

Surgical Management of Obstructive Sleep Apnea in Adults

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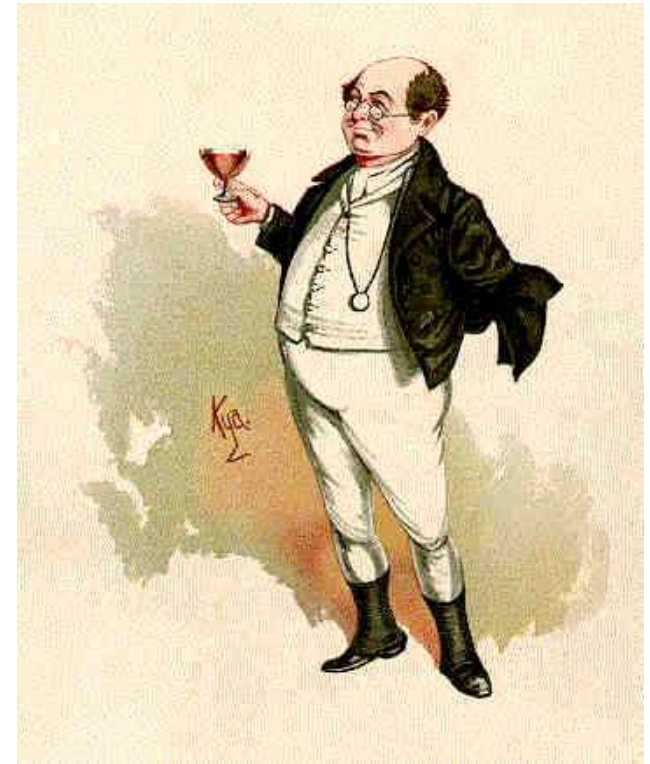
Department of Otolaryngology

Grand Rounds Presentation

September 24, 2009

Outline

- Background information
- History
- Physical exam
- Diagnostic modalities
- Surgical management
 - Types of procedures
 - Protocol for best outcome



Mr. Pickwick from “The Pickwick Papers” by Charles Dickens

Background Information

Sleep disordered breathing

- Primary snoring
- Upper airway resistance syndrome (UARS)
 - Frequent nighttime awakenings
 - Daytime sleepiness
- Obstructive sleep apnea syndrome (OSAS)
 - Nocturnal episodes of apnea and oxygen desaturation
 - Daytime sleepiness
- Obesity hypoventilation syndrome (Pickwickian)
 - Obese
 - Daytime hypercapnia
 - Sleep disordered breathing



Background Information

Obstructive sleep apnea facts:

- Affects approximately 18 million Americans
- Up to 70% of cases associated with obesity
- Increased incidence with age
- Increased overall mortality
- 38,000 CV deaths per year related to OSA
- MVA risk up 7x

History

- Daytime sleepiness
- Bedtimes
- Awakening times
- Body position
- Restless sleep
- Alcohol and sedative use
- Caffeine intake
- Mouth breathing
- Morning headaches
- Menopause status

*Input of bed partner/family member is key

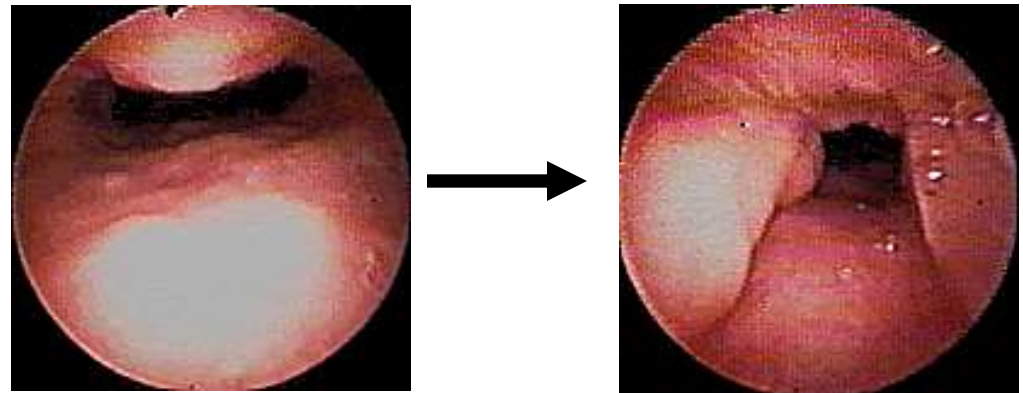
Physical Exam

- Body habitus
 - Obesity
 - Achondroplasia
 - Chest wall deformity
 - Marfan's syndrome
- Nasal obstruction
 - Septum
 - Polyps/tumors
 - Turbinates
 - Adenoids
 - Nasal valve collapse
- Oropharyngeal obstruction
 - Jaw
 - Palate
 - Tongue
 - Tonsils
 - Posterior pharyngeal wall



Physical Exam

- Hypopharyngeal/laryngeal obstruction
 - Epiglottitis
 - Lingual tonsil
 - Vocal cords
 - Tumors
 - Müller maneuver
- Neck
 - Size
 - Lymph nodes
 - Thyroid
- Cardiovascular
 - Arterial HTN
 - Peripheral edema





Diagnostic Modalities

- Questionnaires
- Cephalometric analysis
- Polysomnography

Sleep Apnea Questionnaires

- Epworth
- Stanford
- QOL

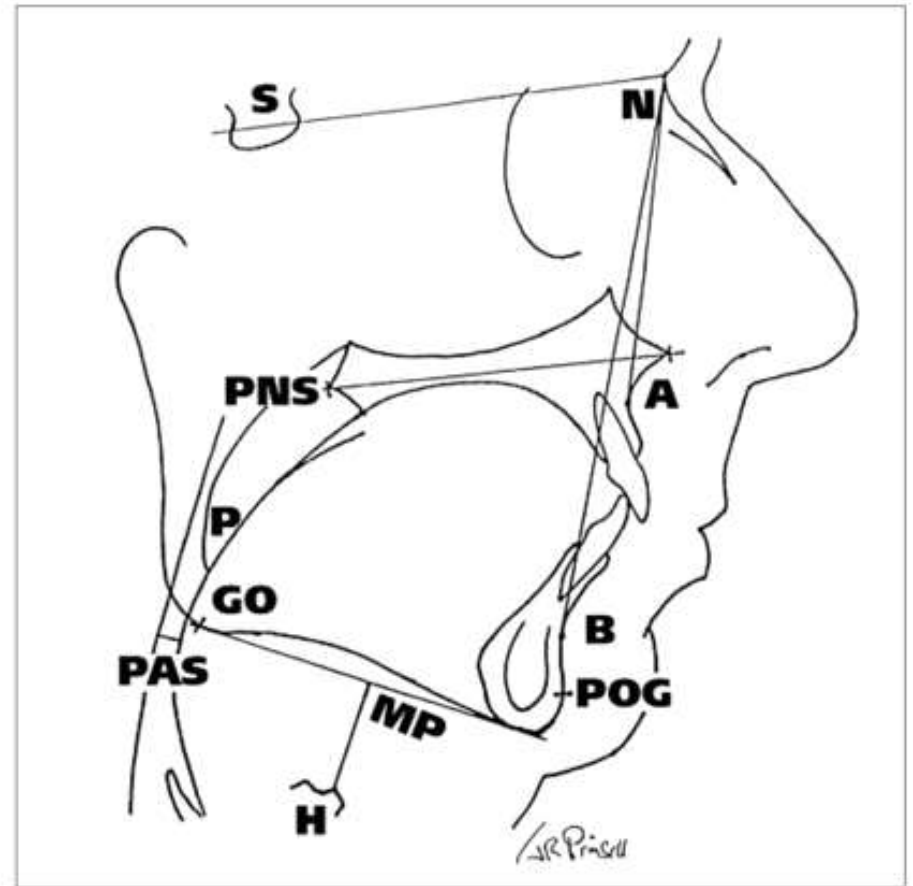
EPWORTH SLEEPINESS SCALE	
<i>Please answer the following questions based on this scale:</i>	
0.	Would never fall asleep
1.	Slight chance of dozing
2.	Moderate chance of dozing
3.	High chance of dozing

<u>Situation</u>	<u>Chance of Dozing</u>
Reading	_____
Watching TV	_____
Sitting in a public place (e.g., theater or meeting place)	_____
Driving a car, stopped at a traffic light	_____
As a passenger in a car for an hour without a break	_____
During quiet time after lunch without alcohol	_____
Lying down to rest when circumstances permit	_____
Total Score: _____	

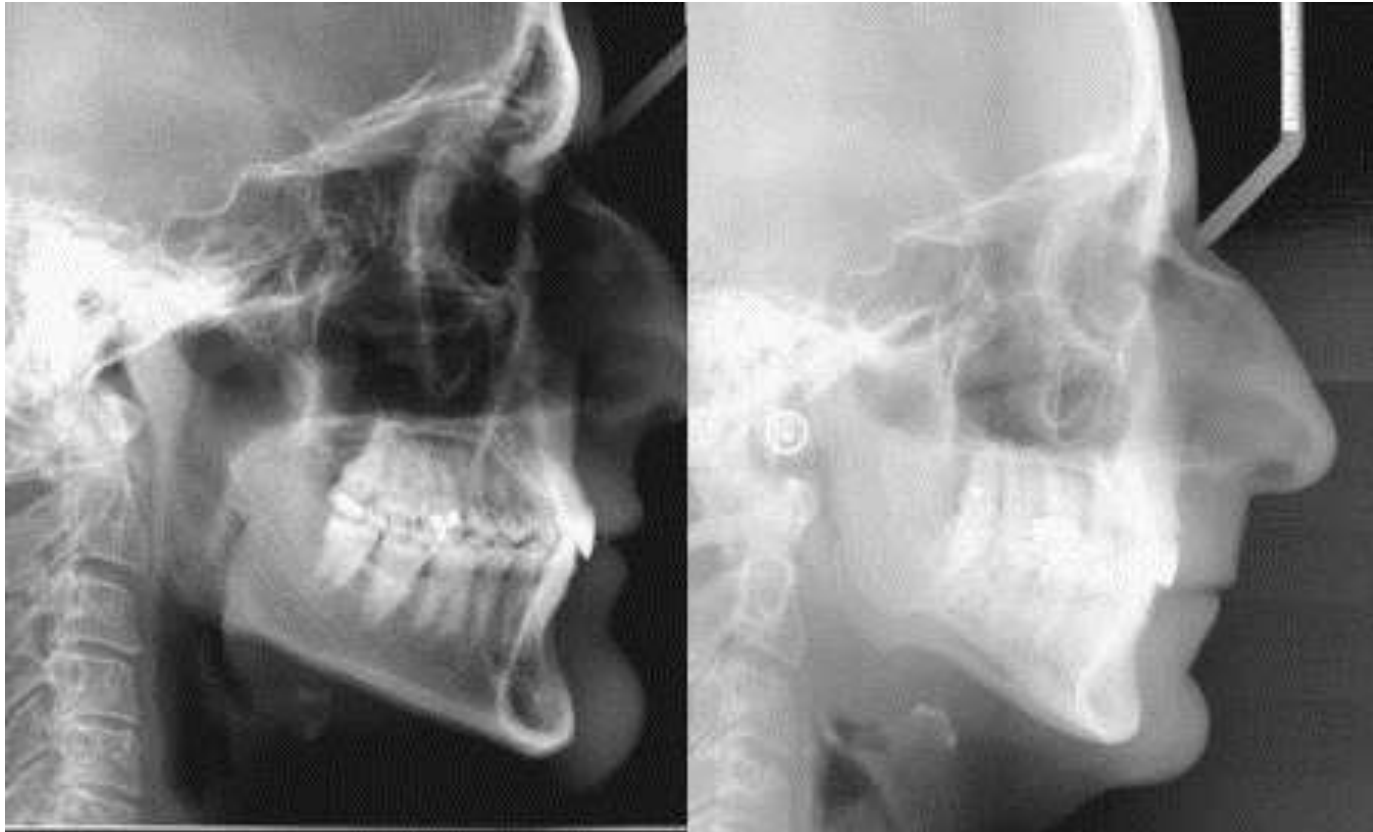
Epworth Score < 8 = Normal

Cephalometric Analysis

- Lateral radiographs of face/skull base
- Points plotted to evaluate position of mandible in reference to skull
- Linear and angular measurements
- 6 major relations
- PAS, P, H



Cephalometric Analysis



Normal

Shortened mandible
Elongated soft palate
Decreased airway space

Polysomnography

Measurements

- Pulse ox, EEG, EOG, ECG, EMG, oral/nasal airflow, respiratory effort, limb/body movements

Definitions

- Apnea – lack of ventilation for ≥ 10 sec with signs of arousal
- Hypopnea – decrease in respiratory movement with a drop in O_2 sat or with signs of arousal
- AHI or RDI = (Apneas + Hypopneas)/hours of sleep

Important parameters

- RDI
- Lowest O_2 saturation
- Number of desaturations below 90%
- Length of time below 90%



Sleep Disordered Breathing

- Primary snoring
 - RDI < 5
 - No daytime sleepiness
- Upper airway resistance syndrome (UARS)
 - RDI < 5
 - Arousal Index > 5
- Obstructive sleep apnea syndrome (OSAS)
 - RDI > 5
 - O₂ desaturation < 90%
- Obesity hypoventilation syndrome (Pickwickian)
 - BMI > 30 kg/m²
 - Daytime hypercapnia w/ PaCO₂ ≥ 45mmHg
 - Sleep disordered breathing

Surgical Indications

- RDI > 15
- RDI >5 and <15 with daytime sleepiness
- O₂ desaturation <90%
- Cardiac arrhythmias
- Unsuccessful medical therapy (CPAP)
- Medically stable for surgery



Surgical Management

- Rhinological procedures
- Palatal reduction
- Tongue base suspension/reduction
- Genioglossus advancement
- Hyoid suspension
- Maxillomandibular advancement
- Tracheotomy

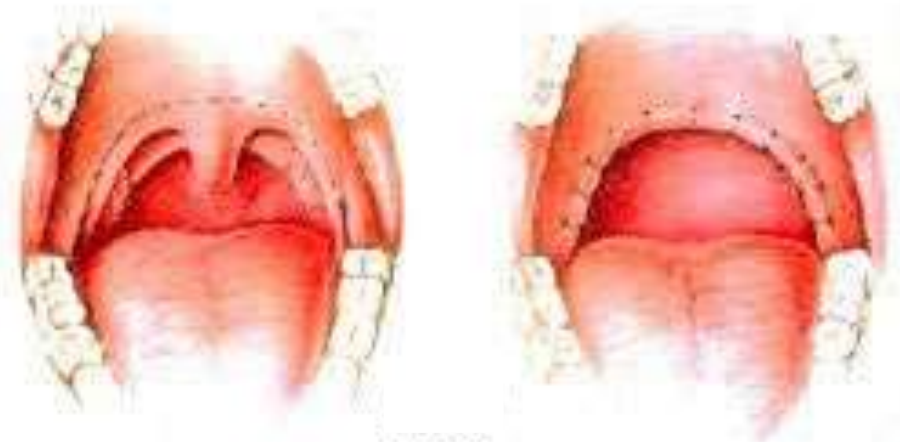
Rhinological Procedures

- Increased nasal resistance may increase negative pressure of airway during inspiration
- Septoplasty, turbinate reduction, FESS
- Corrects deviated septum, allergic rhinitis, nasal polyposis, chronic rhinosinusitis
- Considered adjuncts to other procedures/treatments
- Improvement of nasal CPAP compliance
- Clinical usefulness for sleep apnea is controversial

Palatal Reduction

Uvulopharyngopalatoplasty (UPPP)

- Corrects oropharynx obstruction
- Most common procedure
- Trim excess palatal length and uvula
- Often combined with tonsillectomy
- Success rate 40-50% (only 6% if macroglossia present)
- Complication rate of 1.5% nonfatal, 0.2% fatal

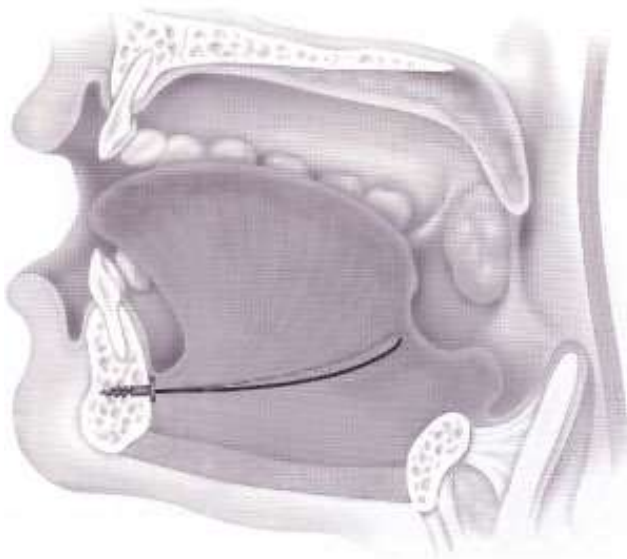


* Success = RDI reduction of $\geq 50\%$ or absolute drop of ≥ 20

Tongue Base Suspension/Reduction

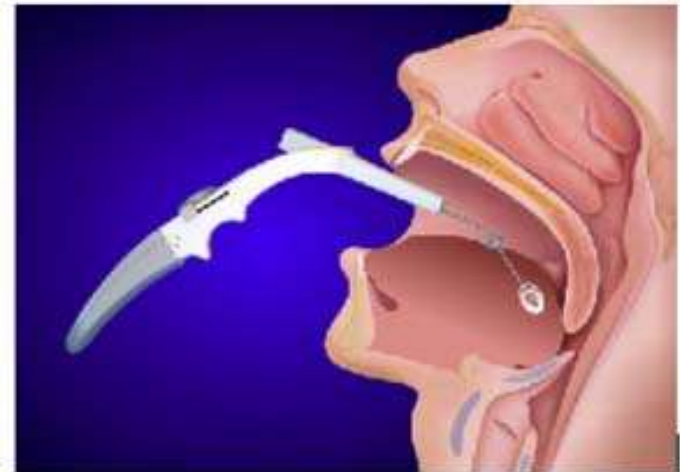
Suspension

- Sutures attach to screw at inner mandible
- Reduces tongue collapse
- Variable success 20-82%



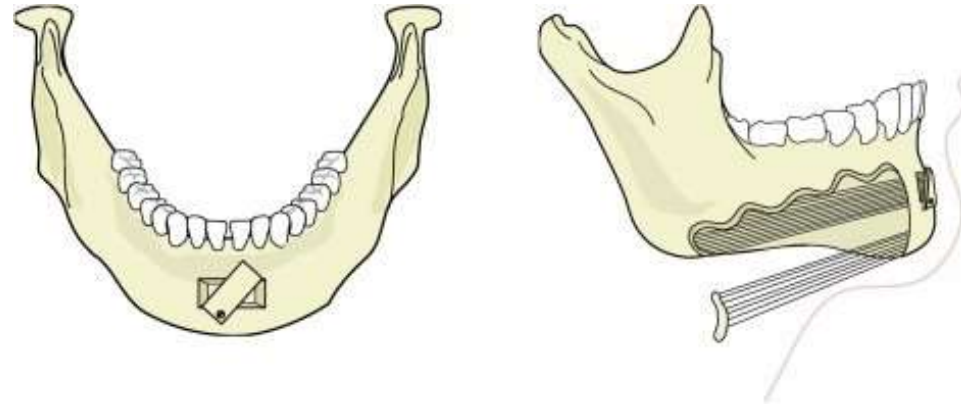
Reduction

- Tissue reduction from heat generated by radiofrequency
- Multiple office based treatments
- Promising success rate 60-85%



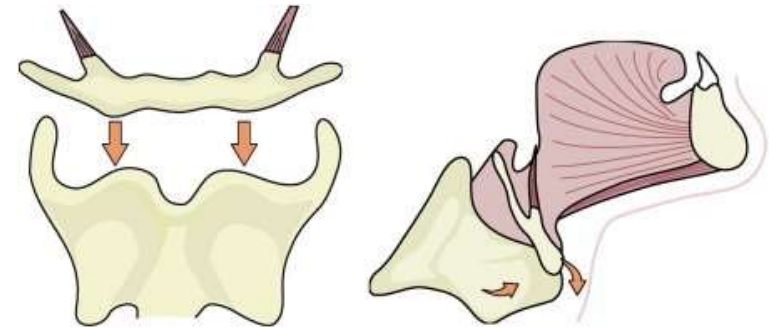
Genioglossus Advancement

- Osteotomy of anterior mandible with advancement and rotation to prevent retraction
- Reduces tongue collapse
- Variable success rate of 23-77%
- Complications of muscle injury, nerve damage

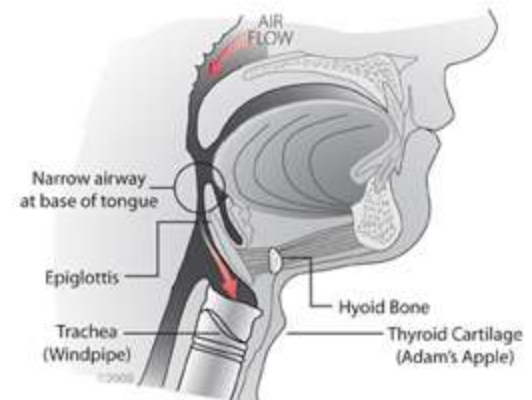


Hyoid Suspension

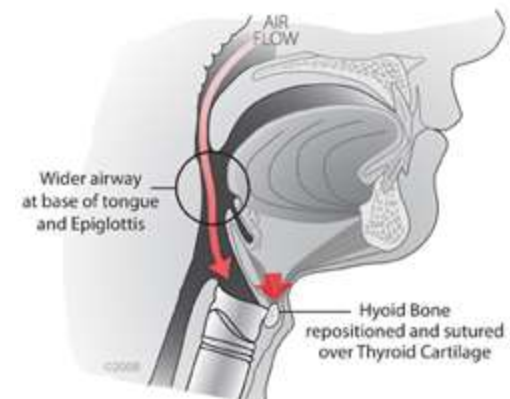
- Hyoid dissected inferiorly and advanced over thyroid cartilage
- Usually performed in conjunction with GA or UPPP
- Variable success rate of 17-65%
- Requires incision on external neck
- May cause dysphagia



Before

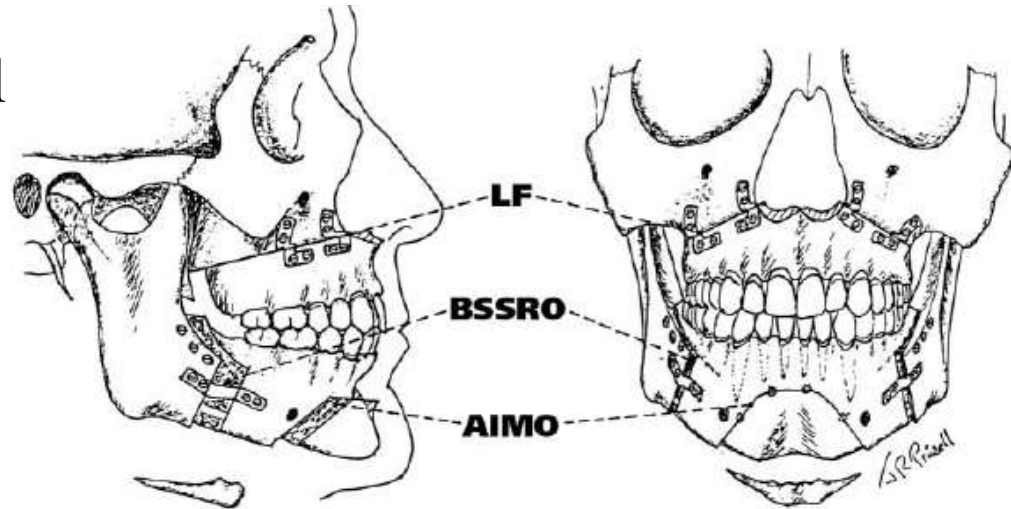


After



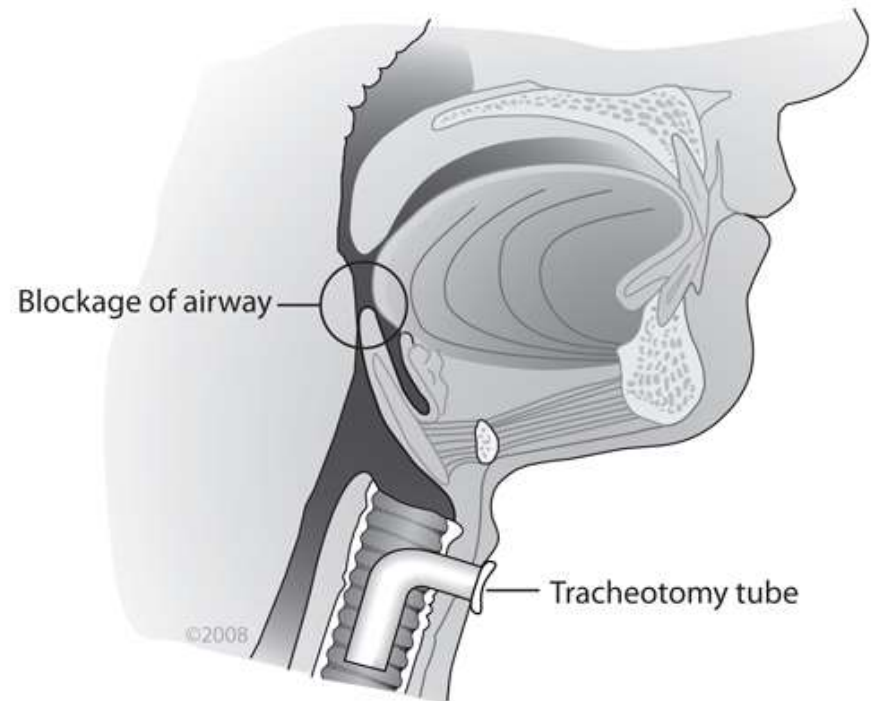
Maxillomandibular Advancement

- Lefort I osteotomy, bilateral ramus osteotomies, anterior inferior mandibular osteotomy
- 10-14 mm advancement ideal but occlusion must be maintained
- Enlarges posterior airway
- Success rate 75-100%
- Alters facial appearance



Tracheotomy

- Indicated for presence of severe, life-threatening OSA
- Only procedure that will consistently show 100% success rates for severe OSA
- Not completely curative for patients with cardiopulmonary decompensation
- Rarely done due to QOL, social stigma issues





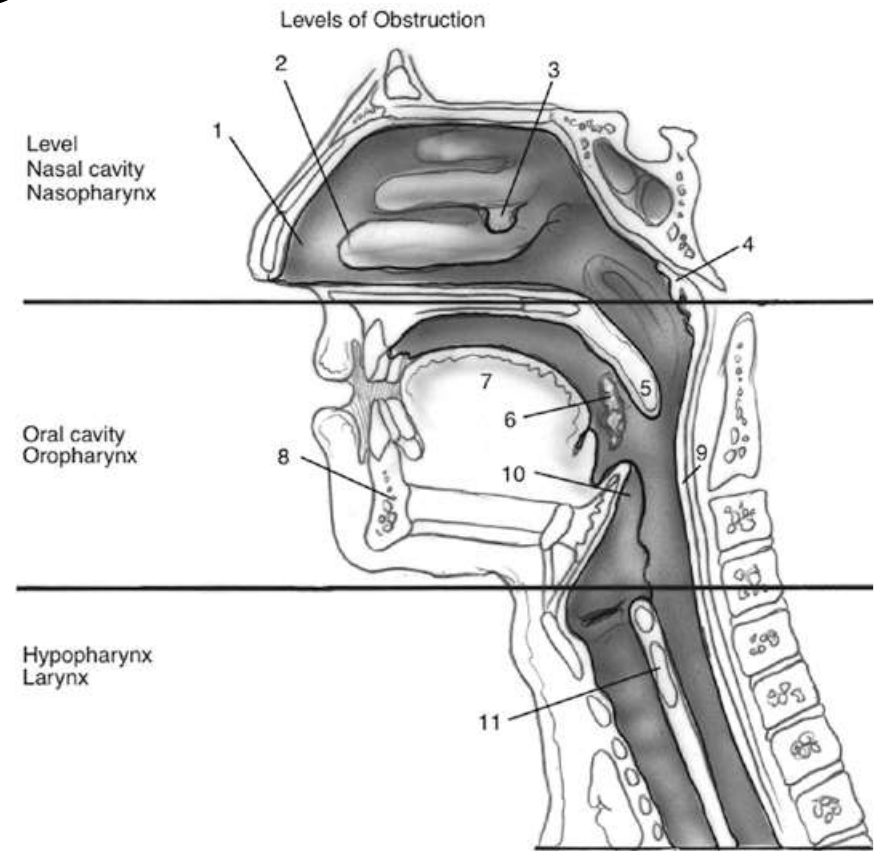
Surgical Planning

Which procedure should be done?

Surgical Planning

Levels of obstruction

- Type I – Nasal cavity or nasopharynx
- Type II – Palate/ oropharynx
- Type III – Base of tongue/ hypopharynx



*Determined by PE and cephalometric analysis

Surgical Planning

Level of severity

	<u>RDI</u>	<u>LSAT</u>
■ Mild:	<20	>85
■ Moderate:	20-40	>80
■ Moderate/Severe:	40-60	>70
■ Severe:	<60	<70

Surgical Planning

- Target level or levels of obstruction
- As severity of OSA increases, so should invasiveness/aggressiveness of the procedure
- Patient desires/preferences/goals
- Health status
- Minimize surgical intervention and avoid unnecessary surgery

Stanford Protocol

Prospective study based on protocol developed at Stanford sleep center

- N = 135 for mild/moderate OSA
- N = 42 for severe OSA
- Goal – minimize surgical interventions and avoid unnecessary surgery while achieving a cure
- Success = RDI reduction of $\geq 50\%$ or absolute drop of ≥ 20

Groups

- Phase I – Oropharynx –UPPP
 - Oropharynx/hypopharynx - GA+HS+UPPP
 - Hypopharynx - GA+HS
 - *HS not performed if intraoperatively patient considered to have achieved adequate enlargement of hypopharynx with GA alone, or if airway edema considered to be likely after GA completed
- Phase II – MMA

Success Rates

- Phase I – Mild/Moderate = 71-78%; Severe = 42%
- Phase II – Those that failed phase I = 100%

Stanford Protocol

To achieve goal of minimal surgical intervention while achieving cure:

- Presurgical evaluation – PE with flexible scope, cephalometric analysis, sleep study
- ↓
- Phase I surgery based on site of obstruction and severity of disease
- ↓
- 6 month postoperative sleep study
- ↓
- Lack of success
- ↓
- Phase II surgery - MMA



Conclusion

- Need for comparison of procedures alone or in combination
- Procedures should be tailored to specific sites of obstruction
- Definition of success should include oxygen desaturation time, number of episodes, lowest value
- Postoperative sleep study important

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