

How to Choose the Right Surgery for the Right Patient The Holy Grail of Sleep Surgery

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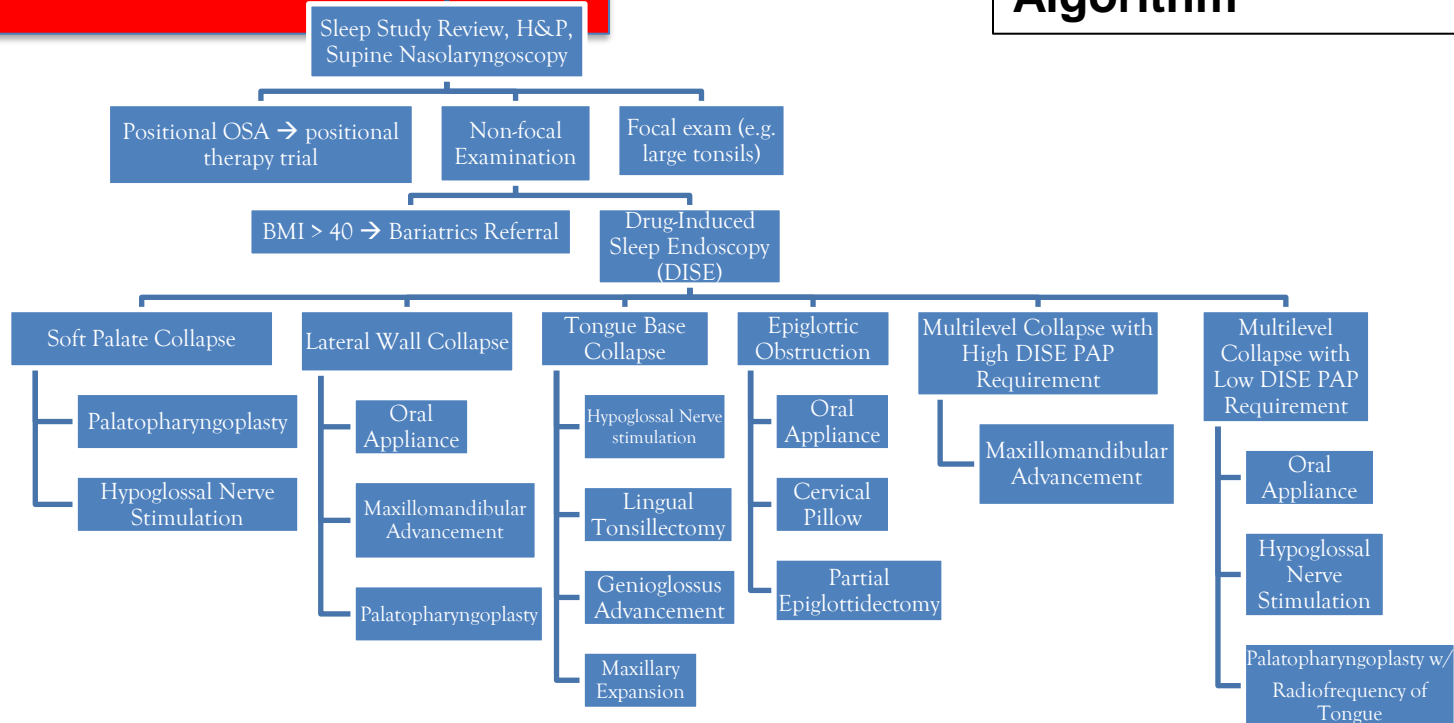
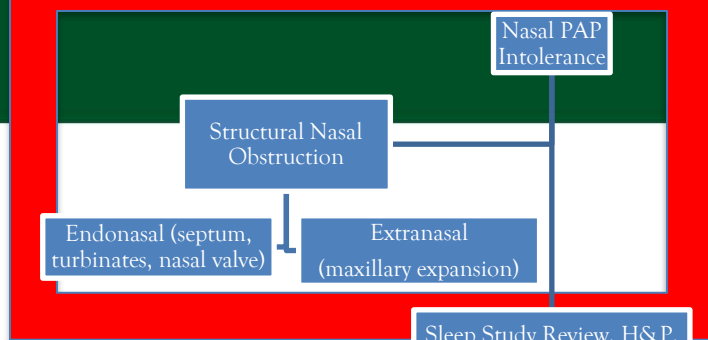


I have the following financial relationships to report with ACCME defined ineligible companies.

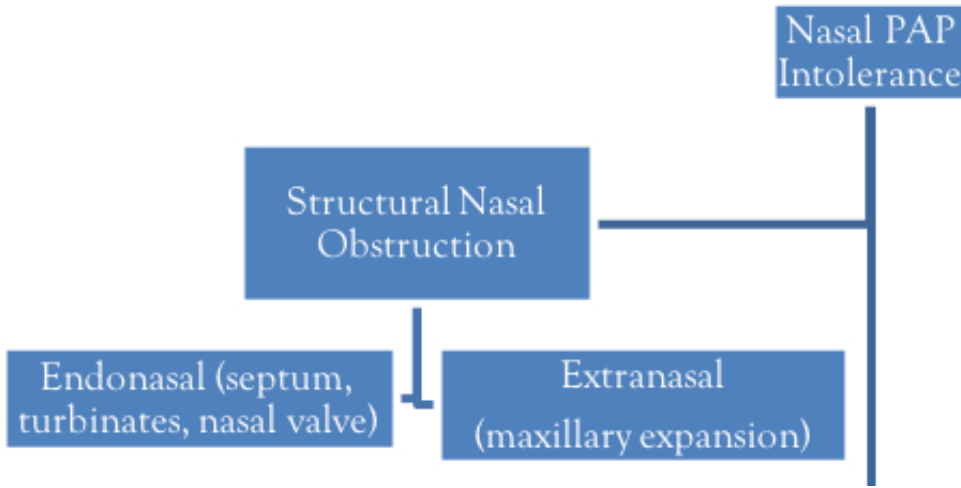
Name of Company	Nature of Relationship	Current Status
Inspire Medical LLC	Consultant, Physician Medical Advisory Board	Active
Lunair Medical, Inc.	Consultant	Active

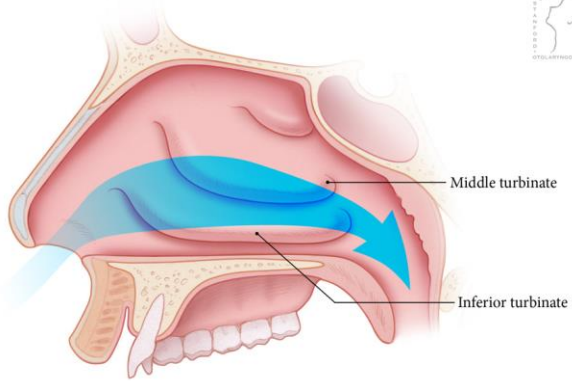
I will not be discussing unlabeled/investigational uses of medical devices or pharmaceuticals during this presentation.

Rush Sleep Surgery Algorithm



Rush Sleep Surgery Algorithm





Nasal Surgery

<https://stanfordhealthcare.org/medical-treatments/n/nasal-surgery.html>

- Septoplasty, inferior turbinate reduction, nasal valve surgery, FESS
- Often considered a first line option to improve PAP tolerance
 - Reduced CPAP pressures approximately 2.5cm H₂O
 - 89% of PAP-intolerant patients improved tolerance post-op
 - Increased adherence by 3 hours/night
- Case studies and small cohort studies have shown mouth vs nasal breathing can impact outcomes of other OSA surgeries

Camacho M, Riaz M, Capasso R, et al. The effect of nasal surgery on continuous positive airway pressure device use and therapeutic treatment pressures: a systematic review and meta-analysis. *Sleep*. 2015;38(2):279-286.

Ramaswamy AT, Li C, Suurna MV. A case of hypoglossal nerve stimulator-resistant obstructive sleep apnea cured with the addition of a chin strap. *Laryngoscope*.

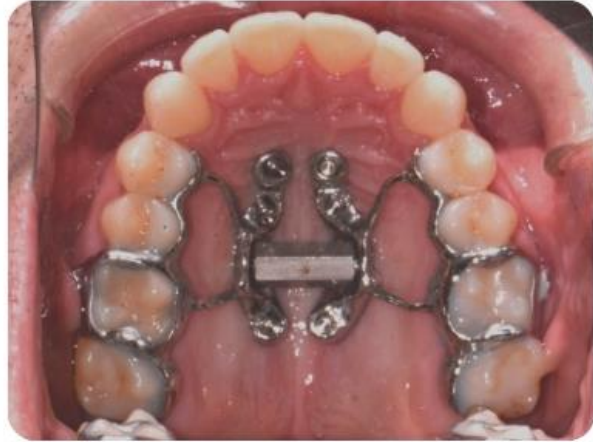
Mouth opening during sleep may be a critical predictor of surgical outcome after uvulopalatopharyngoplasty for obstructive sleep apnea

Lee CH, Mo JH, Seo BS, Kim DY, Yoon IY, Kim JW. Mouth opening during sleep may be a critical predictor of surgical outcome after uvulopalatopharyngoplasty for obstructive sleep apnea. *J Clin Sleep Med*. 2010;6(2):157-162.

- Systematic review and meta-analysis
 - 21 studies included
 - No significant reduction in AHI after isolated nasal surgery
 - Meta-analysis demonstrating slight decrease in AHI, but not clinically relevant
 - Significant reduction in ESS/QOL indices



What happens if the room is too small?



Maxillary Expansion in Adults

- Dental or skeletal crossbite
- Nasal obstruction
- Narrow, high-arched palate
- Limited intraoral volume
- Obstructive sleep apnea



Figure 1: Buccal corridor area show

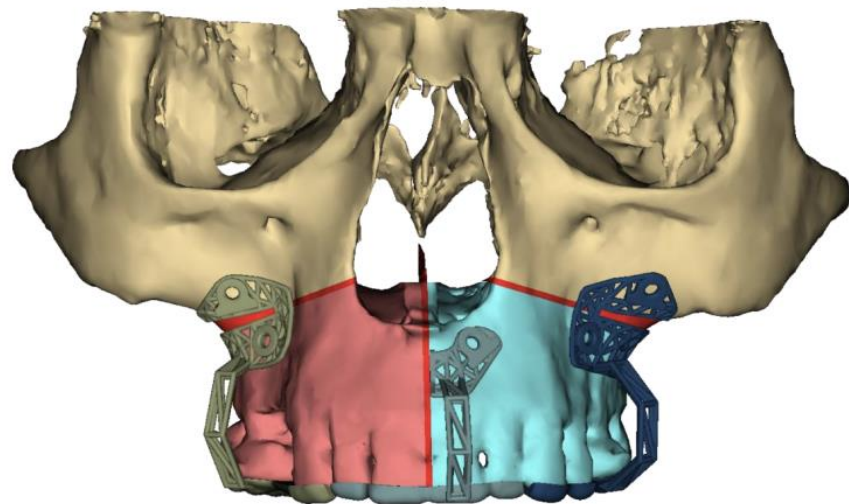


- 1) Decreases nasal resistance and facilitates passage of air through the nose
- 2) Increases maxillary arch width and improves tongue position
→ enables proper sealing of lips and position of tongue with mouth closed
- 3) Increase in oropharyngeal space and improves muscle tension on the lateral walls

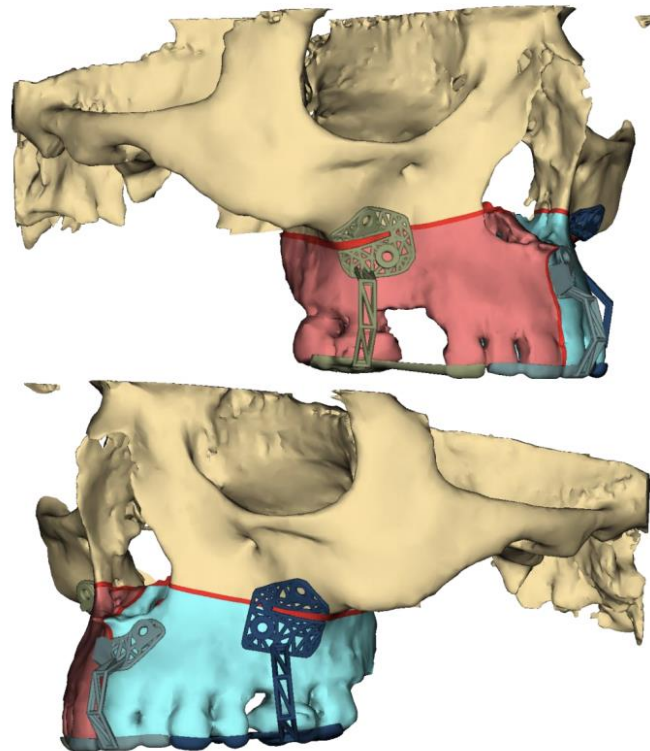
GOOD NEWS EVERYONE



Custom Surgical Cutting Guides

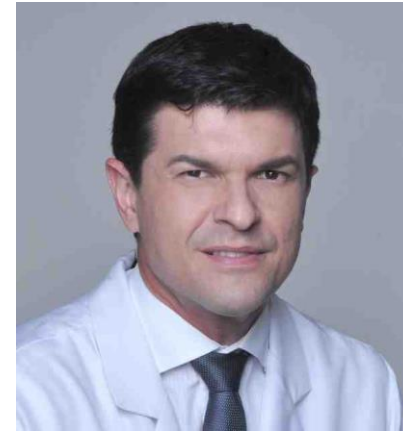


■ Resected maxilla



- How can we make this less invasive and easier to incorporate as an otolaryngologist?

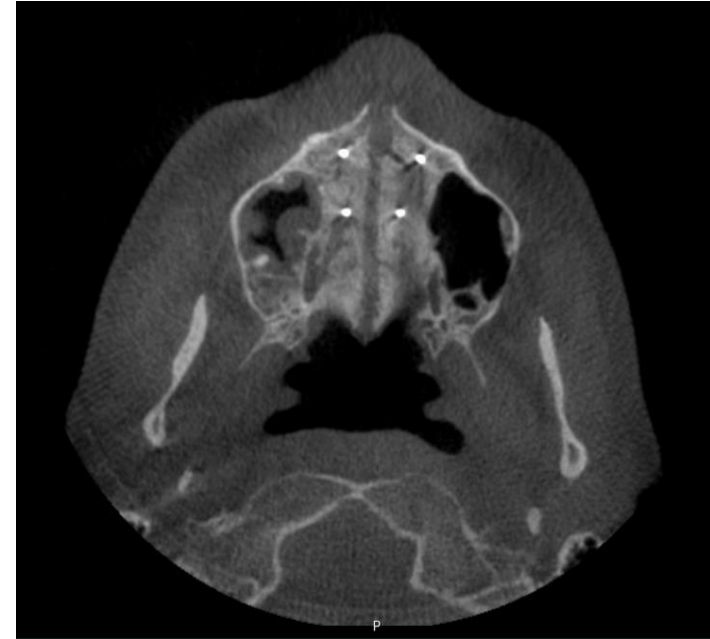
Think like a rhinologist, duh!



Liu SY, Guilleminault C, Huon LK, Yoon A. Distraction Osteogenesis Maxillary Expansion (DOME) for Adult Obstructive Sleep Apnea Patients with High Arched Palate. *Otolaryngol Head Neck Surg.* 2017;157(2):345-348.
Abdelwahab M, Yoon A, Okland T, Poomkonsarn S, Gouveia C, Liu SY. Impact of Distraction Osteogenesis Maxillary Expansion on the Internal Nasal Valve in Obstructive Sleep Apnea. *Otolaryngol Head Neck Surg.* 2019;161(2):362-367.
Li K, Quo S, Guilleminault C. Endoscopically-assisted surgical expansion (EASE) for the treatment of obstructive sleep apnea. *Sleep Med.* 2019;60:53-59.



Separation at PNS



Separation of midpalatal suture

Piriform Aperture

Piriform width: 20.7mm → 24.9mm



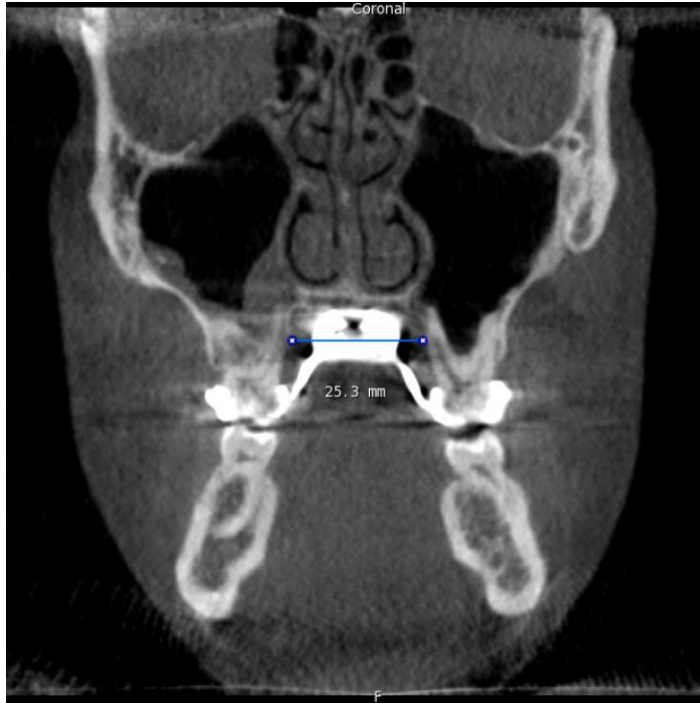
Pre-expansion



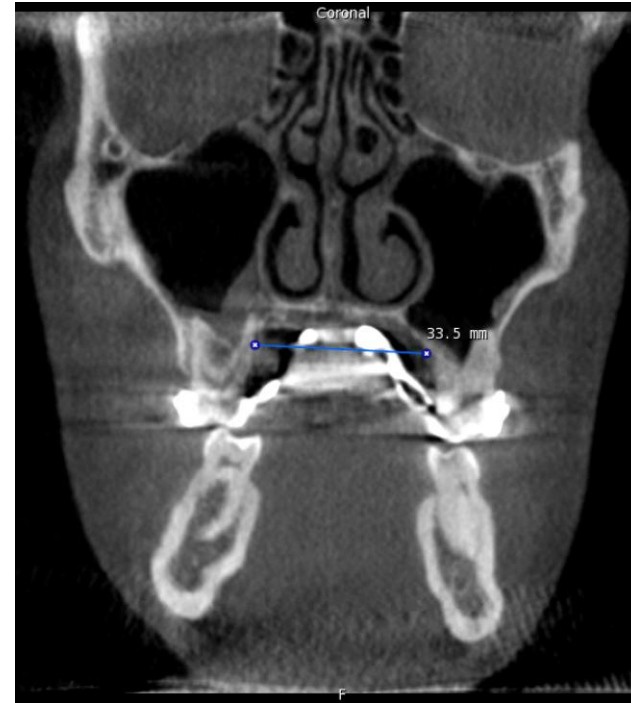
Post-expansion

1st Maxillary Molar

Molar width: 25.3mm → 33.5mm



Pre-expansion



Post-expansion

- Nose Score: 60 → 5
- Sleep quality improved
- Nasal breathing during exercise improved

- **Very fortunate to already be married with kids...**



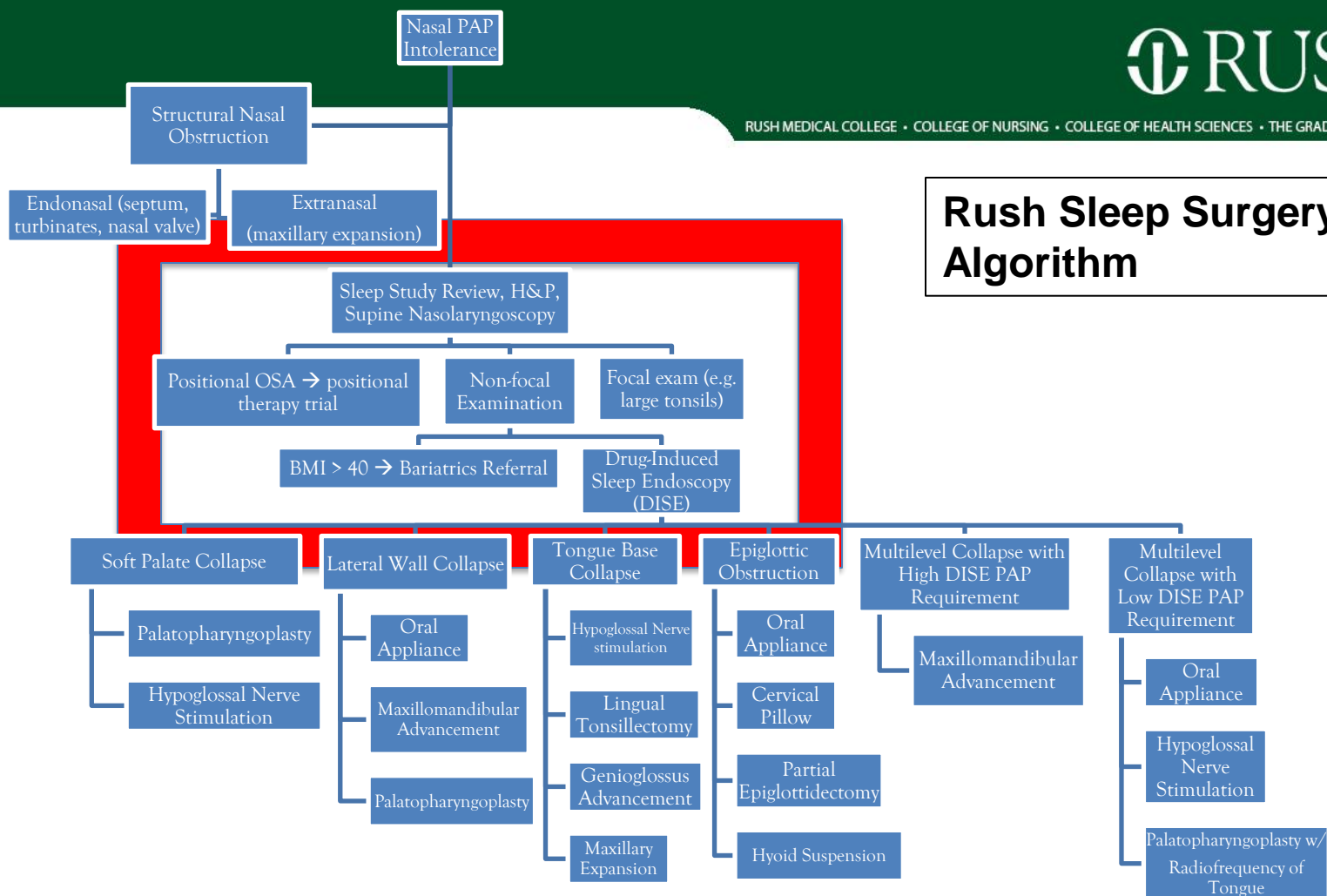
Maxillary Expansion



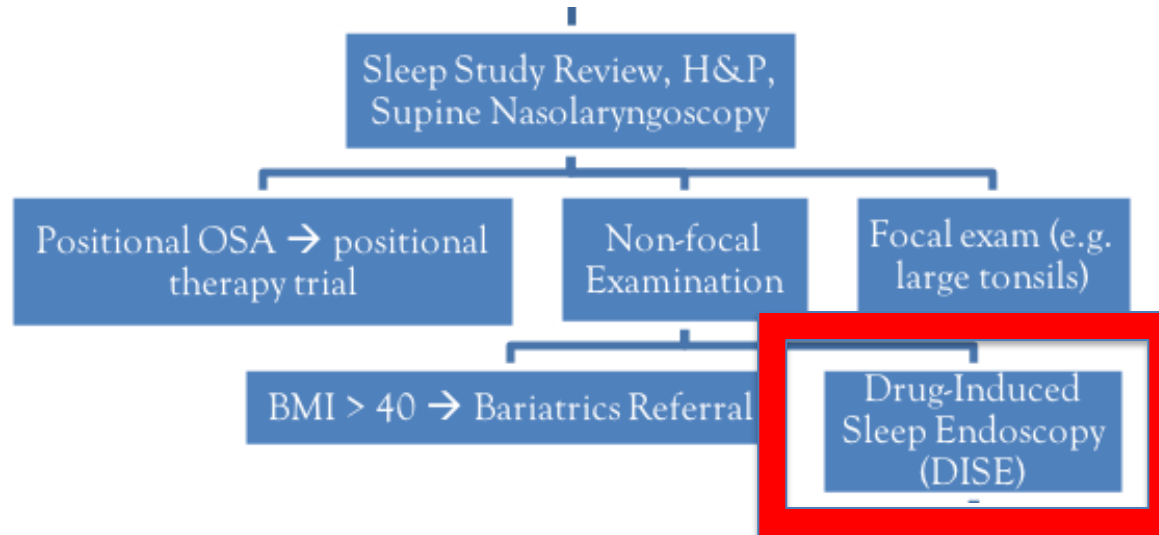
- DOME:
 - AHI: 30.9 → 14.2, ESS 12.3 → 7.8
 - NOSE: 59 → 20
- EASE:
 - AHI: 31.6 → 10.1
 - NOSE: 58 ± 13 → 16 ± 6
- 2PENN:
 - NOSE: 57 → 14

1. Liu SY, Guilleminault C, Huon LK, Yoon A. Distraction Osteogenesis Maxillary Expansion (DOME) for Adult Obstructive Sleep Apnea Patients with High Arched Palate. *Otolaryngol Head Neck Surg.* 2017;157(2):345-348.
Abdelwahab M, Yoon A, Okland T, Poomkonsarn S, Gouveia C, Liu SY. Impact of Distraction Osteogenesis Maxillary Expansion on the Internal Nasal Valve in Obstructive Sleep Apnea. *Otolaryngol Head Neck Surg.* 2019;161(2):362-367.
2. Li K, Quo S, Guilleminault C. Endoscopically-assisted surgical expansion (EASE) for the treatment of obstructive sleep apnea. *Sleep Med.* 2019;60:53-59.
3. Jara SM, Thuler ER, Hutz MJ, et al. Posterior Palatal Expansion via Subnasal Endoscopy (2PENN) for Maxillary Deficiency: A Pilot Study. *Laryngoscope.* 2024;134(4):1970-1977.

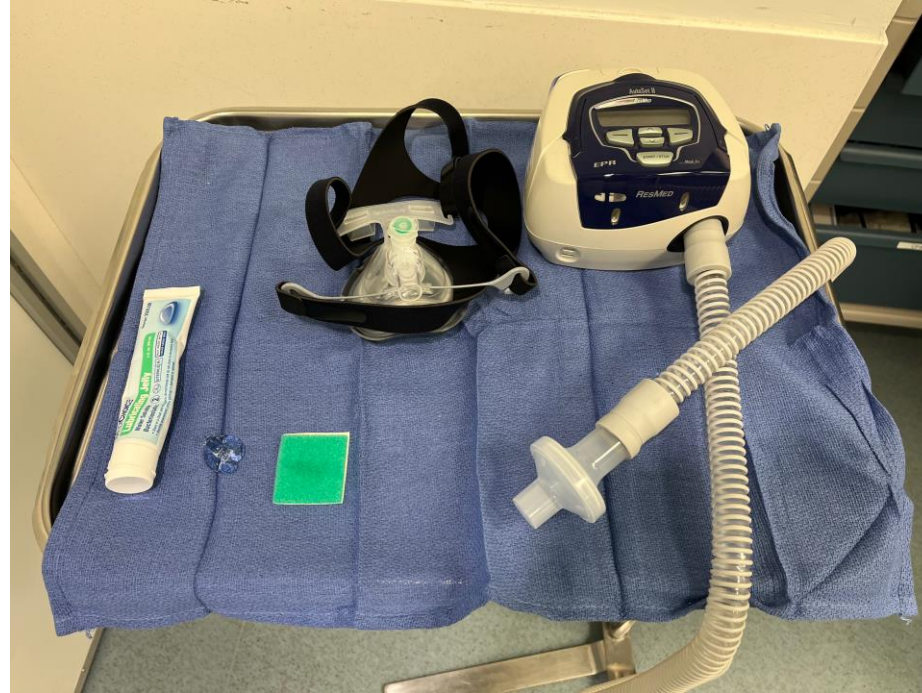
Rush Sleep Surgery Algorithm



Rush Sleep Surgery Algorithm



- Drug-induced sleep endoscopy with positive airway pressure

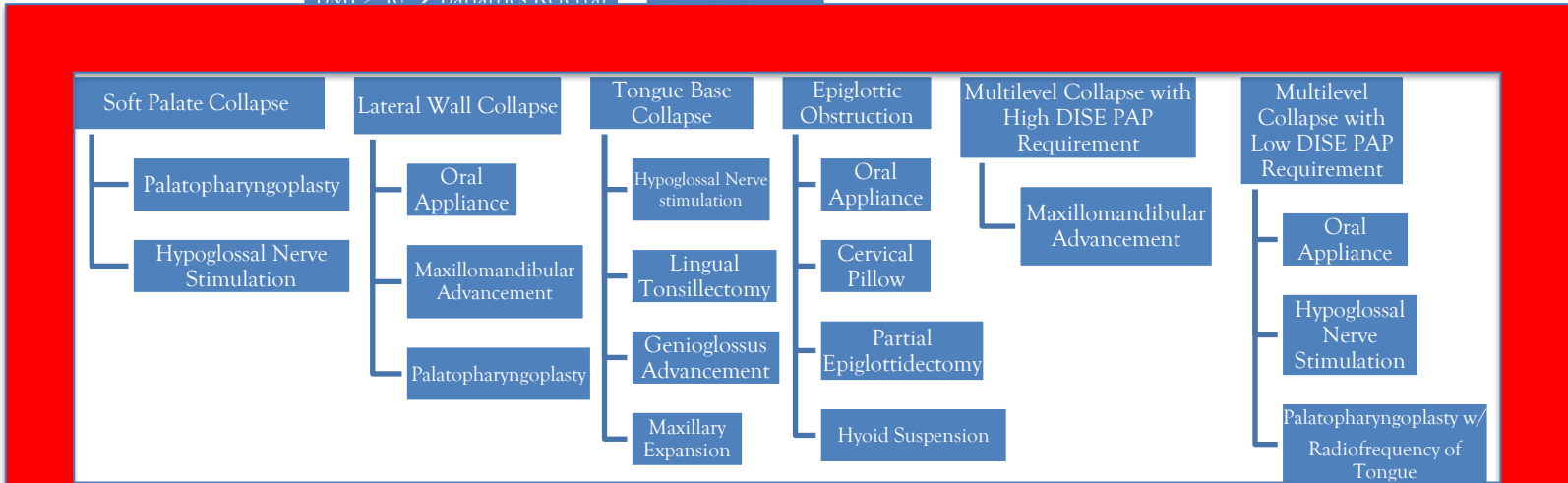
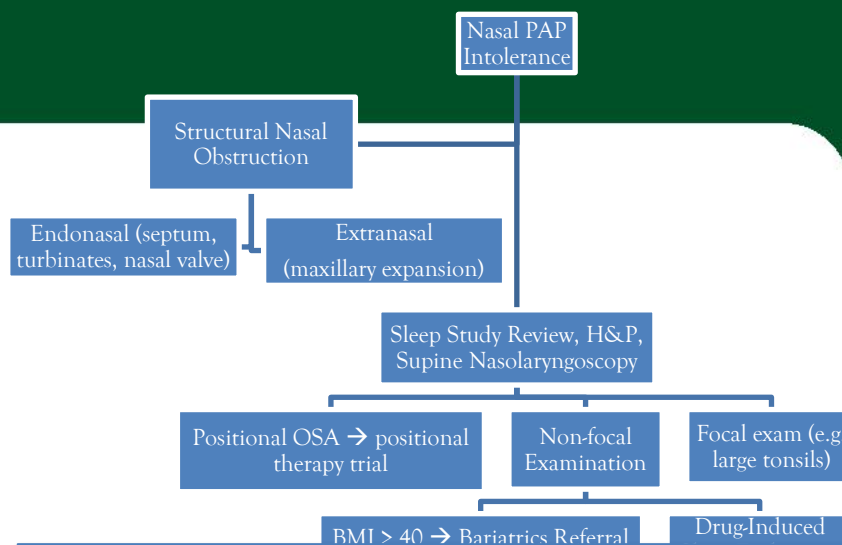


Intra-op Set-up

Mask Set-Up



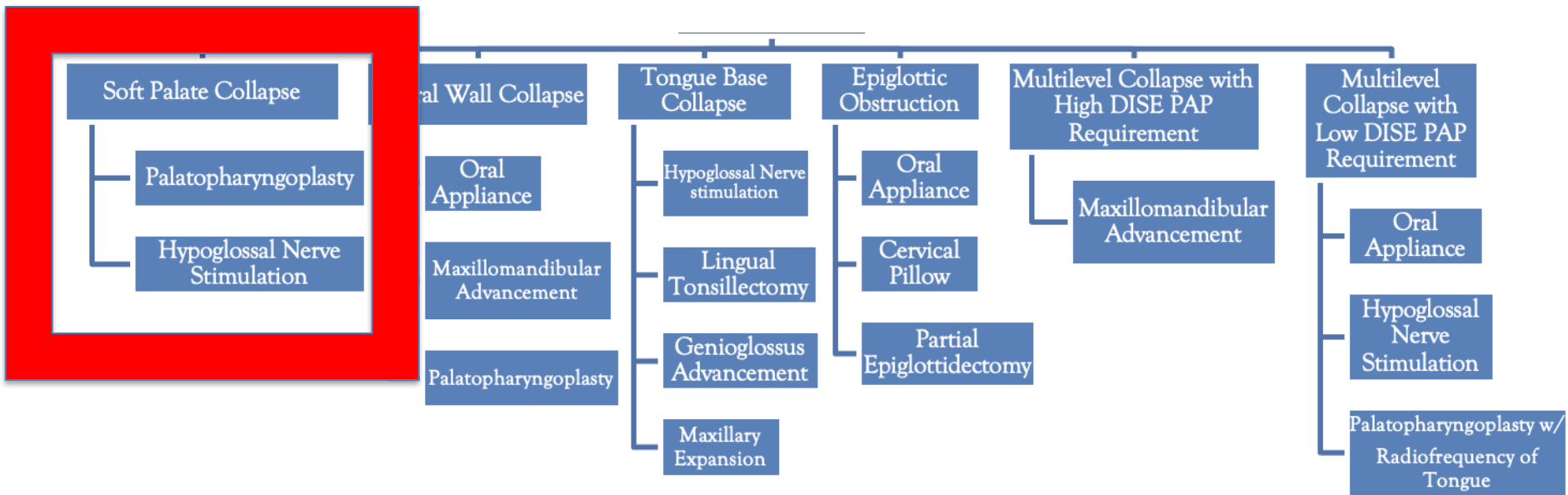
Rush Sleep Surgery Algorithm



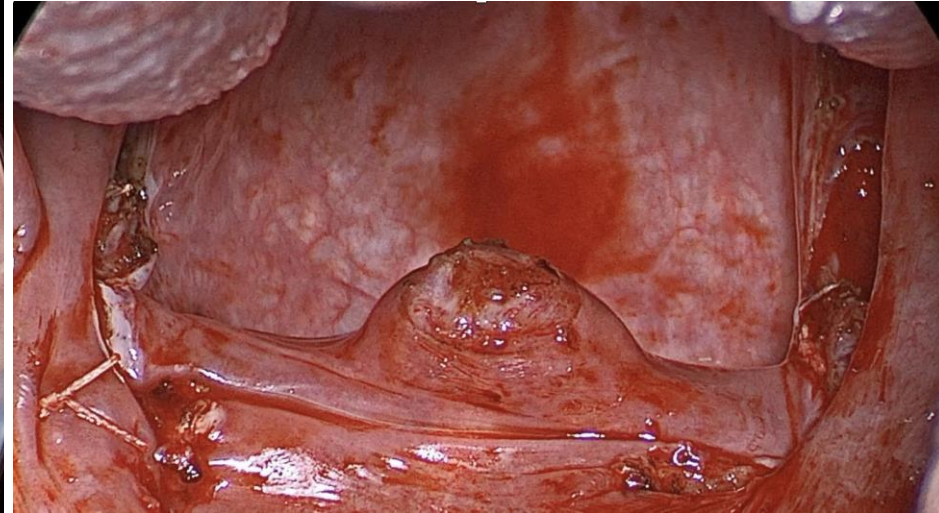
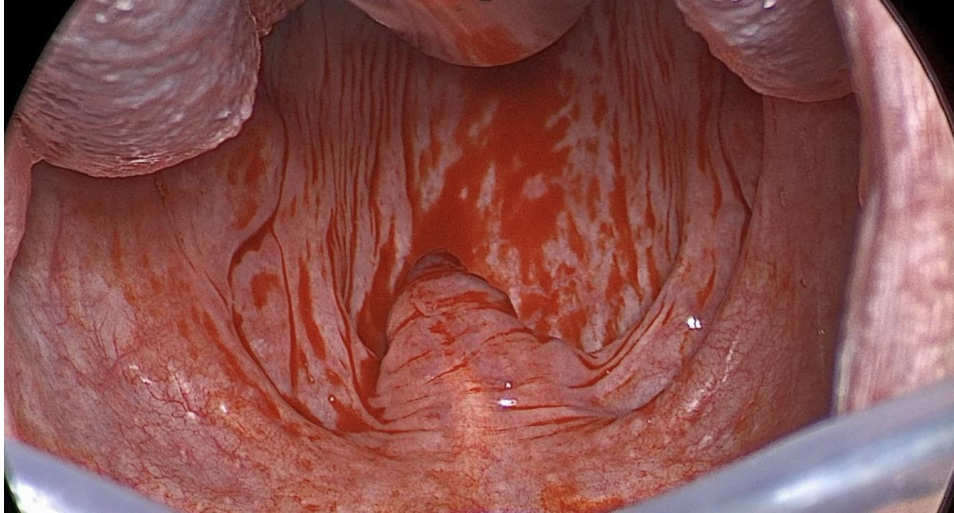
Soft Palate Collapse



Rush Sleep Surgery Algorithm



Barbed Pharyngoplasty



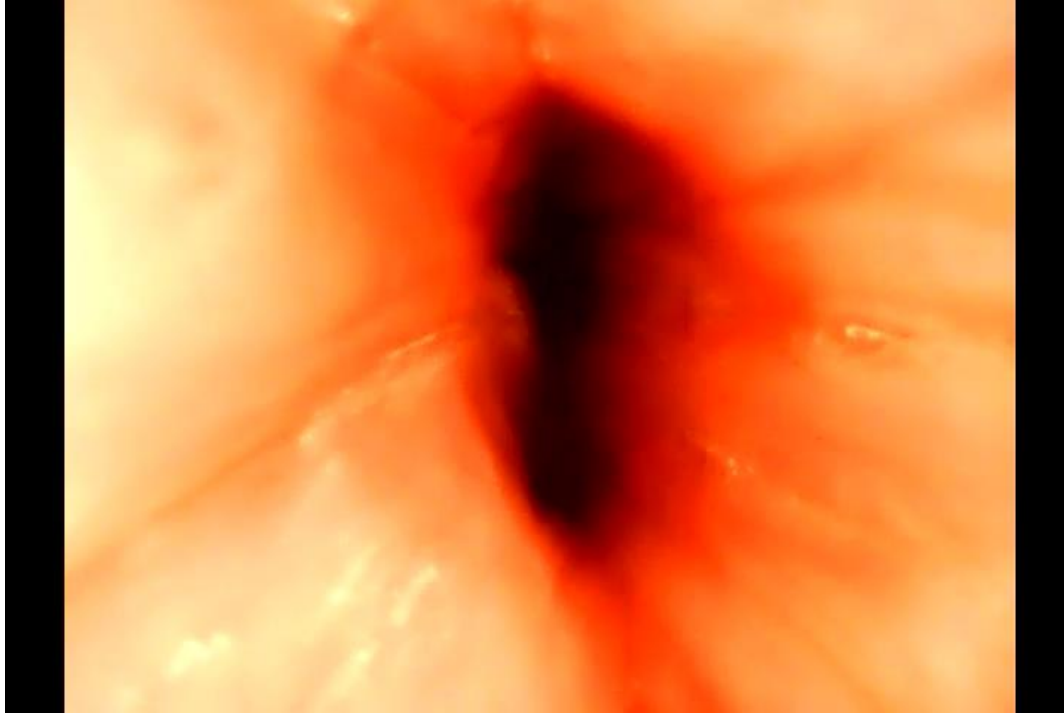
- Weight loss: 10% decrease in body weight → 25-40% decrease in AHI
- Palatopharyngoplasty
 - 20 patients → UPPP with 2nd stage HGNS
 - AHI 54 → 8, ESS 13.3 → 5.7
- OAT: AHI reduction of up to 50%
- MMA

Liu SY, Hutz MJ, Poomkonsarn S, Chang CP, Awad M, Capasso R. Palatopharyngoplasty Resolves Concentric Collapse in Patients Ineligible for Upper Airway Stimulation. *Laryngoscope*.

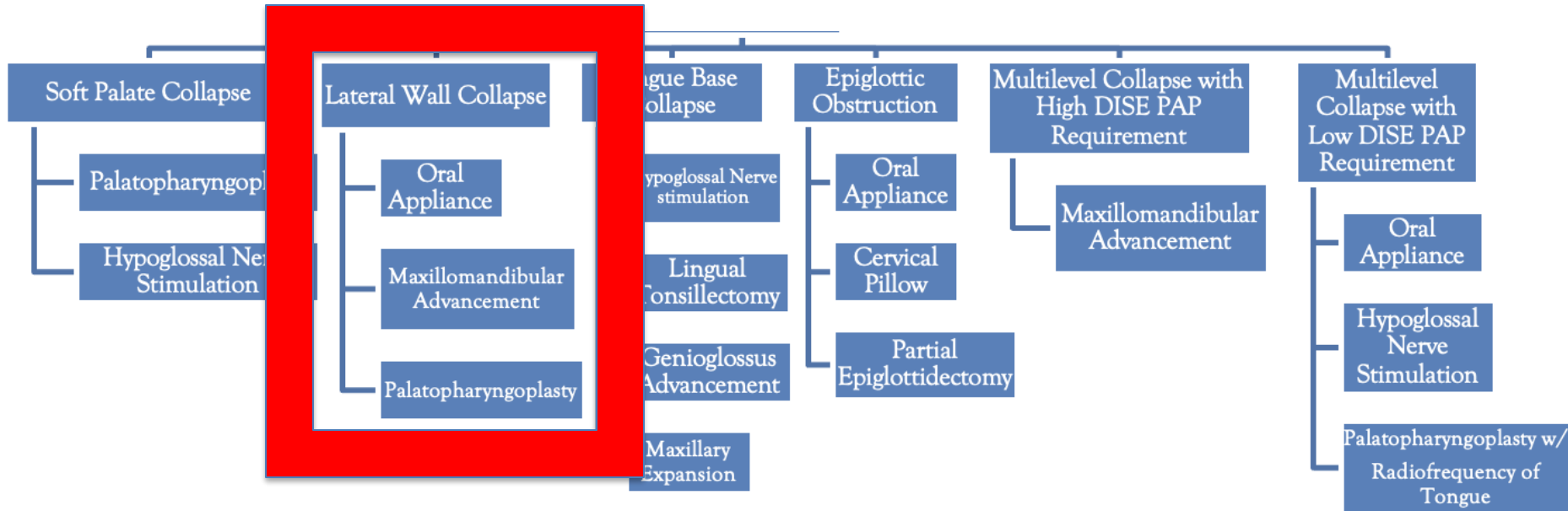
Weidenbecher MS, Vargo JW, Carter JC. Efficacy of expansion pharyngoplasty and hypoglossal nerve stimulation in treating sleep apnea. *Am J Otolaryngol*. 2022;43(5):103592.

Ramar K, Dort LC, Katz SG, et al. Clinical Practice Guideline for the Treatment of Obstructive Sleep Apnea and Snoring with Oral Appliance Therapy: An Update for 2015. *J Clin Sleep Med*. 2015;11(7):773-827.

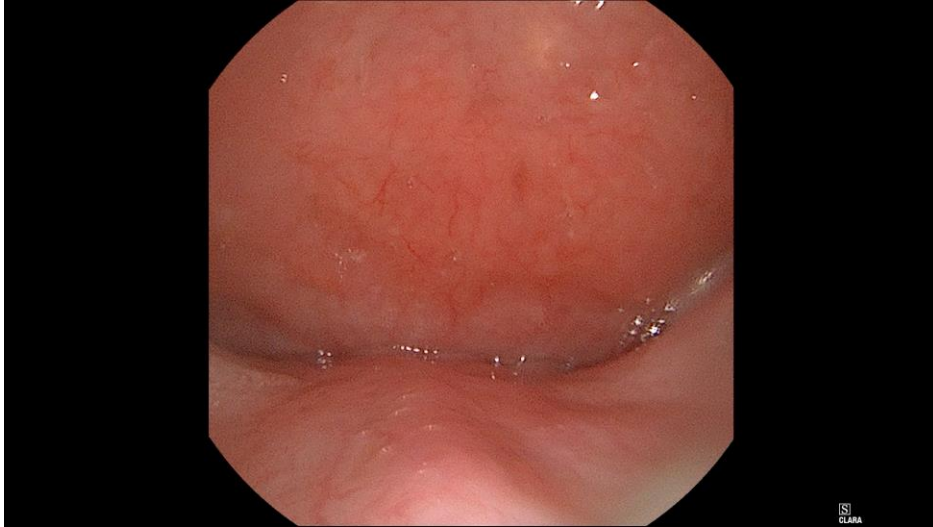
Lateral Wall Collapse



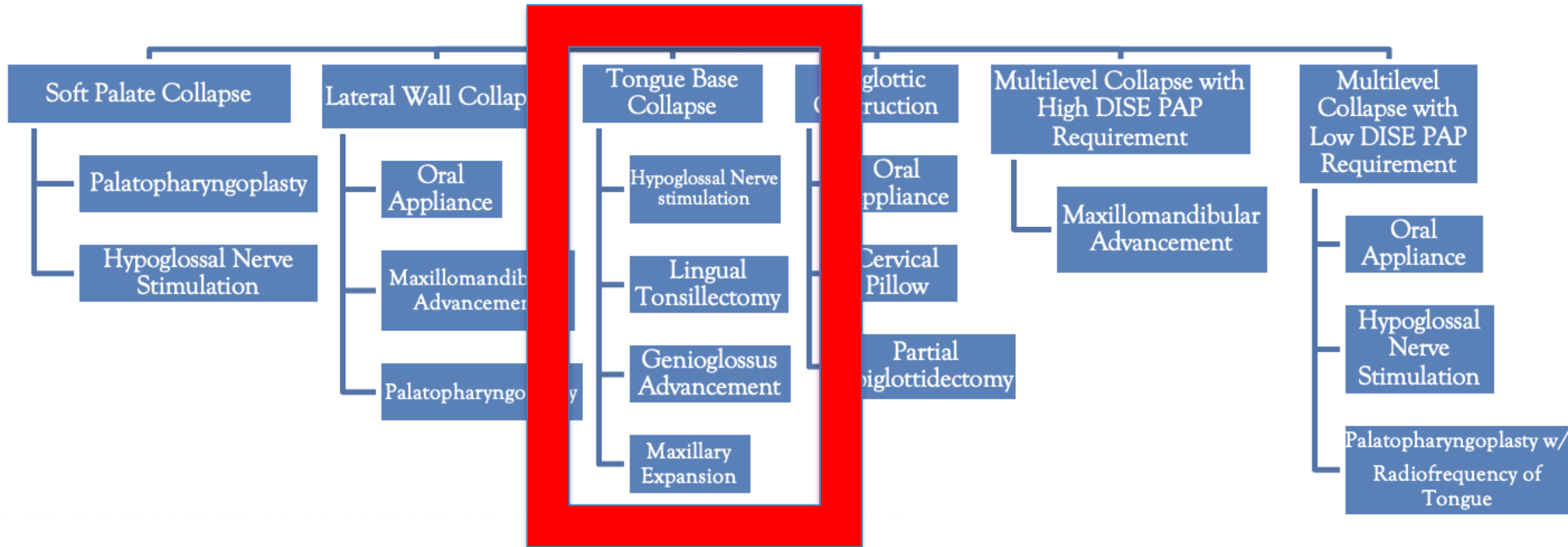
Rush Sleep Surgery Algorithm



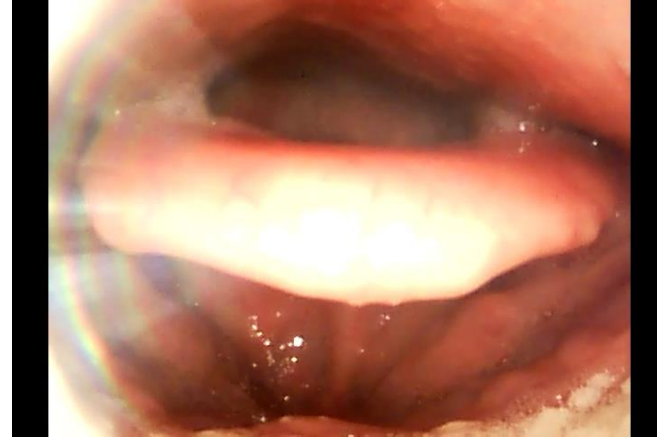
Tongue Base Collapse



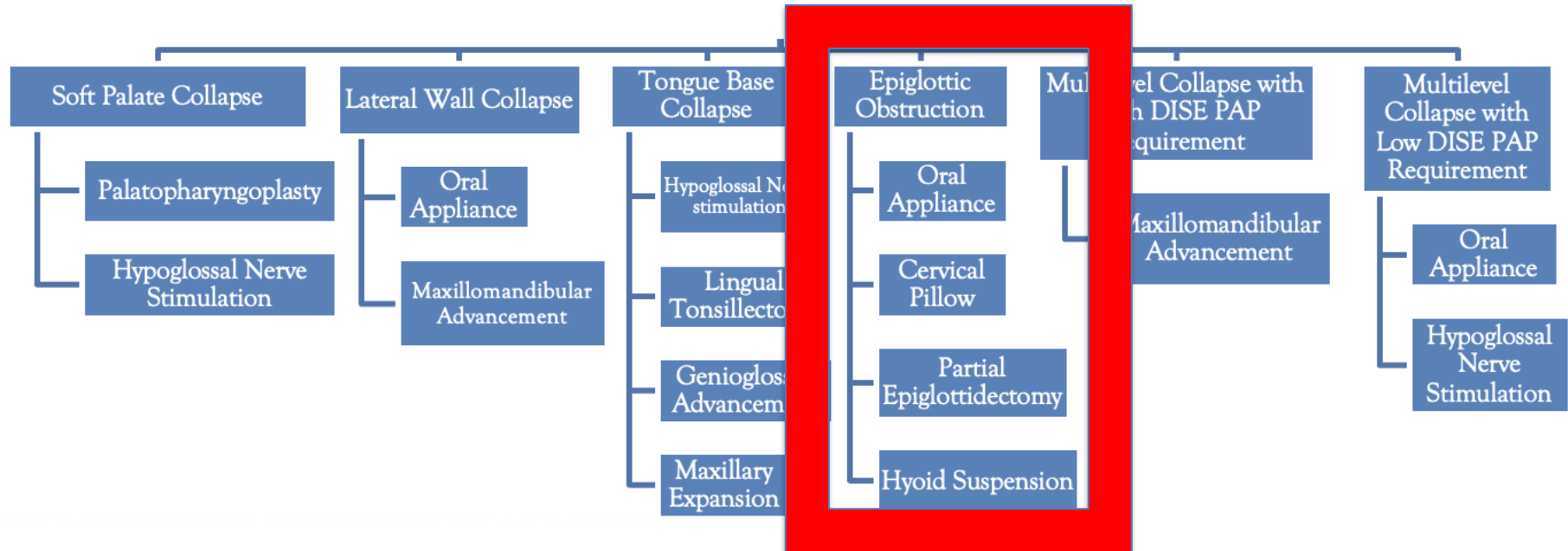
Rush Sleep Surgery Algorithm



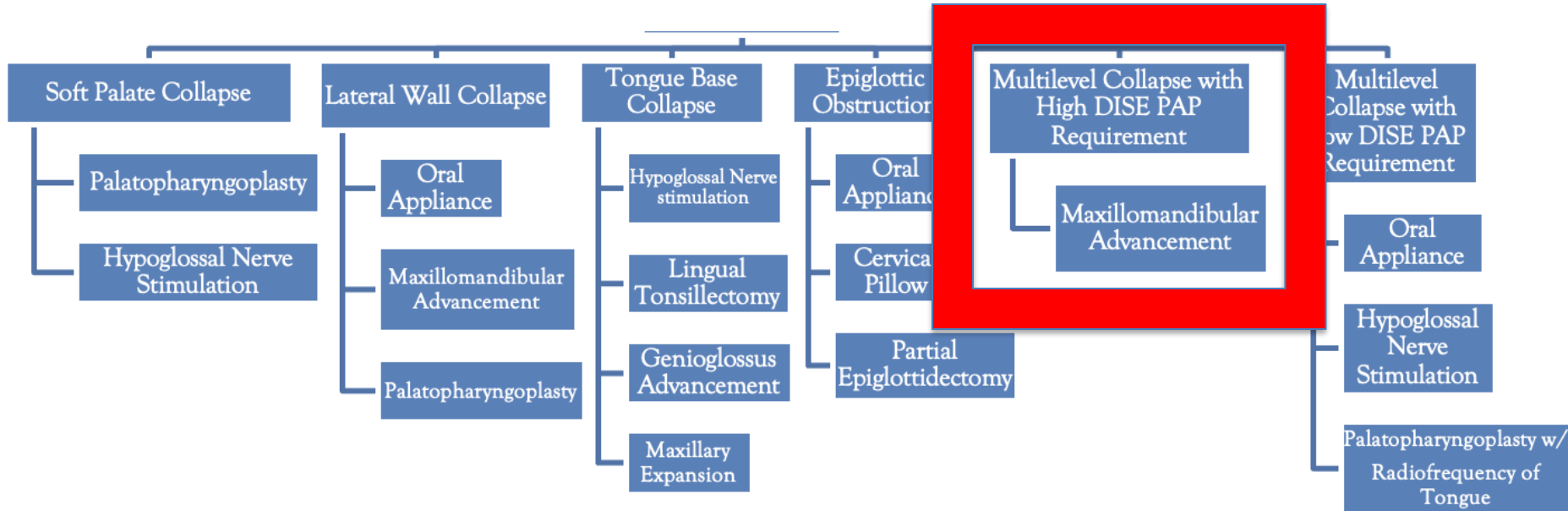
Epiglottic Collapse



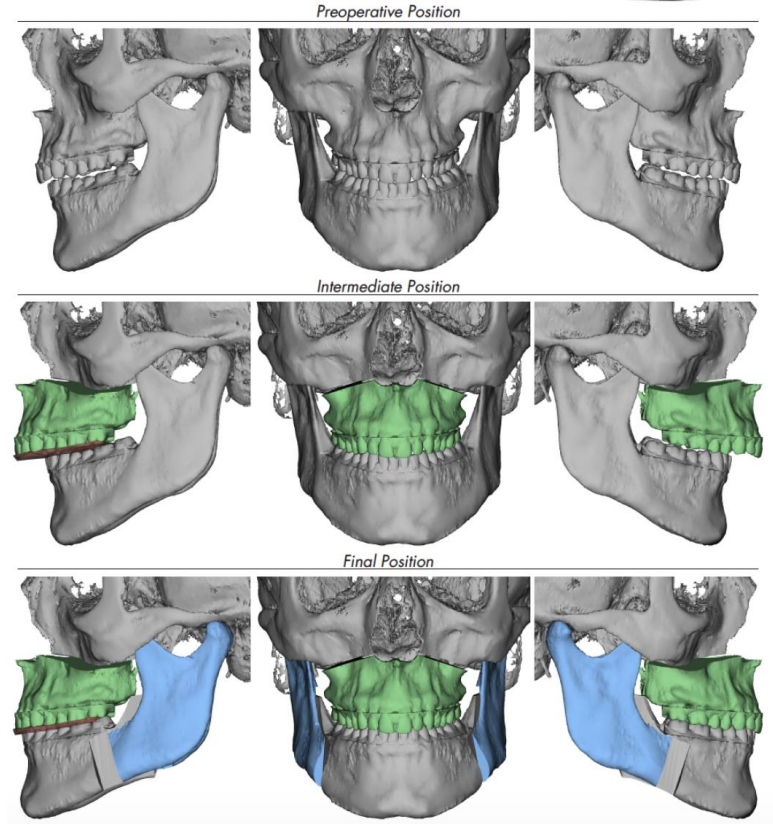
Rush Sleep Surgery Algorithm

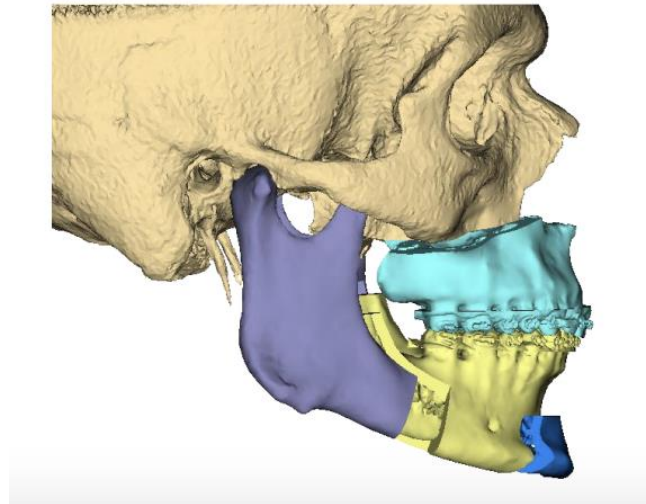
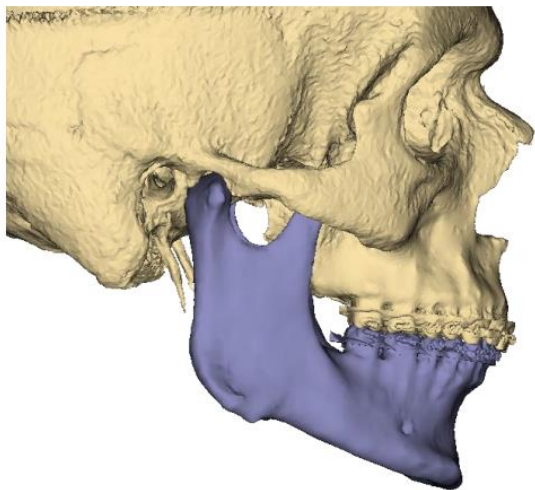


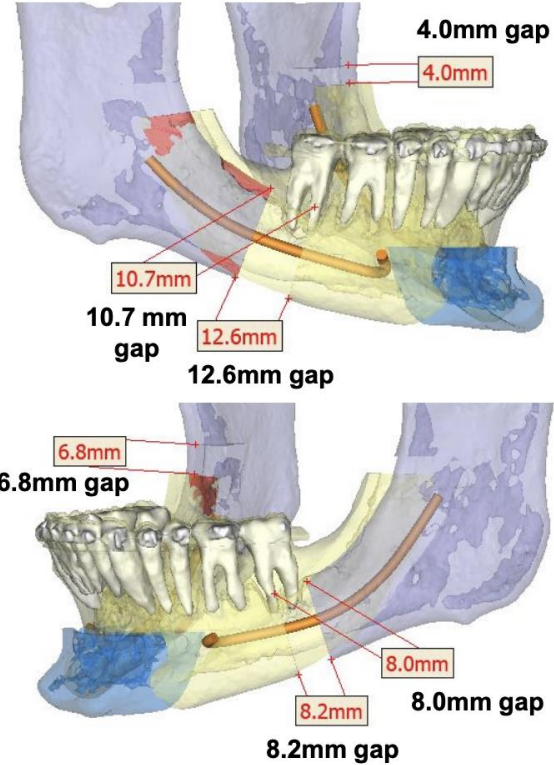
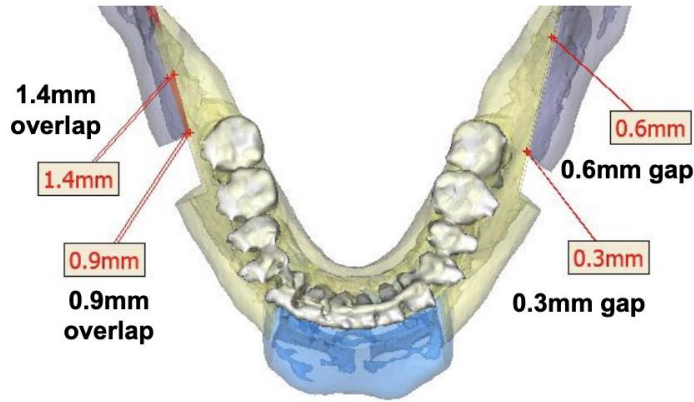
Rush Sleep Surgery Algorithm



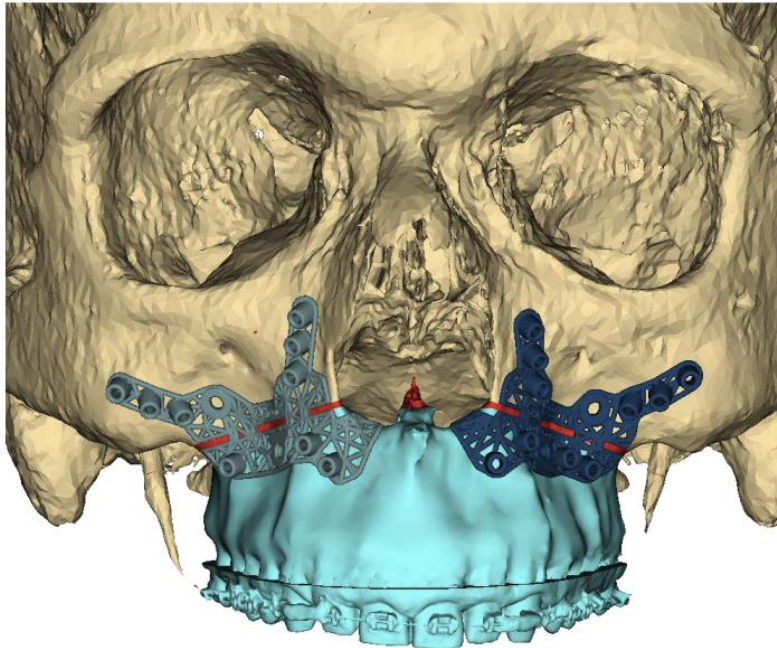
- **Three B's:**
 - **Breathing:** improve OSA
 - **Bite:** maintain preoperative occlusion
 - **Balance (beauty):** improve facial structure/profile
- Determine maximal amount of advancement possible to improve breathing while improving facial balance



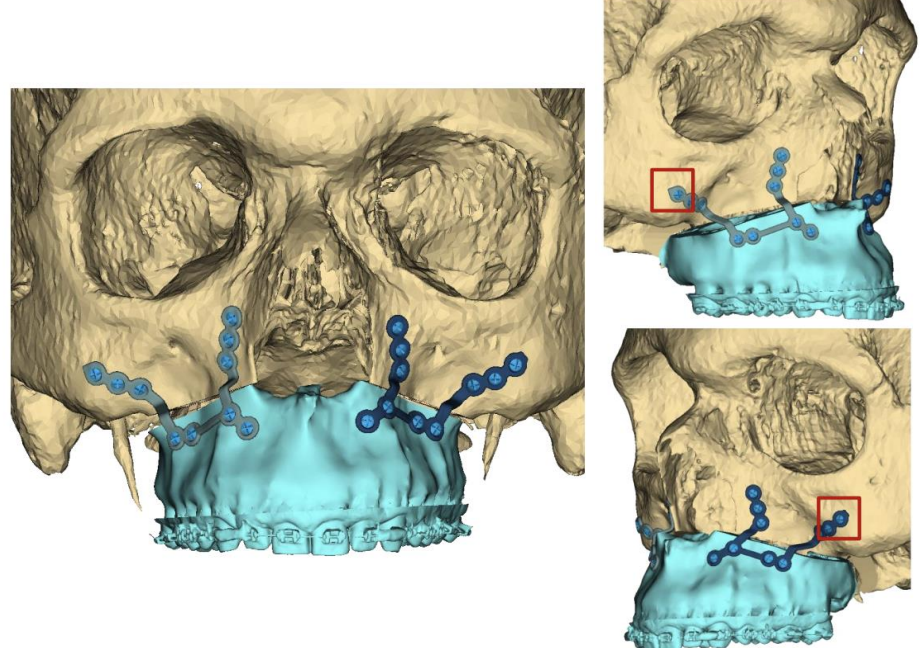




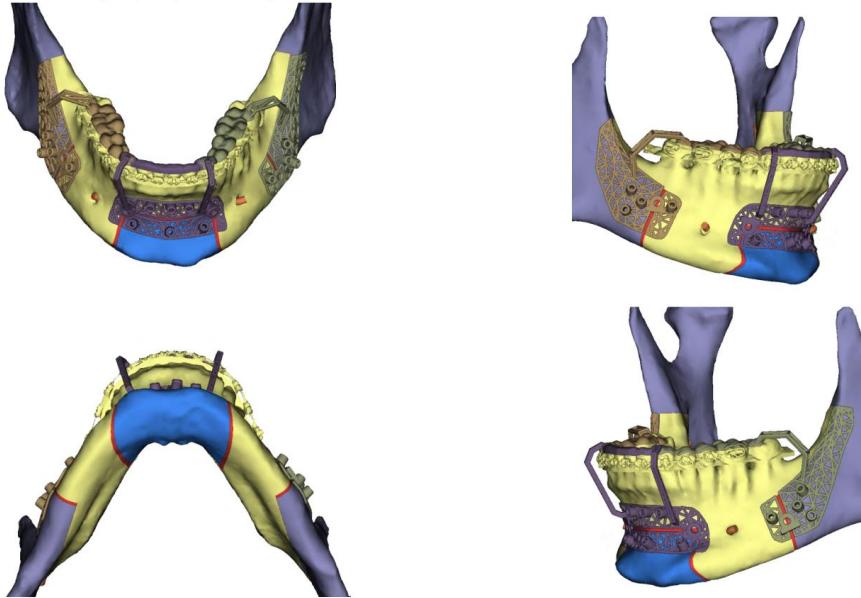
3D Printed Cutting Guides



3D Printed Plates

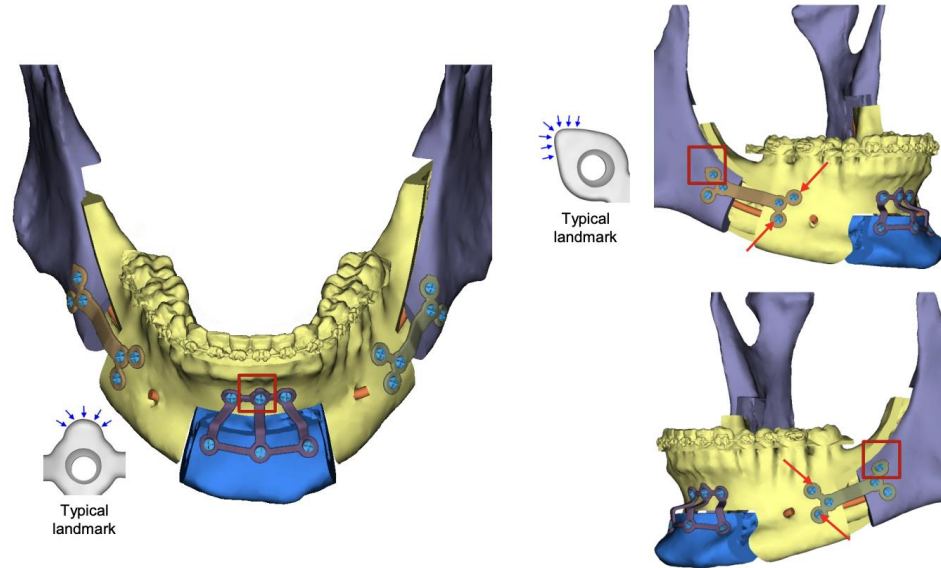


3D Printed Cutting Guides

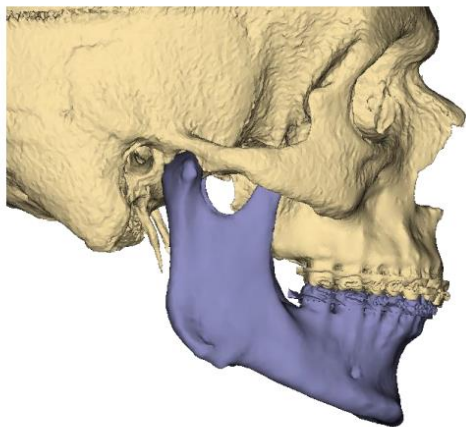


Resected mandible

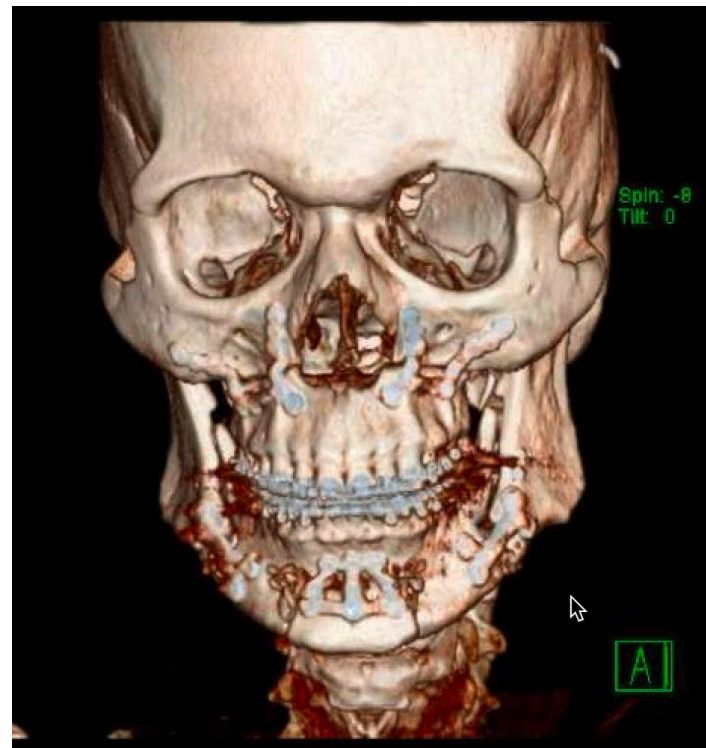
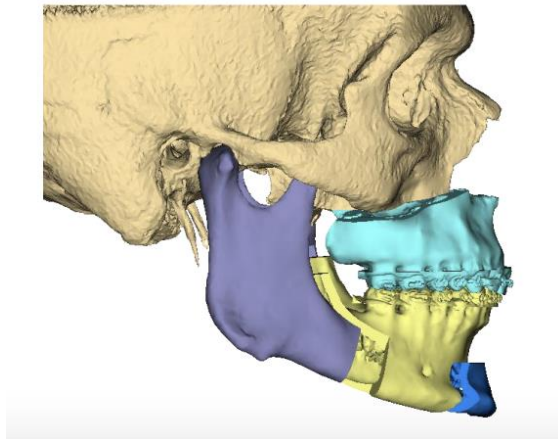
3D Printed Plates



Pre-op

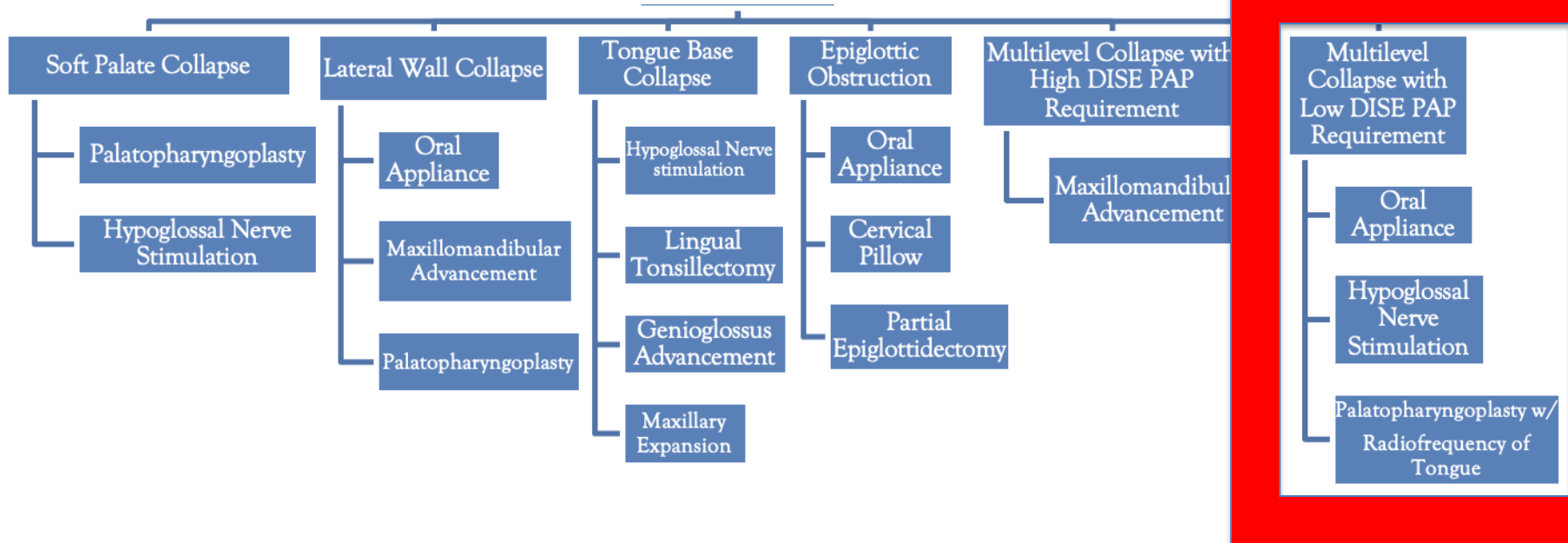


Post-op

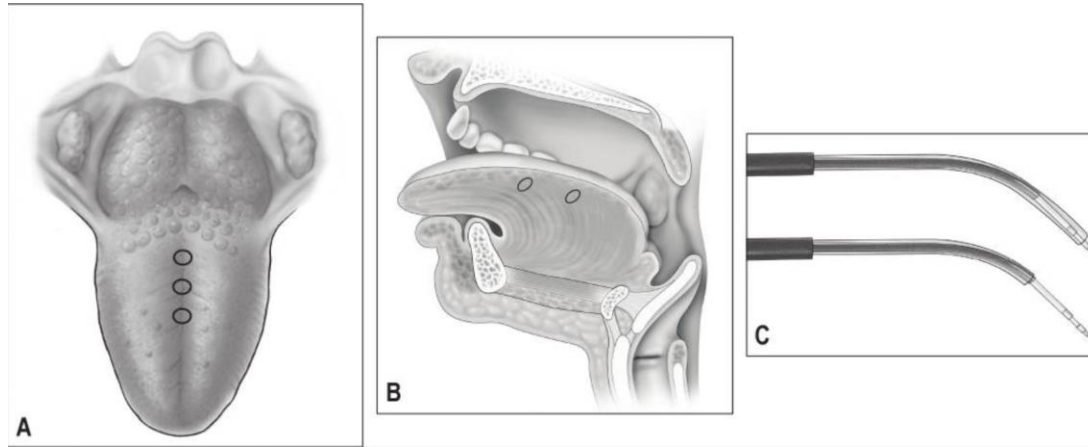


- Systematic Review and Meta-analysis
 - 45 studies, 518 patients
 - AHI reduced 80.1%
 - ESS: 13.5 → 3.2
 - 85.5% surgical success
 - 38.5% cure rate

Rush Sleep Surgery Algorithm



- Modified pharyngoplasty with radiofrequency ablation of the tongue
 - RCT: 102 pts, AHI 47.9 → 20.8, ESS 12.4 → 5.3 at 6 mos



Reflex Ultra 55 coblator wand
Smith and Nephew

MacKay S, Carney AS, Catcheside PG, et al. Effect of Multilevel Upper Airway Surgery vs Medical Management on the Apnea-Hypopnea Index and Patient-Reported Daytime Sleepiness Among Patients With Moderate or Severe Obstructive Sleep Apnea: The SAMS Randomized Clinical Trial. *JAMA*. 2020;324(12):1168-1179.

2024

- Medical:
 - PAP
 - OAT
 - Pharmacologic
 - GLP1
 - ExciteOSA
- Surgical:
 - MMA, palate expansion
 - UPPP/ESP, RF tongue
 - Hyoid Suspension
 - Neural stimulation

2034?

- Medical:
 - PAP
 - OAT
 - Pharmacologic
 - GLP1
 - ExciteOSA
 - Cryotherapy
 - ?
 - ?
- Surgical:
 - MMA/palate expansion
 - ESP/UPPP
 - Hyoid suspension
 - Tonsillectomy
 - Neural Stimulation
 - Inspire
 - Genio
 - LivaNova
 - Ansa Cervicalis
 - ?
 - ?

- Patient selection is the most important component of sleep surgery
- Fully evaluate the airway during physical exam and DISE
- Remember the nose!
- Ensure you are giving patients a variety of treatment options based on your findings