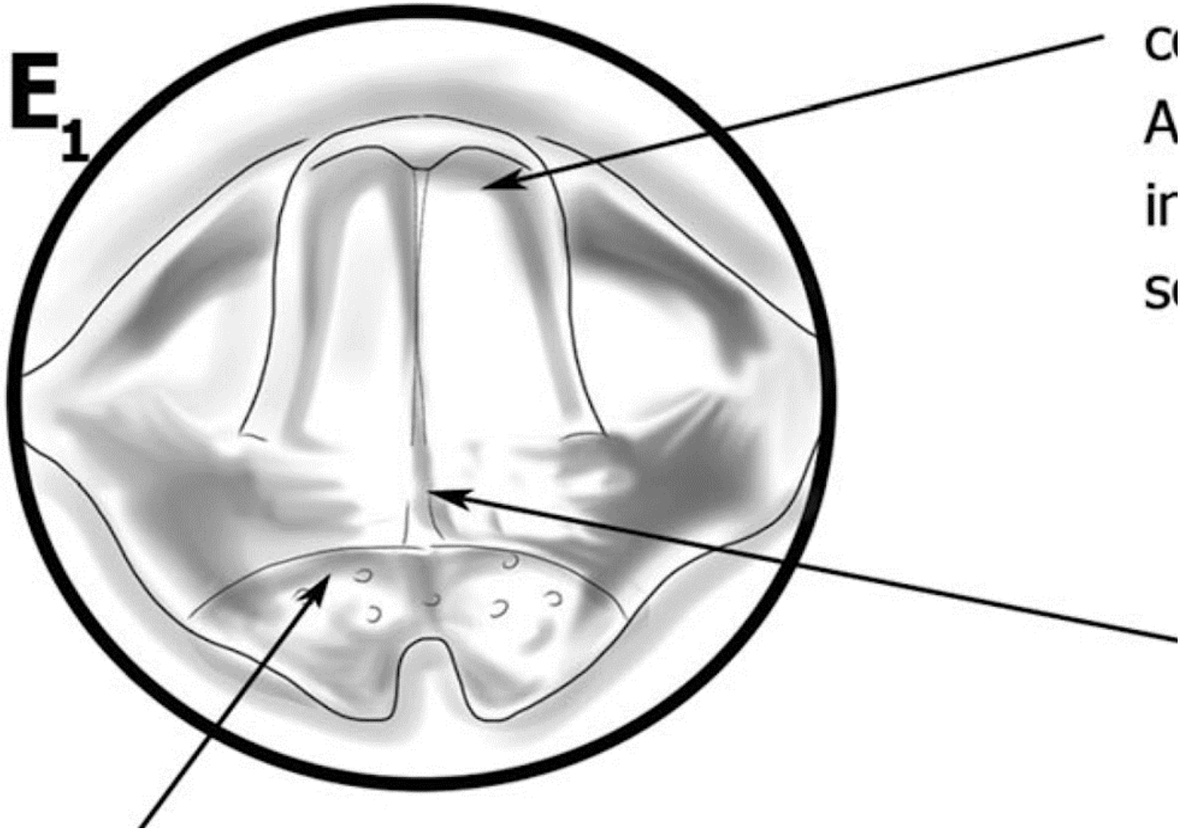






Types of Sleep Surgery Procedures

1.Nasal surgery

2.Palatal surgery

3.Oropharyngeal surgery

4.Hypoglossal nerve stimulation

5.Tongue base procedures

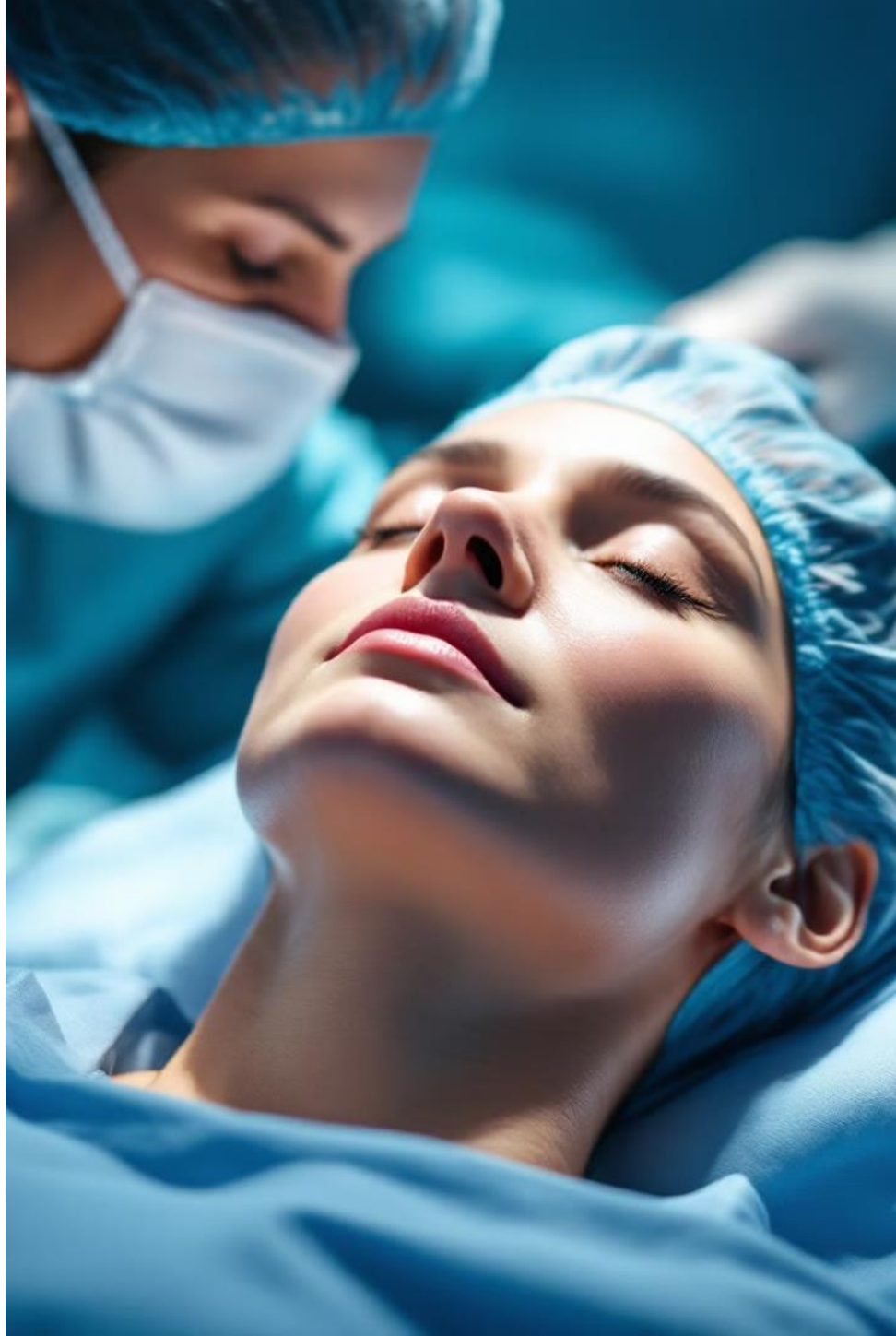
6.Hypopharyngeal procedures

7.Maxilomandibular advancement

8.Tracheotomy

Nasal surgery

- Nasal Surgery in OSA is Pivotal but not Primary.
- Treatment of the nose in OSA is crucial in its pathophysiology and in terms of improving airflow dynamics.
- In a multi-level surgical plan, the nose should be considered and its repair will significantly aid in the success rate of OSA surgery.
- Surgical correction depends on the anatomical abnormality; from septoplasty , inferior turbinate reduction, turbinoplasty, sinus surgery ,septorhinoplasty

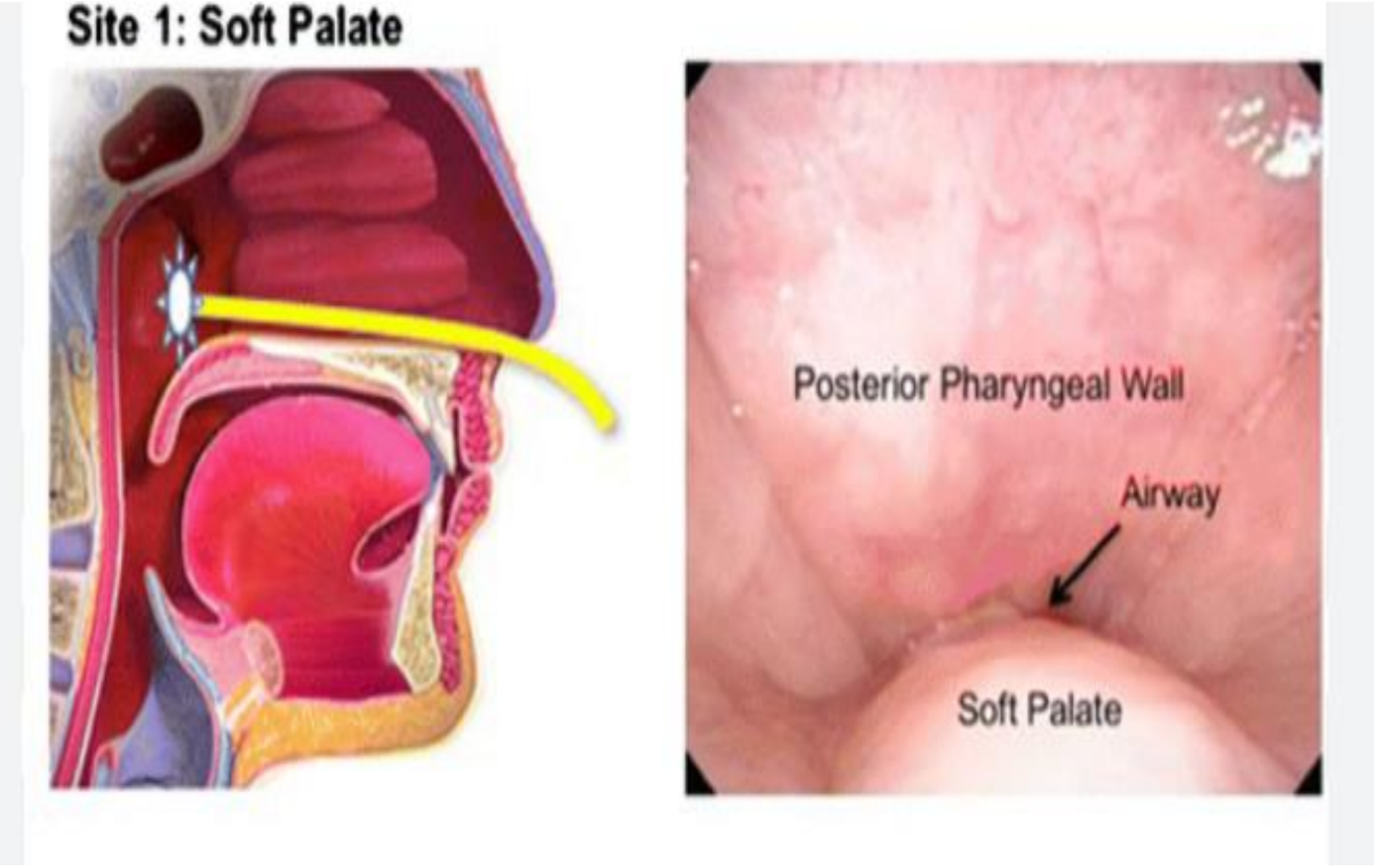


Palatal surgery

1. Uvulopalatopharyngoplasty (UPPP)
(UPPP)

2. Uvulopalatal flap

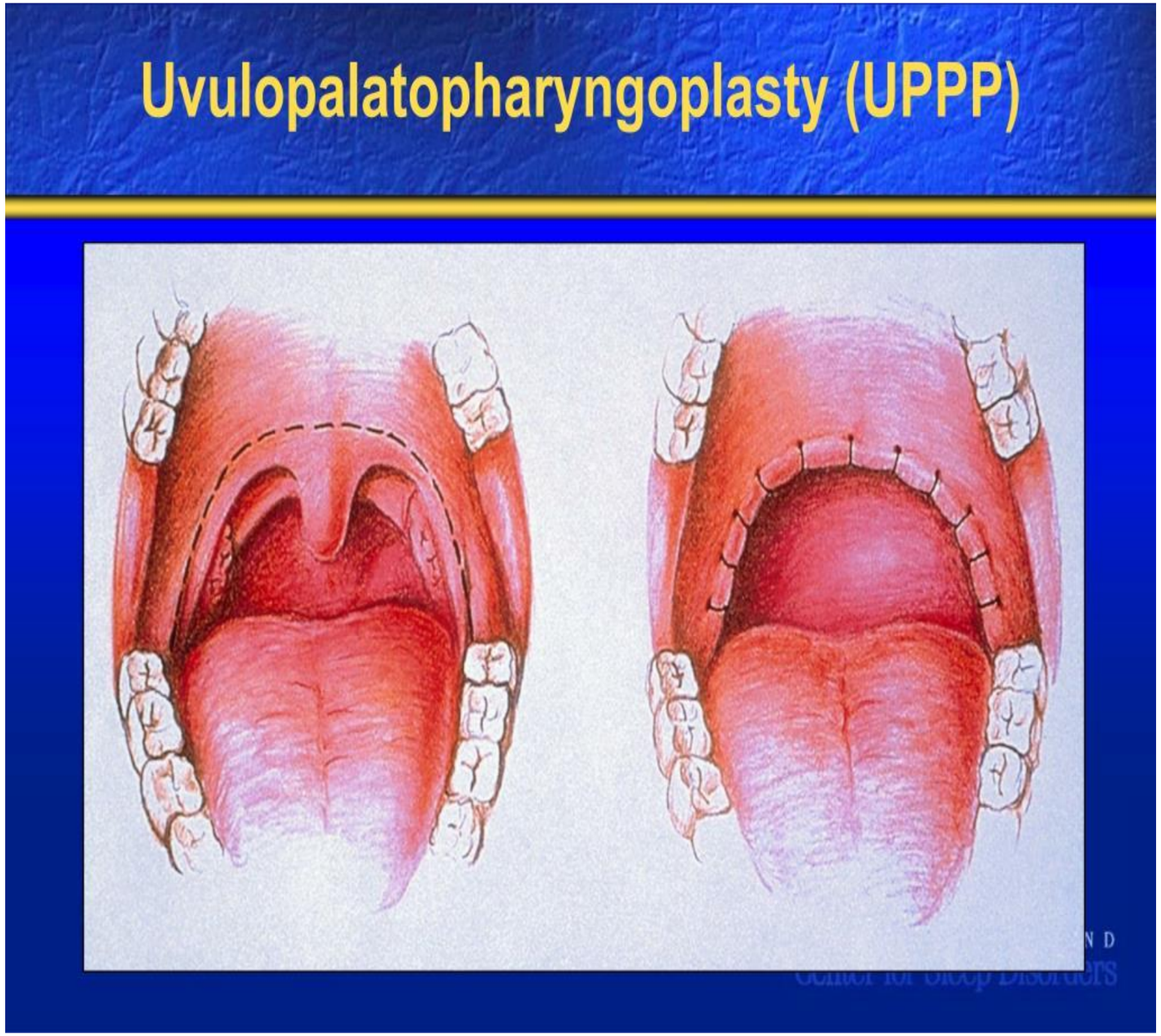
3. Transpalatal advancement pharyngoplasty



Benefits
Reduced snoring
Fewer nighttime awakenings
Less daytime sleepiness
Lower risk of accidents while driving
Decreased risk of cardiovascular disease
Improvements in overall quality of life

Complications

- Pain with swallowing and speech(2W)
- Hemorrhage(2-4%)
- Swallowing difficulties(regurgitation)
- Velopharyngeal insufficiency
- Nasopharyngeal stenosis
- Creation of silent apnea
- Change in voice



Uvulopalatal flap

Indication

- Excessive soft palate length without significant palatal thickness

(relatively thin but long soft palate)

Benefits

- Reduced risk of VPI and nasopharyngeal stenosis

potential to be reversible

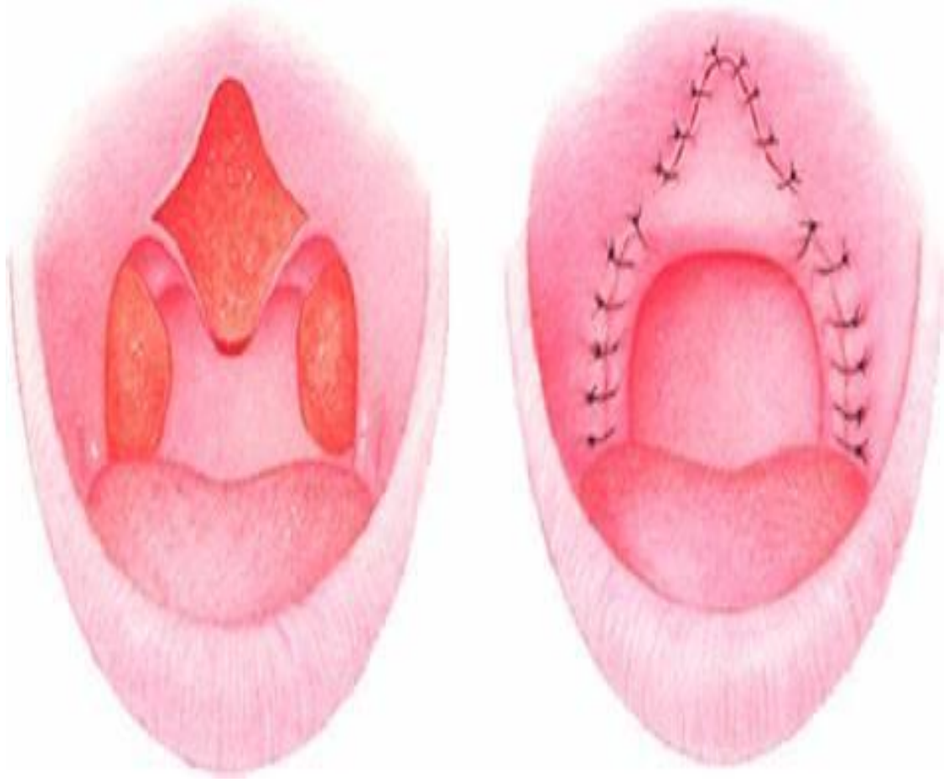
- Improved velopalatal opening from preserved uvular muscle
- low risk of bleeding and pain

complications

- There are no serious complications

Contraindications

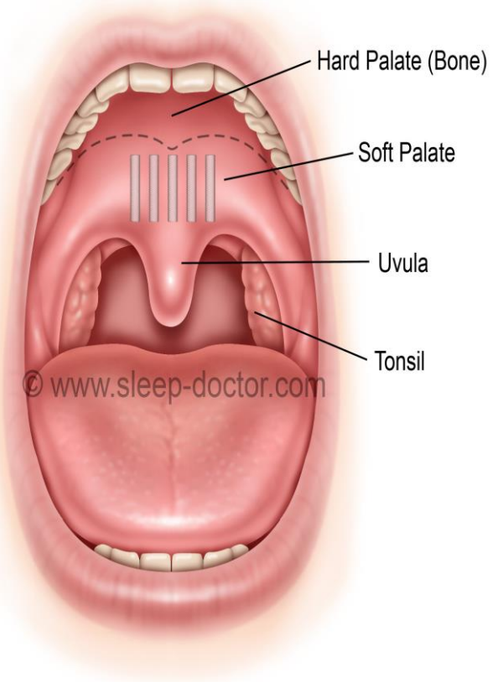
- Excessively thick palate
- It is not the first choice for the patient whose palate is not elongated and whose retropalatal airway would not be improved by palatal shortening.

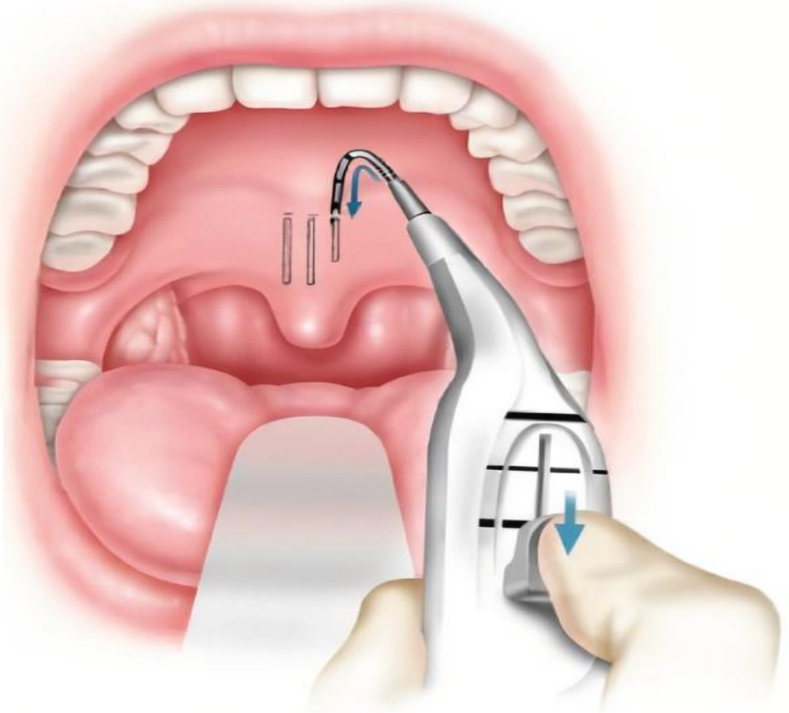


Radiofrequency ablation
Palatal implant

- Beneficial for mild to moderate OSA as a first-line treatment with very few complications

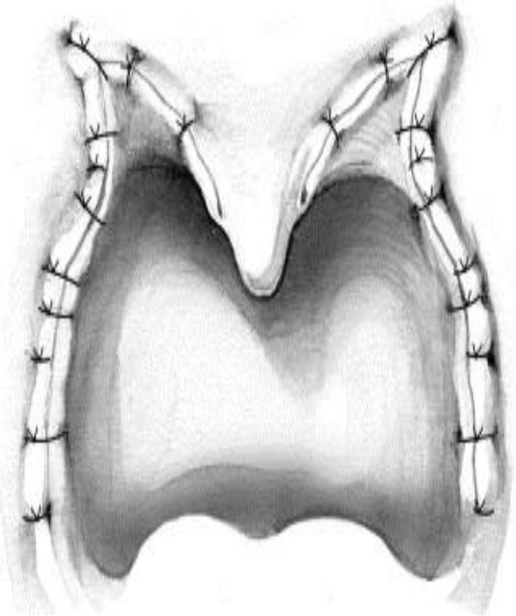
- The main mechanism for RFA and implant in OSA is to enlarge airways by shrinking and stiffening of the tissue

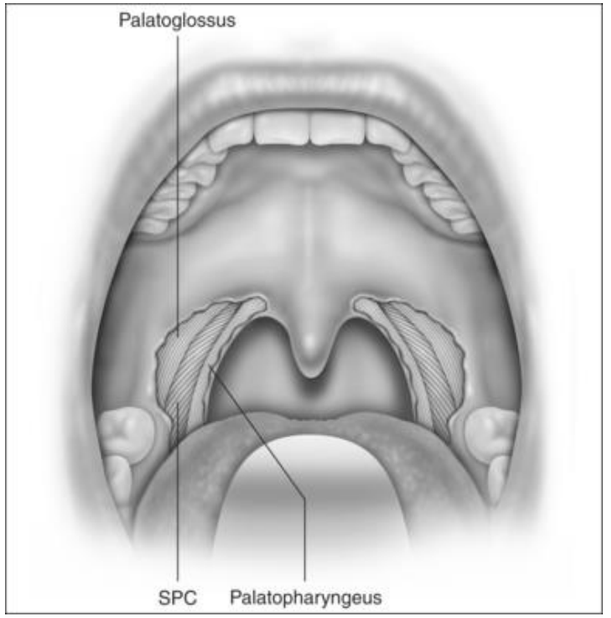


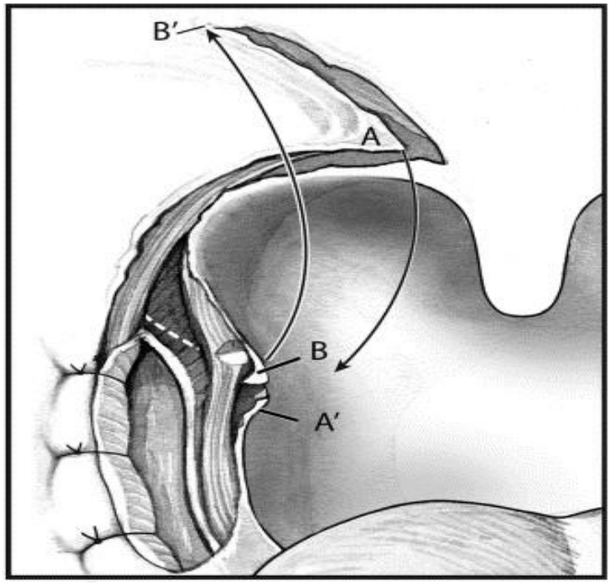


Lateral pharyngoplasty

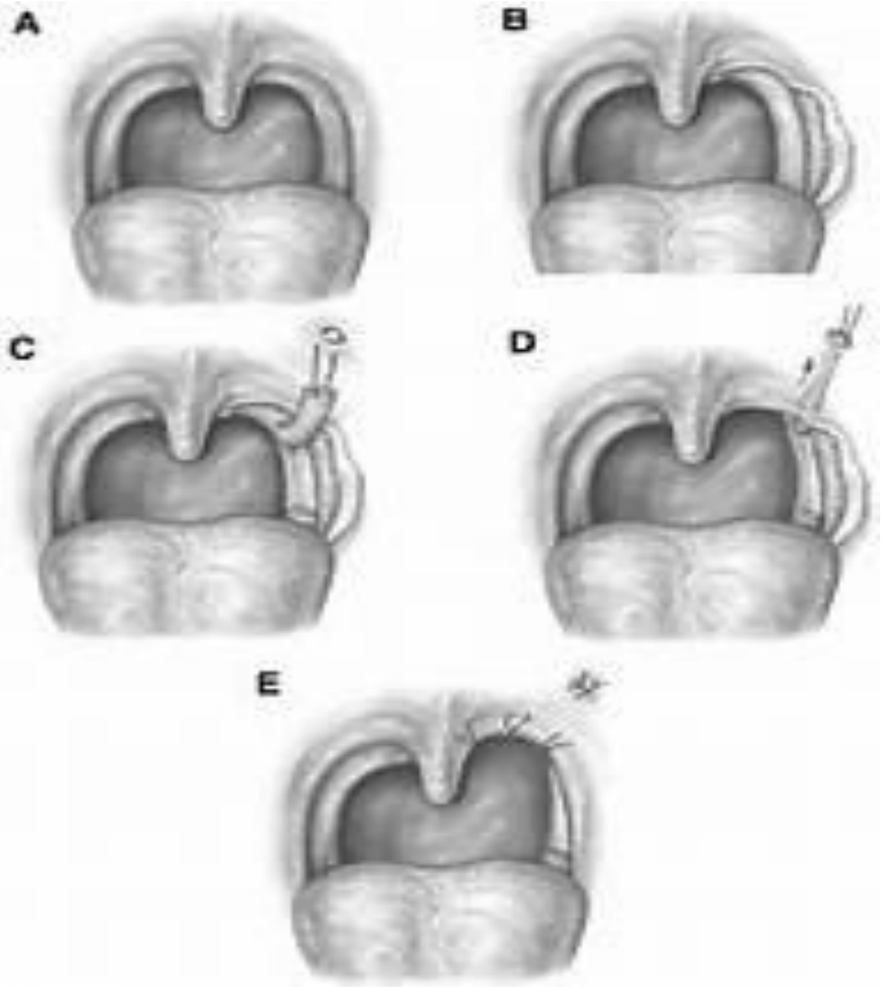
- Increase the size of the airway without affecting normal functions such as breathing, speaking, and swallowing.
- It does require more dissection, being more difficult for surgeons to perform and also having a slightly longer recovery time







Expansion sphincter pharyngoplasty(ESP)

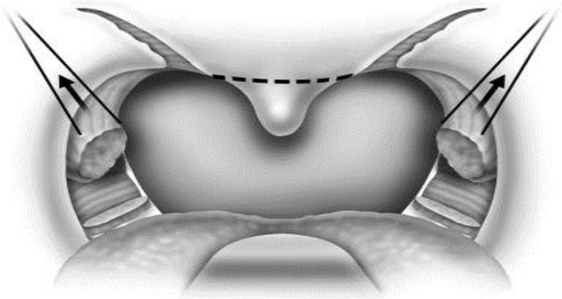


- The palatopharyngeus (posterior pillar) is transected inferiorly and the muscle pedicle is rotated anteriorly, superior, and laterally to enlarge the lateral velopharyngeal dimension.

- It is ideally suited for a more obliquely or horizontally oriented soft palate with a large lateral oropharyngeal wall component and a circumferential pattern of collapse at the velum.

- The proportion of patients responding to ESP was 78%, compared to 45% with UPPP.

- Complications
- **Bleeding**
- **Infection(rare)**
- **Difficulty swallowing(1-3 d)**
- **Changes in speech(rarely permanent)**
- **Throat dryness or feeling of something stuck in the throat**
- **Change in sense of taste or tongue numbness**
- **Tooth injury**
- **Continued snoring**



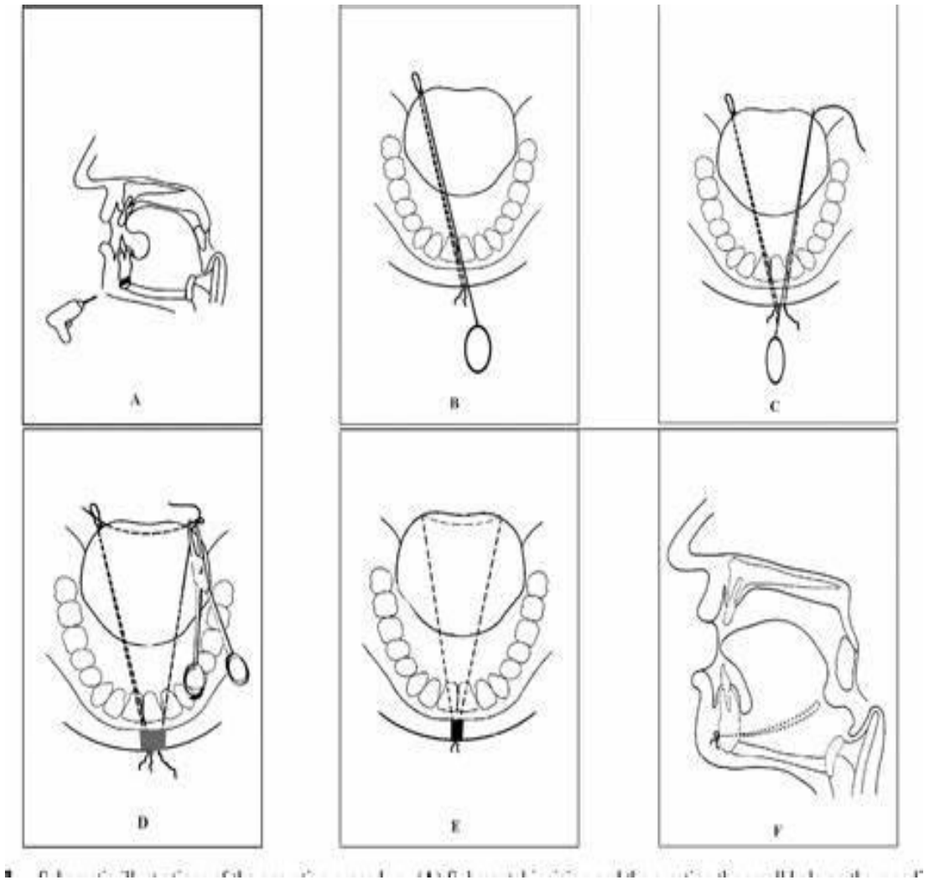
Tongue base suspension

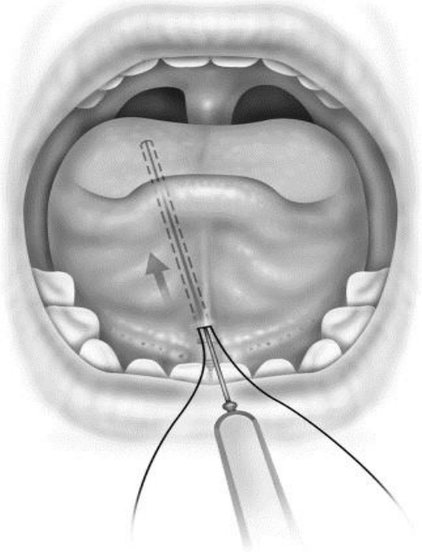
Benefits

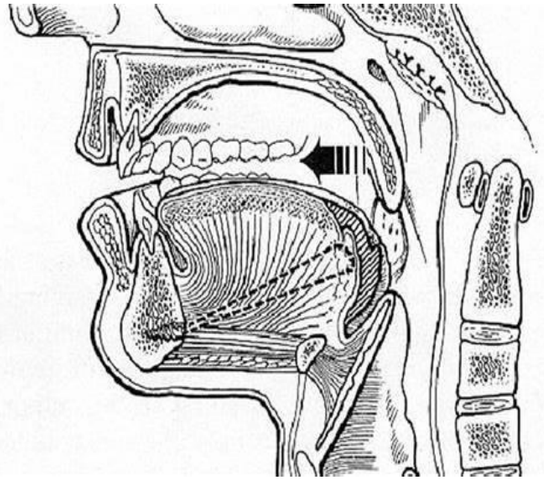
- Increased total sleep time and sleep efficiency
- significantly reduced respiratory arousal index

Complications

- temporary dysphagia
- temporary dysarthria
- mouth floor hematoma (rare)
- dysphagia, choking, or cough-related arousals(very rare)

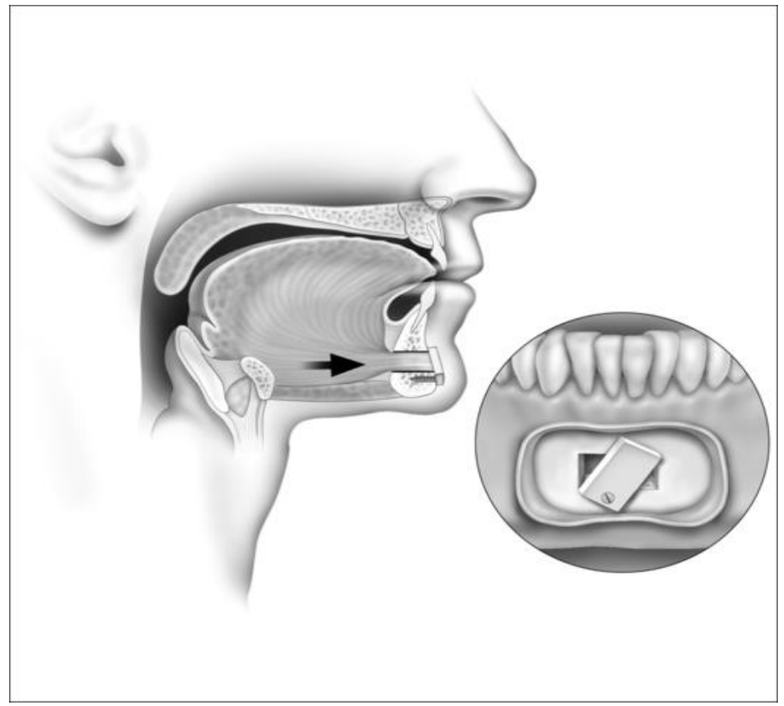


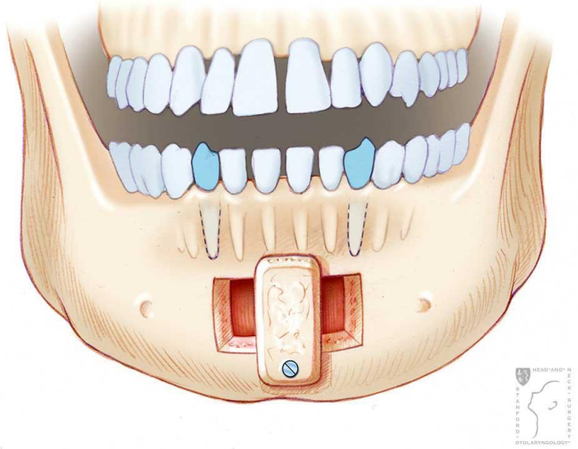


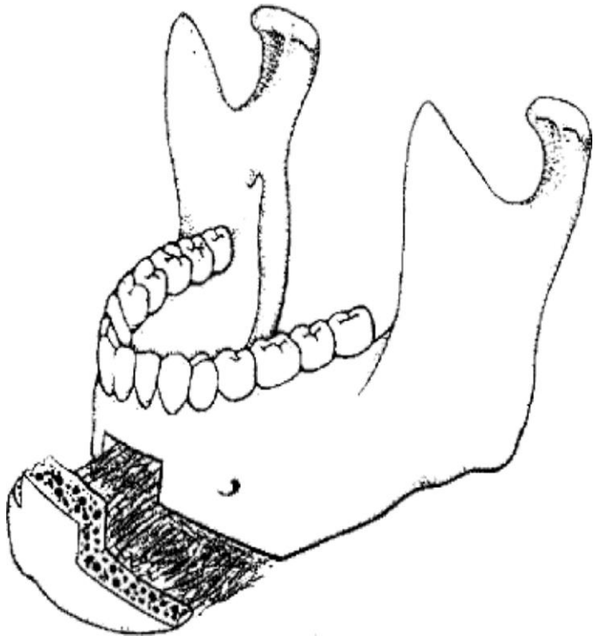


Genioglossus advancement

- Surgical manipulation of the genioglossus muscle's attachment to the mandible.
- The result is reducing obstruction at the hypopharynx and tongue base by displacing this musculature anteriorly.



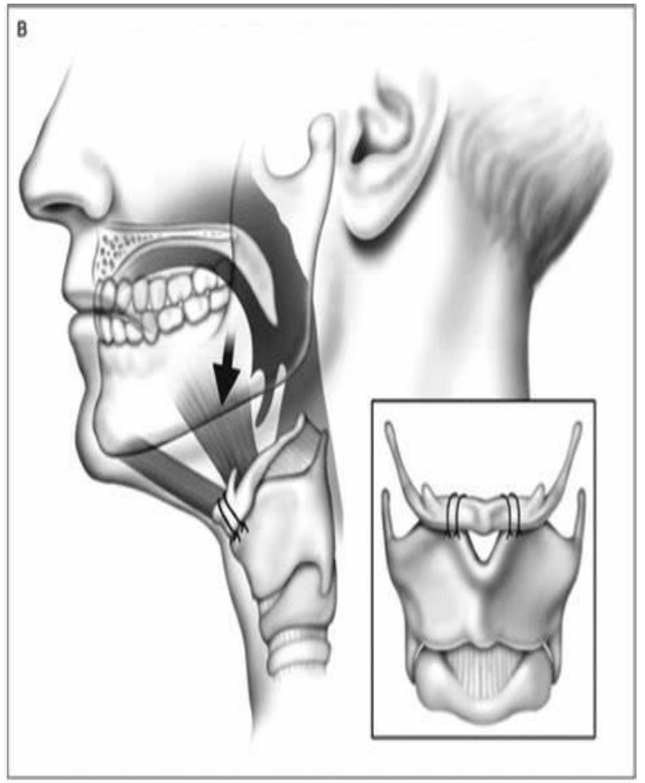


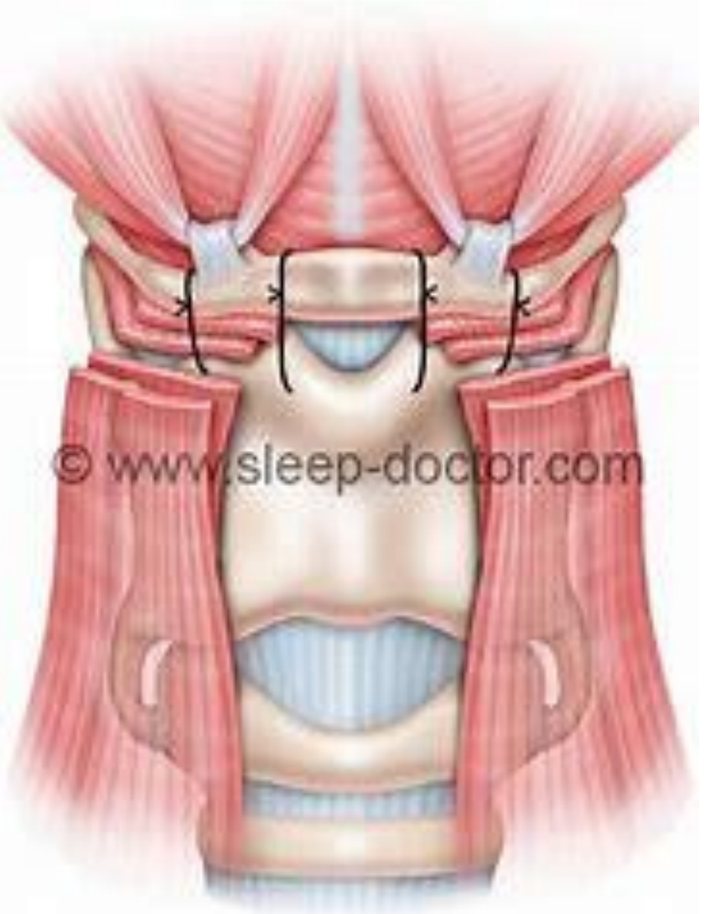


Hyoid suspension

Complications of G.A and H.S

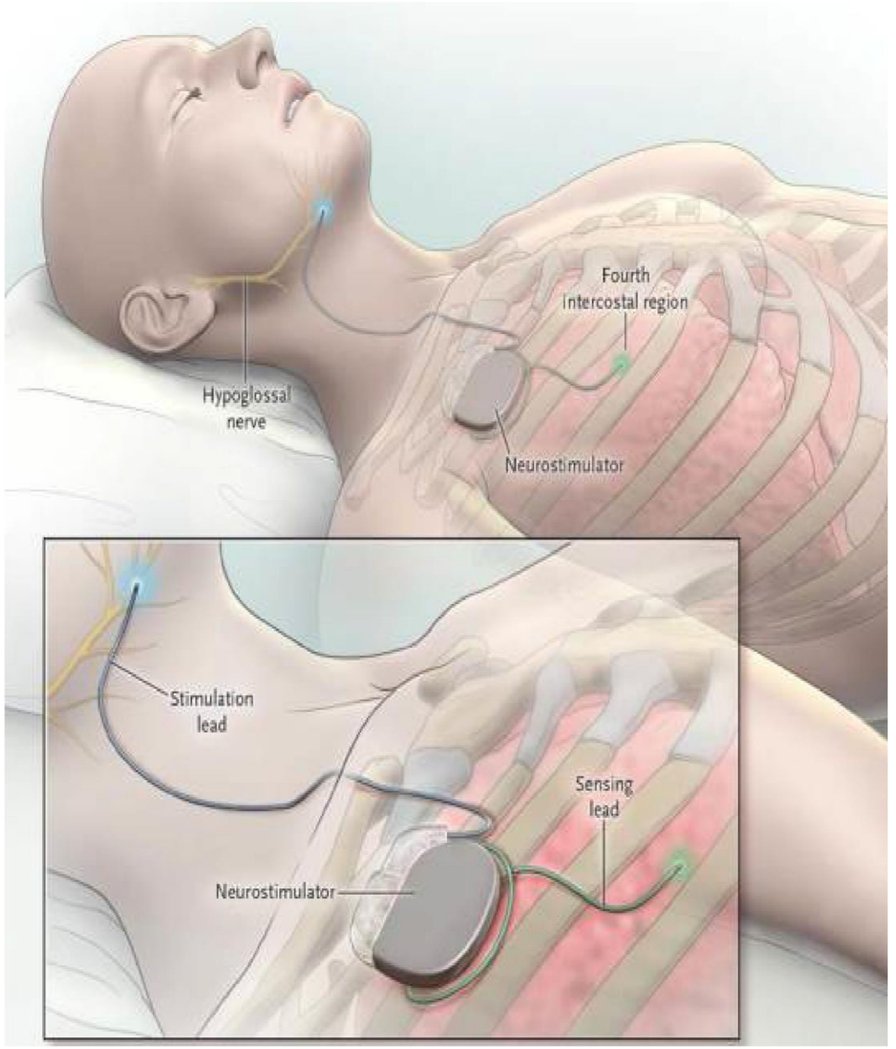
- Permanent numbness
- Infection
- Seroma
- Risk of mandibular fracture,aspiration and death



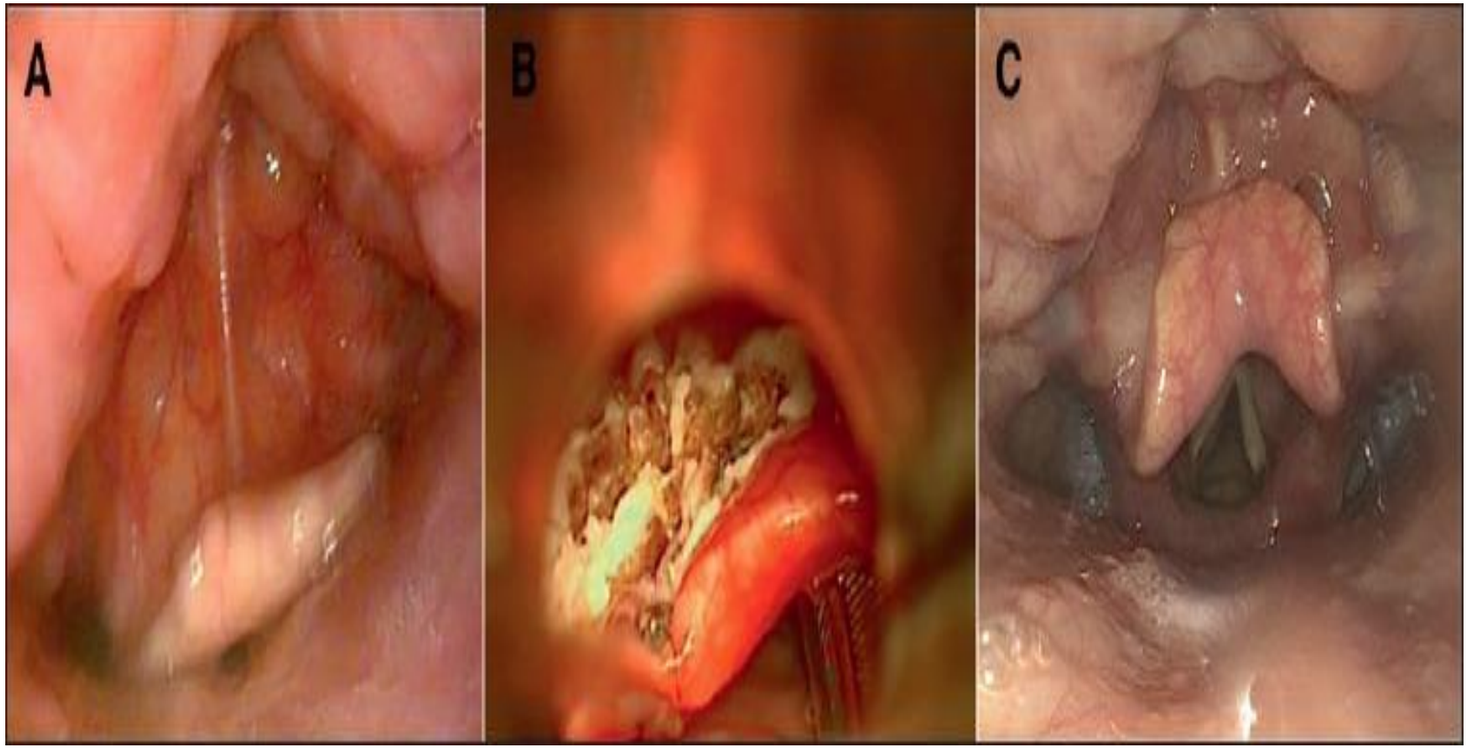


Hypoglossal nerve stimulation

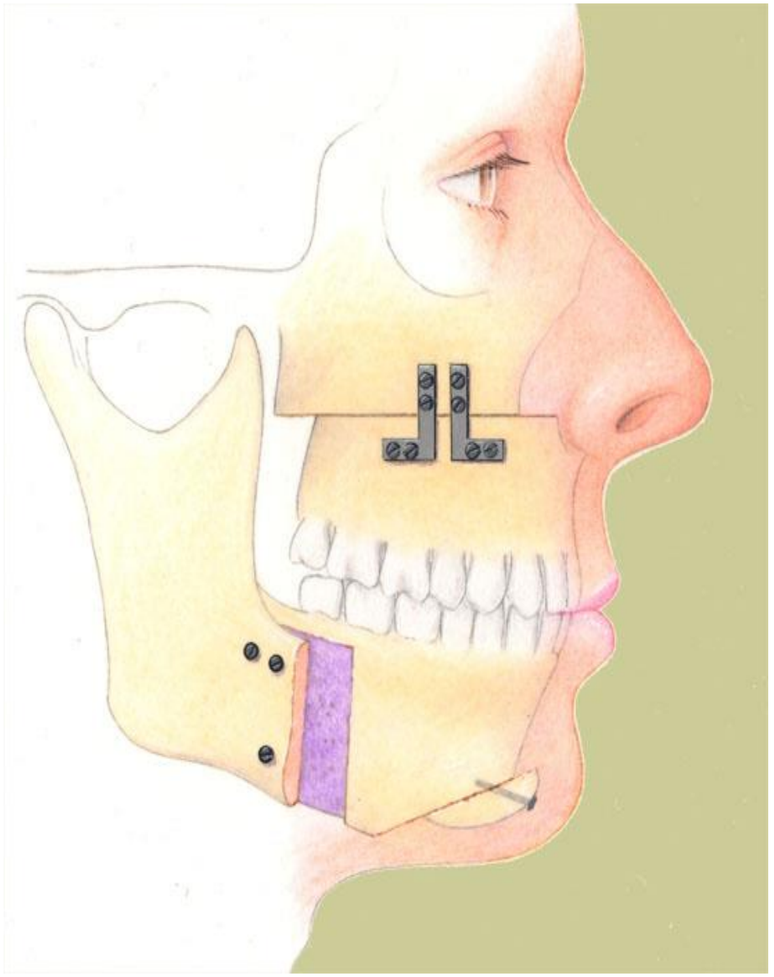
- Implantable hypoglossal nerve stimulating device
- Electrical stimulation of 12th nerve improve the neuromuscular tone of the pharynx during sleep especially genioglossus muscle
- Rapidly detect the onset of the inspiratory phase of respiration through chest wall pressure sensors

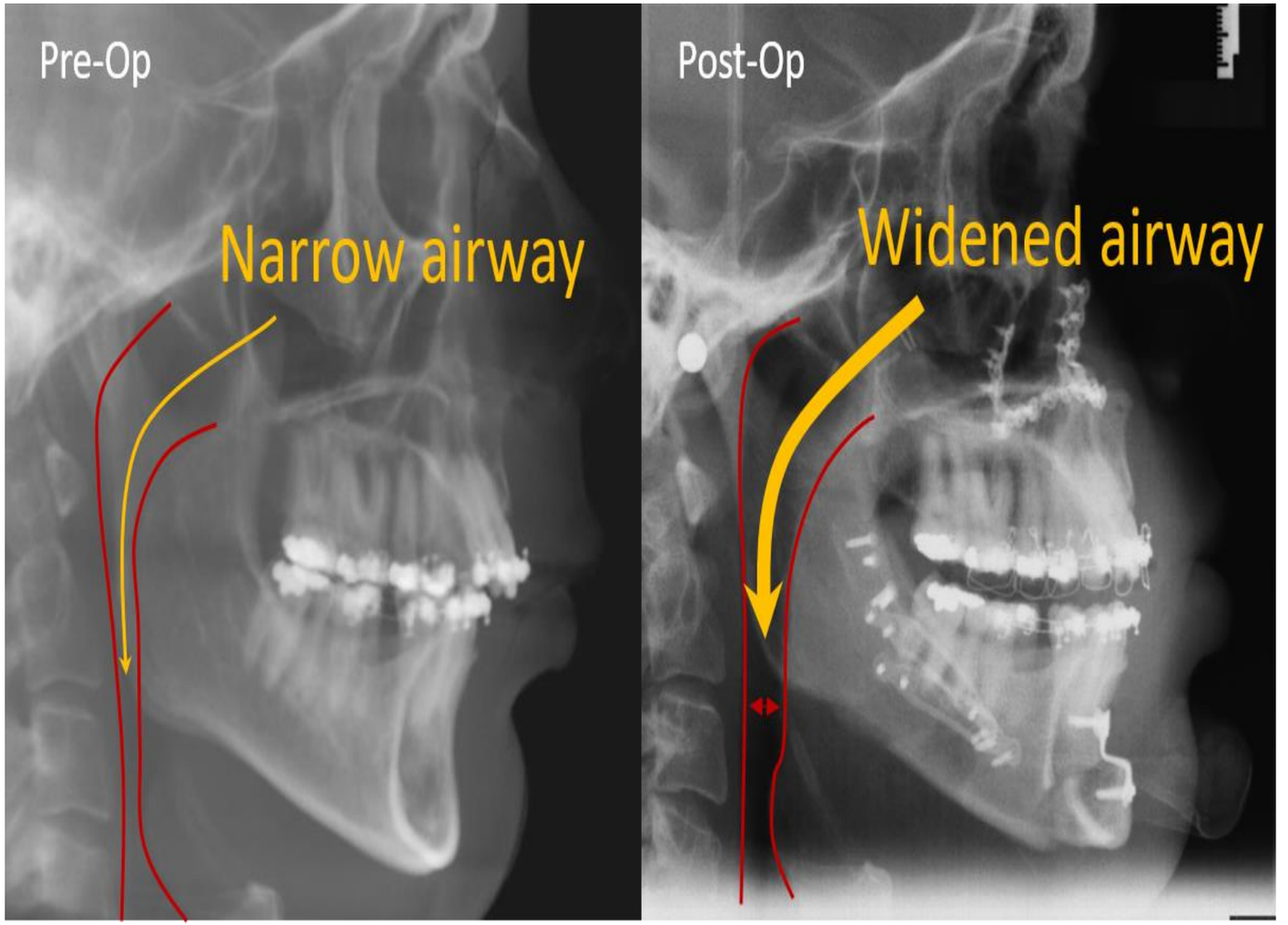


Epiglottopexy



Maxillomandibular advancement





Maxillomandibular Advancement Surgery

Surgical Technique

Both upper and lower jaws are moved forward to enlarge the airway.

Visible Results

Procedure can significantly alter facial appearance and improve breathing.

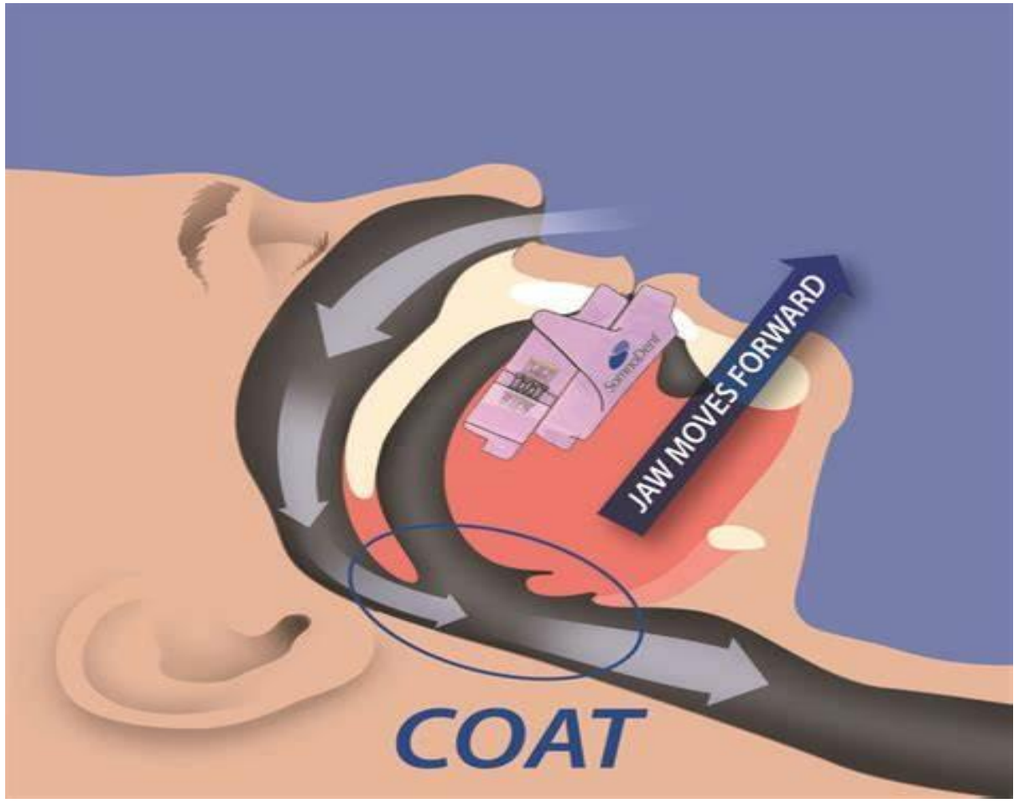
Improved Sleep Quality

MMA often leads to substantial reduction in reduction in OSA symptoms.

Bariatric surgery

Oral appliance

- Custom-Fitted Devices
- Repositioning the jaw to keep the airway open
- Non-invasive alternative to surgery
- Portable and easy to use
- Effective for mild to moderate OSA



Benefits of Sleep Surgery

Improved Cardiovascular Health

Reduces risk of heart disease and hypertension.

Enhanced Cognitive Function

Improves memory, focus, and overall mental clarity.

Increased Energy Levels

Alleviates daytime sleepiness and boosts boosts productivity.

Conclusion and Key Takeaways Takeaways

Personalized Approach

Sleep surgery offers tailored solutions for OSA patients.

Multidisciplinary Care

Collaboration between sleep specialists and surgeons is crucial. crucial.

Ongoing Research

Continued advancements are improving surgical outcomes for OSA.