The Dreaded CCC!

Now What?

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Overview

- Impact of DISE on HGNS Outcomes
- Weight loss
- OAT
- ESP + HGNS
- ESP + RF
- MMA

Impact of DISE Findings on HGNS

- 343 pts across 10 centers
  - Complete vs partial/no BOT collapse: 78% vs 68%
  - Complete vs partial/no lateral wall collapse: 58% vs 74%

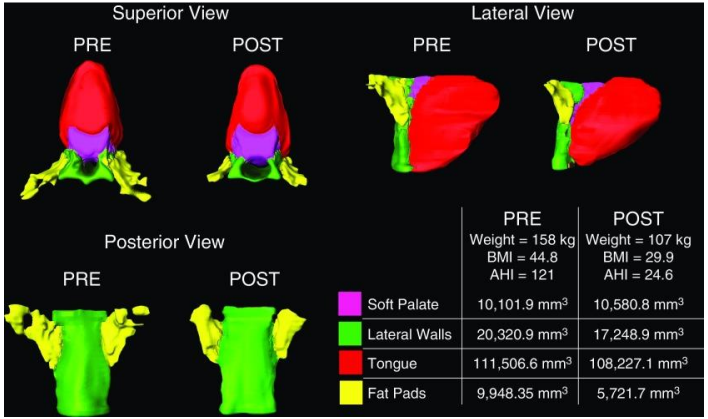
- 14 pts with CCC per blinded review
  - 58% surgical success (AHI < 15), 36% surgical cure (AHI < 5)

- Should CCC be an exclusion criteria? Should complete LW collapse?

Huyett P, Kent DT, D'Agostino MA, et al. Drug-Induced Sleep Endoscopy and Hypoglossal Nerve Stimulation Outcomes: A Multicenter Cohort Study. *Laryngoscope*. 2021;131(7):1676-1682.
Vanderveken OM, Maurer JT, Hohenhorst W, et al. Evaluation of drug-induced sleep endoscopy as a patient selection tool for implanted upper airway stimulation for obstructive sleep apnea. *J Clin Sleep Med*. 2013;9(5):433-438.

Weight Loss

- 10% weight loss → 25-40% reduction in AHI
- Reduction in tongue fat, increased lateral distance of retropalatal airway and decreased volume of lateral walls
- GLP1s can help!
  - SURMOUNT OSA trial



	PRE Weight = 158 kg BMI = 44.8 AHI = 121	POST Weight = 107 kg BMI = 29.9 AHI = 24.6
Soft Palate	10,101.9 mm^3	10,580.8 mm^3
Lateral Walls	20,320.9 mm^3	17,248.9 mm^3
Tongue	111,506.6 mm^3	108,227.1 mm^3
Fat Pads	9,948.35 mm^3	5,721.7 mm^3

Wang SH, Keenan BT, Wiemken A, et al. Effect of Weight Loss on Upper Airway Anatomy and the Apnea-Hypopnea Index. The Importance of Tongue Fat. *Am J Respir Crit Care Med*. 2020;201(6):718-727.
Sutherland K, Smith G, Lowth AB, et al. The effect of surgical weight loss on upper airway fat in obstructive sleep apnoea. *Sleep Breath*. 2023;27(4):1333-1341.

- Non-invasive, higher rates of adherence vs CPAP
- Mean reduction of AHI by 13.9
- Significant number of patients reduce AHI > 50%

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.
https://www.gentledentistry.com/not-a-fan-of-using-cpap-for-your-sleep-apnea-consider-an-oral-appliance/

Oral Appliance Therapy

- De Beeck – Decreased response rates/deterioration over time with CCC
- Vena et al. – Isolated soft palate collapse related to poorer response rates
- Adherence: 83% at 1 year, 62-64% at 4-5 years
- Issues: need teeth, cost, malocclusion, TMJ, discomfort

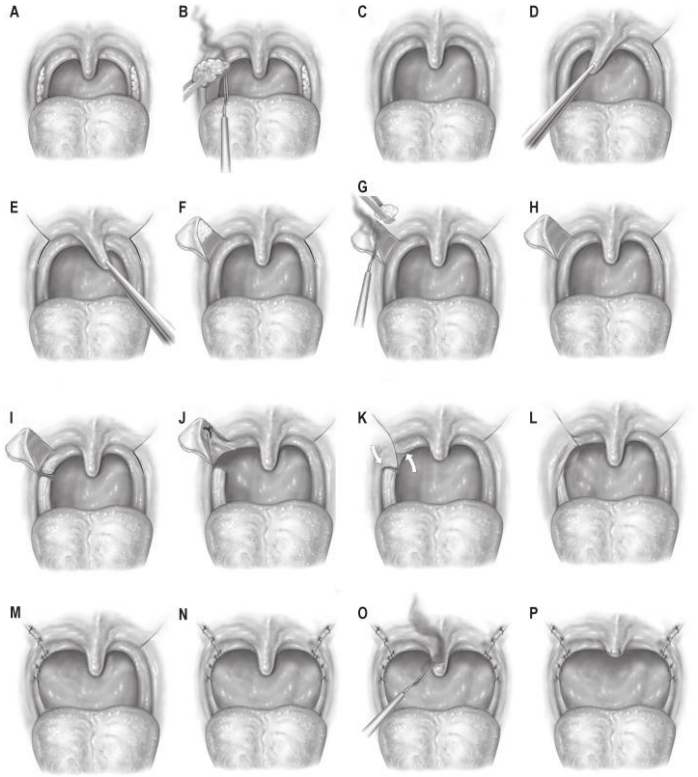
Op de Beeck S, Dieltjens M, Verbruggen AE, et al. Phenotypic Labelling Using Drug-Induced Sleep Endoscopy Improves Patient Selection for Mandibular Advancement Device Outcome: A Prospective Study. *J Clin Sleep Med*. 2019;15(8):1089-1099.
Vena D, Azarbarzin A, Marques M, et al. Predicting sleep apnea responses to oral appliance therapy using polysomnographic airflow. *Sleep*. 2020;43(7):zsaa004.

Expansion sphincter pharyngoplasty + radiofrequency ablation of the tongue

- Multicenter, parallel-group, open-label randomized controlled trial of 102 pts
  - Age 18-70, BMI < 38, no DISE involved
- ESP + RF vs medical management

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.

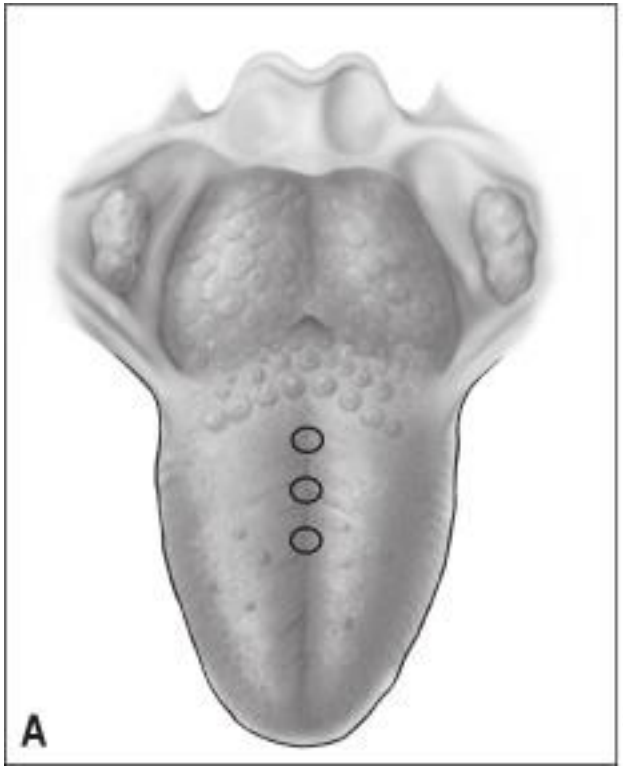
Expansion Sphincter Pharyngoplasty

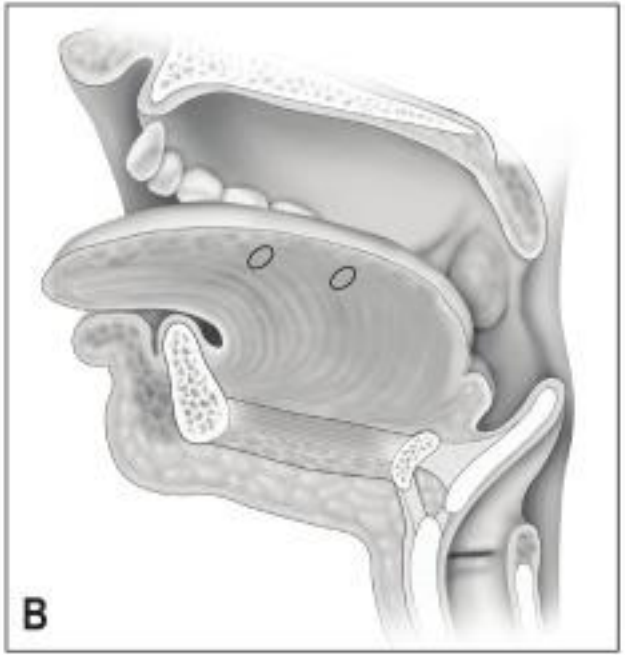


Radiofrequency Ablation of Junctional Tongue

RUSH

RUSH MEDICAL COLLEGE • COLLEGE OF NURSING • COLLEGE OF HEALTH SCIENCES • THE GRADUATE COLLEGE





Results

- Surgery group at 6 months:
  - AHI: 47.9 → 20.8
  - ESS: 12.4 → 5.3
- Medical group:
  - AHI: 45.3 → 34.5
  - ESS: 11.1 -→ 10.5

Conversion of CCC?

- 12 pts in a prospective, non-consecutive, single-blinded cohort study
- Inclusion criteria: age > 18, AHI > 15, BMI < 32, <25% central apneas
- 75% male, BMI 30.5
- CCC noted on DISE → modified palatopharyngoplasty

Liu SY, Hutz MJ, Poomkonsarn S, Chang CP, Awad M, Capasso R. Palatopharyngoplasty Resolves Concentric Collapse in Patients Ineligible for Upper Airway Stimulation. *Laryngoscope*. 2020;130(12):E958-E962.

Results

- AHI 54 → 33.1
- 12/12 pts resolved CCC on post-op DISE
  - 3/12 had resolution of collapse at velum
  - 9/12 had conversion to AP collapse

Two-stage Surgery

- Retrospective review of 20pts w/ CCC
- Age 43-81 years, BMI 30.7, preop AHI 53.9, ESS 13.3

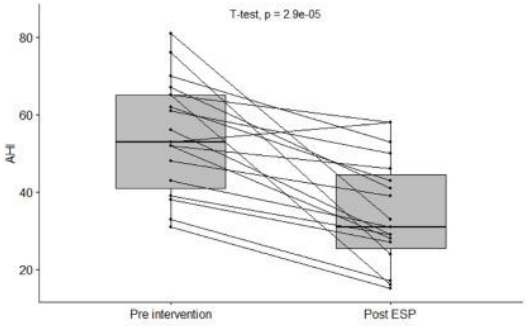
Weidenbecher MS, Vargo JW, Carter JC. Efficacy of expansion pharyngoplasty and hypoglossal nerve stimulation in treating sleep apnea. *Am J Otolaryngol*. 2022;43(5):103592.

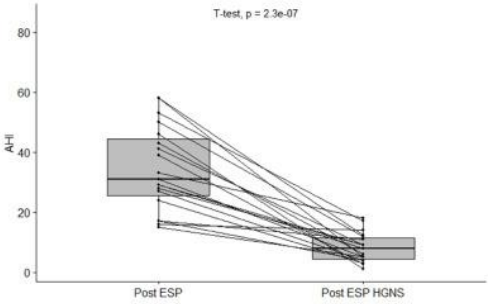
Following ESP

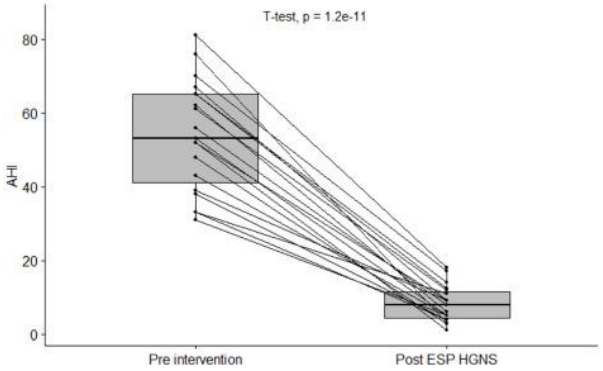
- 20/20 converted to AP collapse
  - 5/25: resolution of palatal collapse (V0)
  - 11/25: partial AP collapse (V1 – AP)
  - 4/25: complete AP collapse (V2– AP)
- Average weight loss 13.5lbs
- 2nd stage HGNS implantation

Results

- Results:
  - AHI 53.9 → 8.2
  - ESS: 13.3 → 5.7

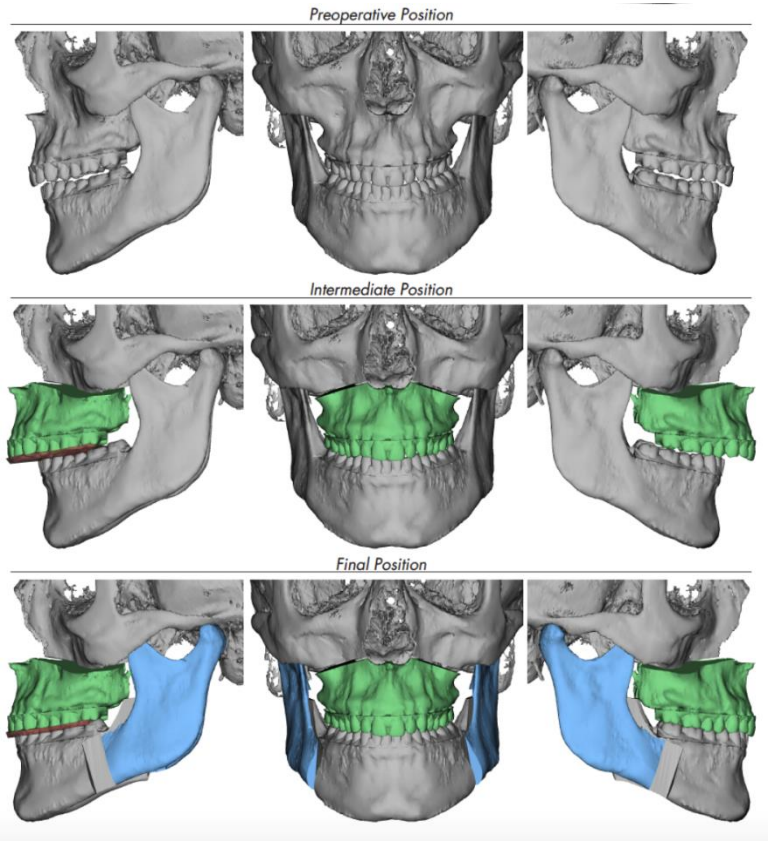




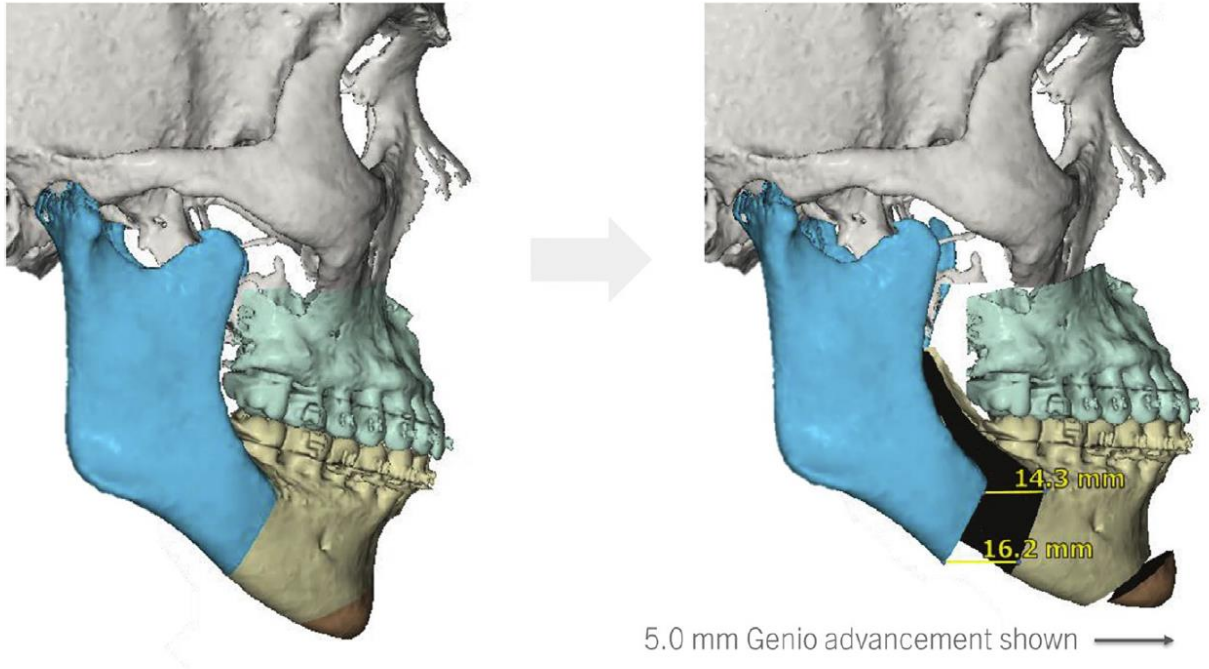


Maxillomandibular Advancement Surgery

- **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



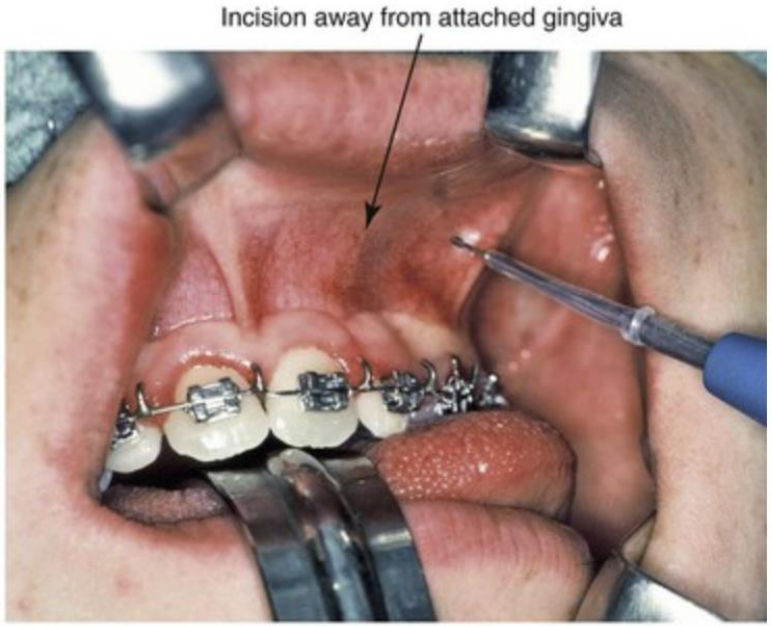
Maxillomandibular Advancement Surgery



VSP with CCW rotation centered at buttress (*left panel*, Before MMA; *right panel*, After MMA).

Nasal Intubation

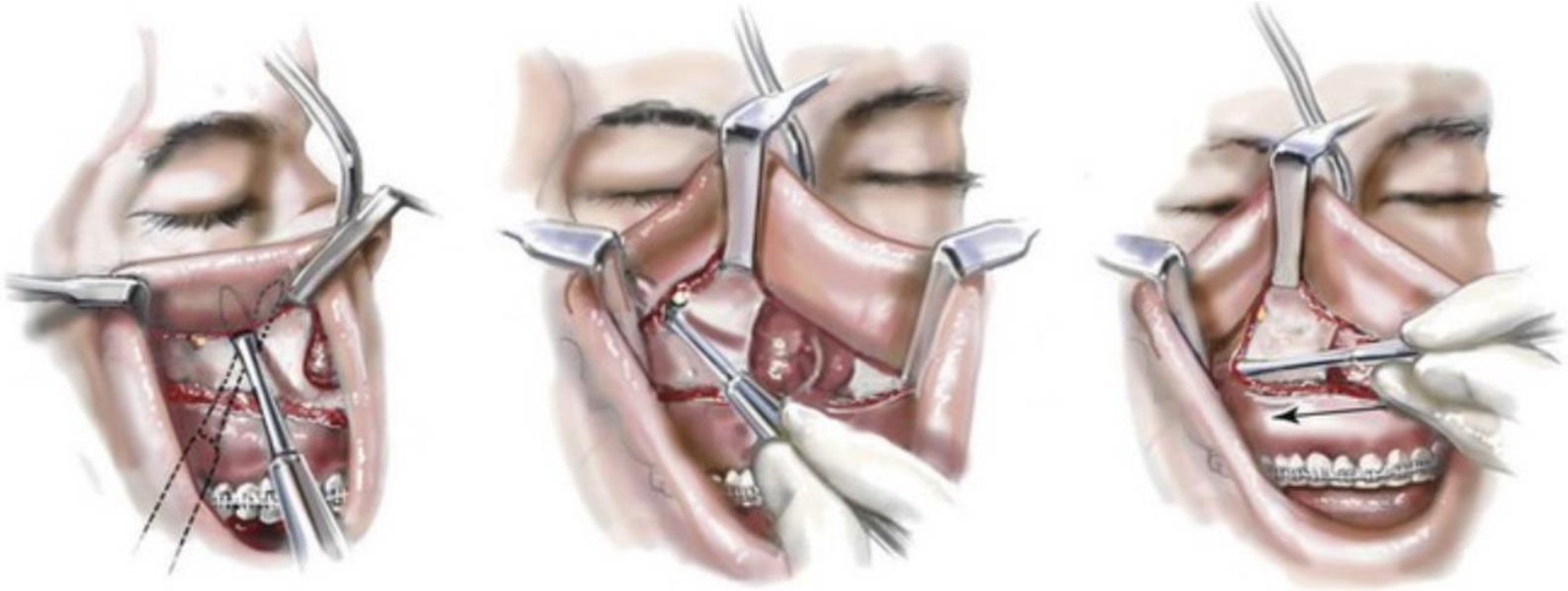
LeFort Osteotomy – Incision



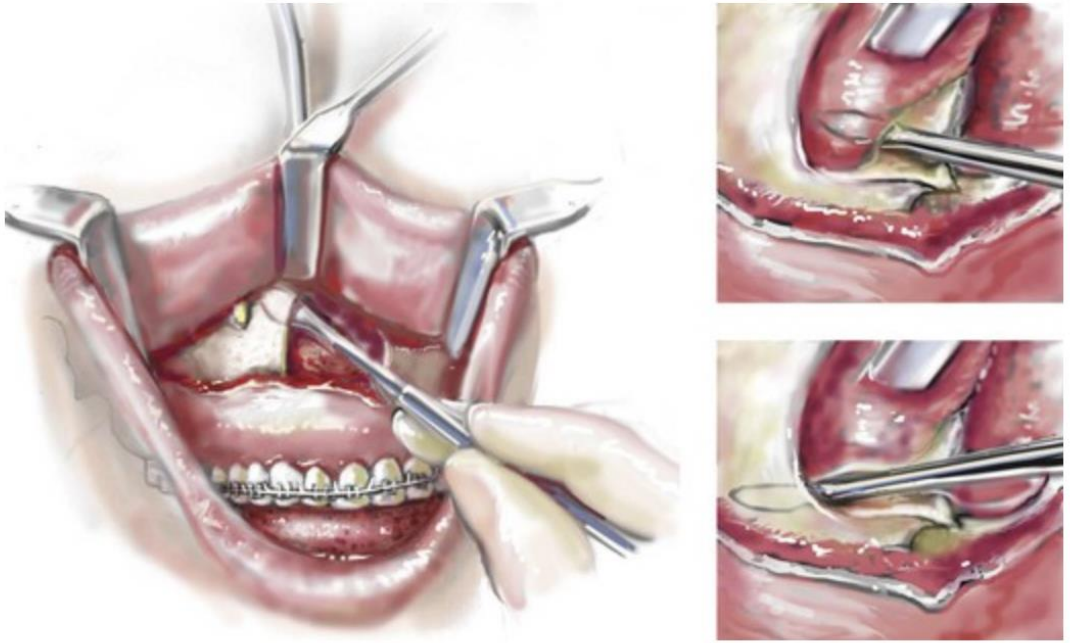
Circumvestibular incision

https://pocketdentistry.com/15-sequencing-of-orthognathic-procedures-step-by-step-approach/

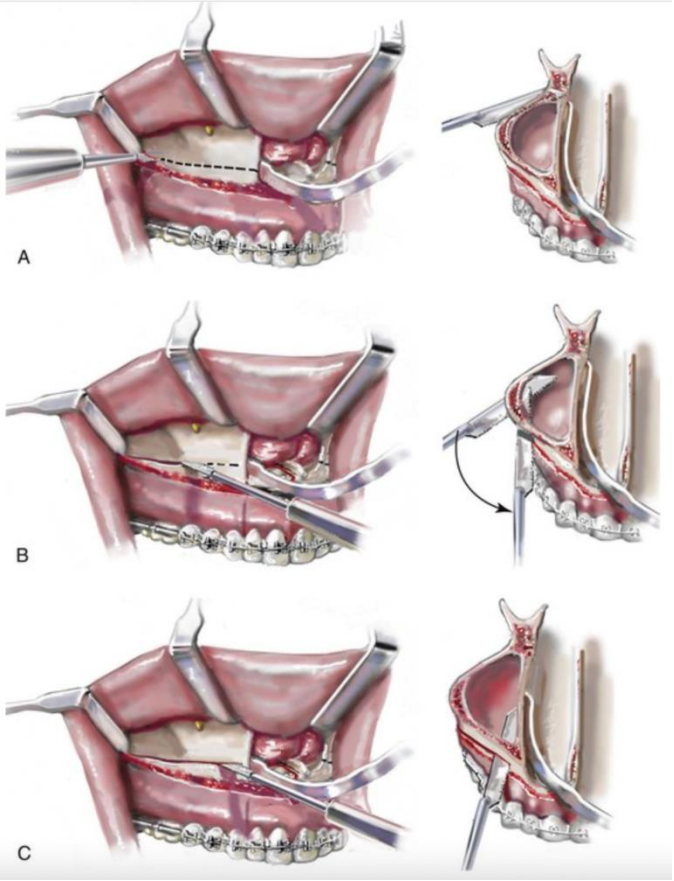
LeFort Osteotomy - Dissection

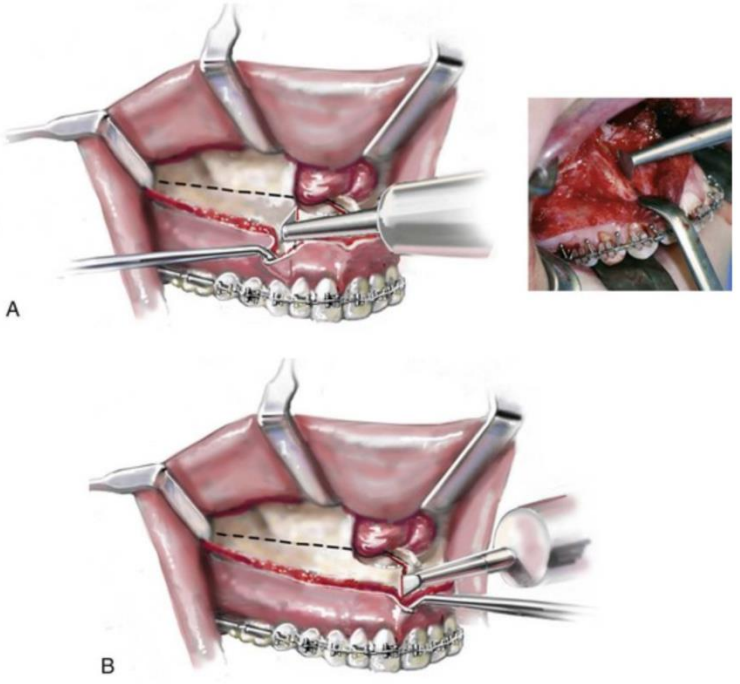


LeFort Osteotomy – Dissection (Continued)

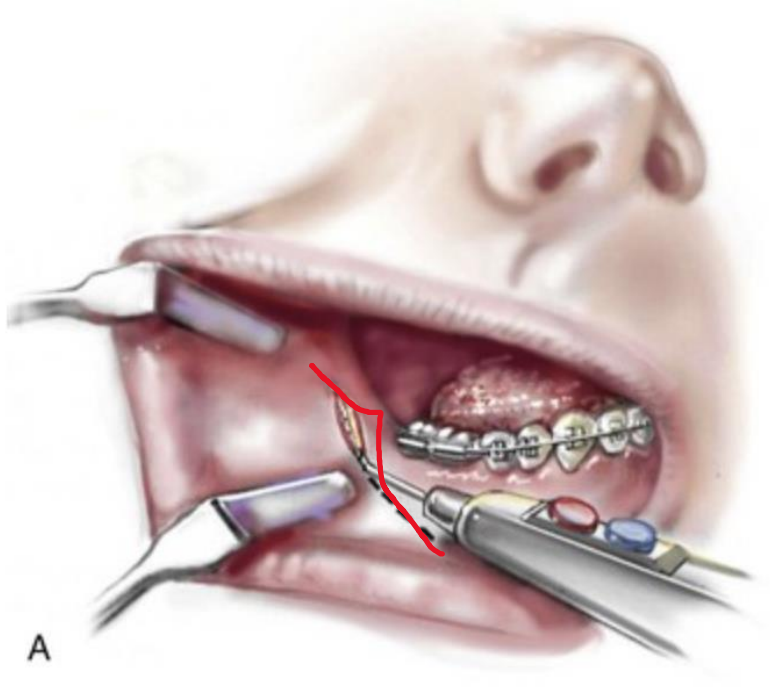


LeFort Osteotomy

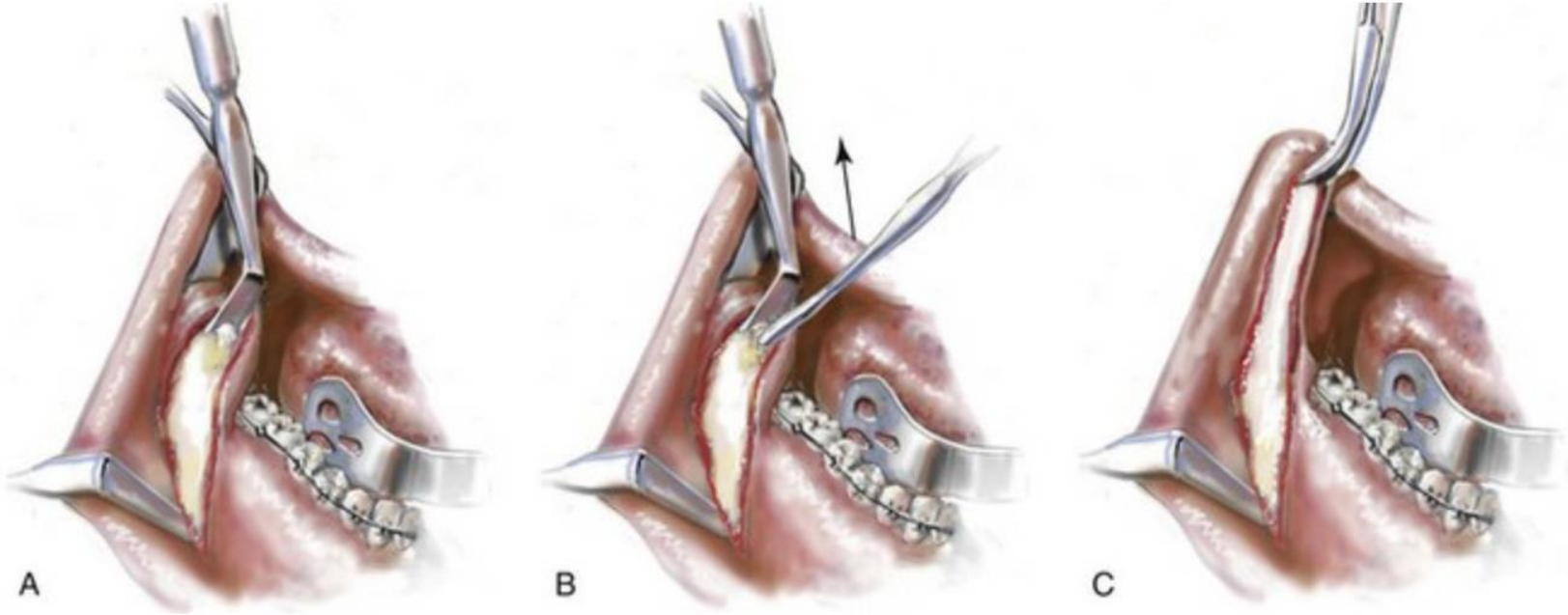




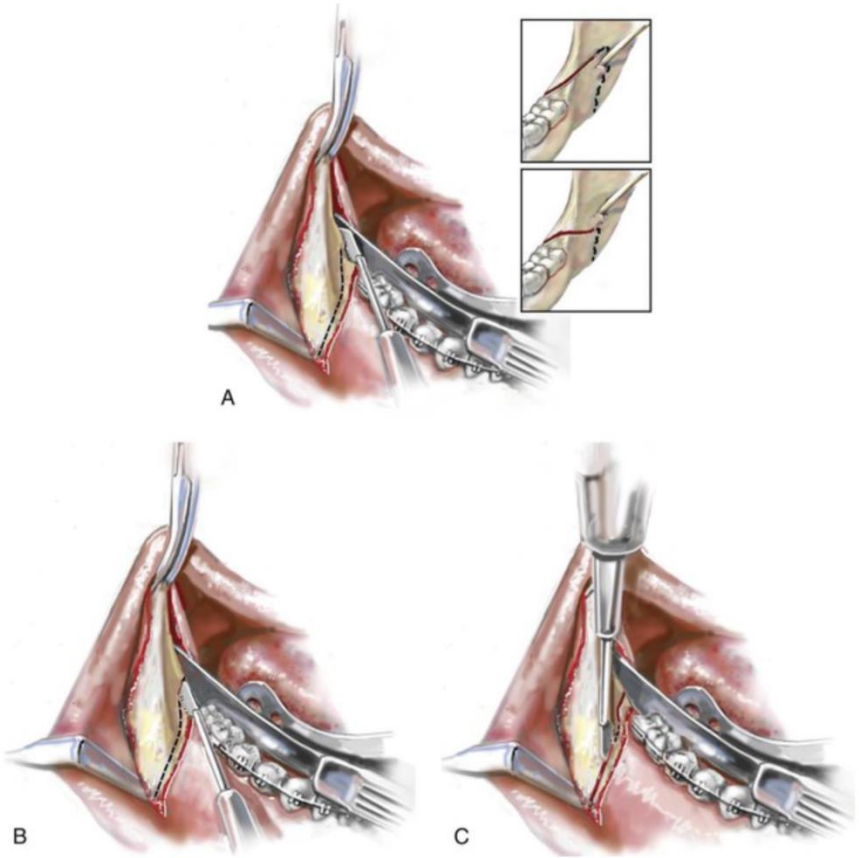
BSSO - Incision



BSSO – Dissection



BSSO - Osteotomy



Maxillomandibular Advancement Surgery

- 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

Zaghi S, Holty JE, Certal V, et al. Maxillomandibular Advancement for Treatment of Obstructive Sleep Apnea: A Meta-analysis. *JAMA Otolaryngol Head Neck Surg*. 2016;142(1):58-66.

Skeletal Surgery

- Benefits
  - Corrects underlying anatomic deficiencies contributing to OSA
  - More sustained, long-term results compared to soft tissue surgery
  - Single surgery
- Limitations
  - More invasive, highly technical
  - Longer recovery
  - Higher complication rates
  - Requires coordination with dental colleagues

MMA Complications

- Major complications are 1% - cardiac arrest, mandibular fracture
- Minor complication rates 3-20%
  - Malocclusion, facial paresthesia related to inferior alveolar nerve, dysphagia, VPI, minor hemorrhage, local infection

- Most consistently effective surgical option for OSA other than tracheostomy
- Reduces collapsibility of upper airway at all levels
- Previously thought of as salvage surgery but for many, can now be first line
- Consider in severe OSA, lower BMI, partial or complete collapse at multiple levels, skeletal deficiencies, significant lateral wall collapse, hypertrophy of salpingopharyngeus muscles

Conclusion

- Management of CCC
  - Weight loss
  - Oral Appliance Therapy
  - ESP + HGNS
  - ESP + RF
  - MMA