Beyond CPAP: A sleep physician's take on surgical options for OSA

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Inspire Physician of Excellence
Inspire Care Team of Excellence

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Disclosures

I am a speaker and consultant for Inspire Medical Systems.

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Disclosures

I am a sleep physician…not a surgeon.

Some of the statements here will be based on my clinical experience and I will state when that is the case.

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Agenda

- Very brief review of obstructive sleep apnea (OSA) and CPAP
- Define surgical success in OSA
- Diagnostic tools
- Sleep surgical options
- Sleep physician's role in surgical management

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Obstructive Sleep Apnea

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OSA Prevalence

- Moderate-to-severe OSA (AHI ≥15): ~6–17% of adults; up to 30–40% in older adults
- **80–90% of OSA cases remain undiagnosed**

Punjabi NM. The epidemiology of adult obstructive sleep apnea. *Proc Am Thorac Soc.* 2008;5(2):136-143.

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Health impact of untreated OSA

- ↑ risk of **hypertension, cardiovascular disease, stroke**
- Associated with **insulin resistance, type 2 diabetes**
- ↑ risk of **motor vehicle accidents**
- Associated with **increased all-cause mortality**
- Severity assess by the **Apnea/Hypopnea Index (AHI)**

Principles and Practice of sleep Medicine, 7th Edition

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CPAP – The Gold Standard

- Provides continuous positive airway pressure to splint the upper airway open during sleep.
- Reduces apnea-hypopnea index (AHI) by **70–90%** in adherent users.
- Improves symptoms of **daytime sleepiness, cognitive function, and quality of life**.
- Demonstrates reductions in **blood pressure, cardiovascular risk, and accident risk**.

Patil SP, et al. Treatment of Adult Obstructive Sleep Apnea With Positive Airway Pressure: An American Academy of Sleep Medicine Systematic Review, Meta-Analysis, and GRADE Assessment. J Clin Sleep Med. 2019 Feb 15;15(2):301-334.

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CPAP Challenges

- Long-term adherence rates range from **50-70%** (≥4 hours/night, ≥70% nights).
- Common barriers: discomfort, nasal congestion, mask leaks, claustrophobia, dryness.
- Strategies to improve adherence: heated humidification, better mask fitting, patient education, behavioral support.

J Otolaryngol Head Neck Surg. 2016;45:43.

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Patients need other options....

- Oral appliance
- Weight reduction, including with pharmacotherapy
- Positional therapy
- **Surgery**
- Others… (eXciteOSA, nasal positive airway pressure valve, pharmacotherapy)

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What is surgical success?

- How do you define success? Patients sometimes think they will get "cured" with surgery.
- AHI, symptoms, ESS, mortality
- Surgical success typically isn't a complete correction but is often defined as a 50% AHI reduction and AHI <20.
- Need to set realistic expectations with patients.

Shor AE, et al. *Sleep*. 1996;19(2):156-177.

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Who to refer....

RECOMMENDATIONS FOR CLINICALS WHO TREAT ADULTS WITH OSA:

1. We recommend that clinicians discuss referral to a sleep surgeon with adults with OSA and BMI<40 who are intolerant or unaccepting of PAP as part of a patient-oriented discussion of alternative treatment options. (STRONG)

2. We recommend that clinicians discuss referral to a bariatric surgeon with adults with OSA and obesity (class II/III, BMI ≥35) who are intolerant or unaccepting of PAP as part of a patient-oriented discussion of alternative treatment options. (STRONG)

3. We suggest that clinicians discuss referral to a sleep surgeon with adults with OSA, BMI<40, and persistent inadequate PAP adherence due to pressure-related side effects as part of a patient-oriented discussion of adjunctive or alternative treatment options. (CONDITIONAL)

4. We suggest clinicians recommend PAP as initial therapy for adults with OSA and a major upper airway anatomic abnormality prior to consideration of referral for upper airway surgery. (CONDITIONAL)

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Pediatric surgical options

- Tonsillectomy and adenoidectomy often first line
- Success rates can be reduce depending on obesity and overall body habitus
- Inspire now an option for patients with Down Syndrome who are 13+ and have moderate to severe OSA.

Marcus CL, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. *Pediatrics*. 2012;130(3):e714-e755

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Diagnostic Tools to Guide Surgery

- DISE
  - Flexible nasoendoscopy performed under sedation to mimic sleep conditions.
  - Helps predict surgical success and guides choice of procedure.
- Cephalometric Analysis
  - Lateral skull X-ray that measures craniofacial structure.
  - Useful in planning skeletal surgeries like maxillomandibular advancement (MMA).
- Imaging (CT/MRI)
- Sleep Testing (In-lab and home)

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DISE

- Palatal/Velum Collapse 70-90%
- Tongue Base Collapse 30-60%
- Lateral Wall Collapse 30-40%
- Epiglottic Collapse 10-20%

Velum: AP Collapse Latera Wall Concentric

Camasco-Llatas M, Matarredona-Quiles S, De Vito A, Chong KB, Vicini C. Drug-Induced Sleep Endoscopy: Technique, Indications, Tips and Pitfalls. *Healthcare*. 2019; 7(1):1.

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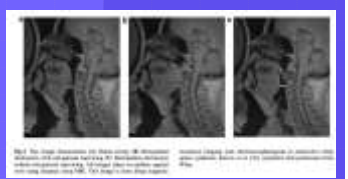
Where is the obstruction on MRI?

- Retropalatal collapse: 98%
- Retroglossal collapse: 41%
- Hypopharyngeal collapse: 5%



Volner K, et al. *Dynamic Sleep MRI in Obstructive Sleep Apnea: a Systematic Review*. *J Clin Med*. 2021;10(13):2940.

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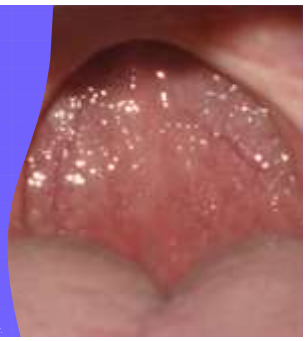
Uvulopalatopharyngoplasty (UPPP)

- First widely used surgical procedure for OSA (introduced in the 1980s).
- Involves removal/resection of uvula, part of the soft palate, and redundant pharyngeal tissue.
- Long-term durability is limited–success rates drop to **~30-40% at 5 years**.
- Post-op pain, velopharyngeal insufficiency (nasal regurgitation), dysphagia, voice changes.
- Less frequently used now as a *standalone* procedure.



Caples SM, et al. Sleep. 2010;33(10):1396-1407.

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Surgeries that target the lateral wall

- Expansion Sphincter pharyngoplasty and lateral pharyngoplasty
- Done as modification or part of UPPP
- Variable success rates
- Success data is limited on my review

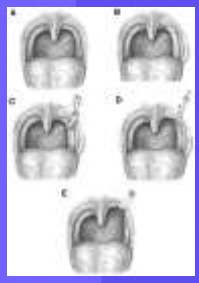

Image from Woodson et al., Operative Techniques in Otolaryngology (2012) 23, 3-10

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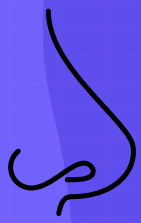
Nasal Surgery (Septoplasty/Turbinate reduction)

- This is asked about by patients frequently.
- Alone rarely resolve OSA
- I do not suggest this as treatment for OSA but will retest if the procedure was performed for another reason.



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Other procedures

- Tongue base reduction and genioglossus advancement
- Hyoid suspension
- Often combined with other surgeries
- Variable success
- I have not seen patients with success after these procedures.

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Maxillomandibular Advancement (MMA)

- Enlarges the entire upper airway space, including **retropalatal and retroglossal regions**.
- Considered the most effective single surgical procedure for adult OSA.

Image from sleepapneasurgery.com

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Maxillomandibular Advancement (MMA)

- **Efficacy**
- Meta-analyses show **success rates of ~85–90%**, with many patients achieving near-normal AHI.
- Cure (AHI <5) rates reported at ~40–50%.
- Long-term studies confirm sustained improvements in sleep quality, oxygenation, and quality of life.
- **Limitations**
- Invasive, requiring hospitalization and recovery (typically several weeks).
- Reserved for severe or refractory OSA where other surgical and non-surgical therapies have failed.

Holty JE, Guilleminault C. Maxillomandibular advancement for the treatment of obstructive sleep apnea: a systematic review and meta-analysis. Sleep Med Rev. 2010 Oct;14(5):287-97.

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Hypoglossal Nerve Stimulation (HGNS)

- An implantable neurostimulator that delivers electrical pulses to branches of the hypoglossal nerve
- Stimulates the genioglossus muscles and stabilizes the upper airway
- 2 FDA approved: Inspire and Genio
- General indications:
  - Moderate to severe OSA with CPAP failure
  - Non-concentric collapse on DISE
  - Favorable BMI (often less than 35)

My practice has been providing HGNS management since 2020.

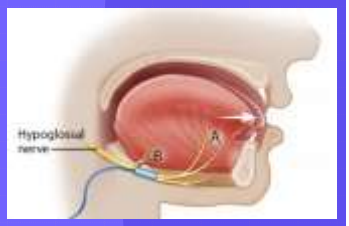

Image from med.stanford.edu

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Defining Goals & Setting Expectations with HGNS in My Practice

	Goal	Expectation
DISEASE BURDEN	AHI < 15/hour and 50% reduction from baseline	Decrease severity of patient's health risks
SYMPTOM RELIEF	Decrease ESS by 2 points	Satisfied patients getting restful sleep
ADHERENCE	At least 4 hours per night	All-night use

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Inspire

- FDA approved in 2014 (over 100K implants completed as of May 2025)
- Unilateral HGNS
- Stimulation is timed to inspiration via a sensing lead.
- Outcomes show durable success in the ADHERE Registry.

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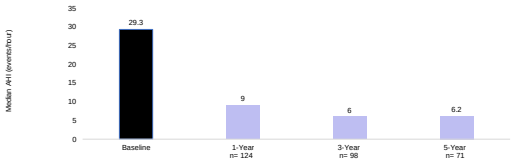
Inspire: STAR Trial - AHI



p<0.0001

Otolaryngol Head Neck Surg. 2018 Jul;159(1):194-202.

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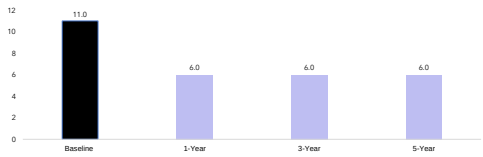
Inspire: STAR Trial – Epworth Scale



Otolaryngol Head Neck Surg. 2018 Jul;159(1):194-202.

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Genio by Nyxoah

- FDA approved August 2025
- Bilateral hypoglossal nerve stimulation
- External power source
- Cyclical stimulation
- DREAM Trial (n=115) 4% AHI improved from 27.8 to 9.5 (p<0.001)
- ESS 9.7 to 6.2

Woodson BT, et al. Bilateral hypoglossal nerve stimulation for obstructive sleep apnea: a nonrandomized clinical trial. J Clin Sleep Med. 2025 Jul 24.

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HGNS

	Initial Beliefs/Concerns	Present Day
EFFECTIVENESS	Is HGNS just like UPPP?	Our outcomes match the research with low AHI and improved ESS
WHO QUALIFIES?	"We won't refer many patient."	• Many patients qualify • Effective in obese patients • Referrals and the practice continue to grow
"IT'S SURGERY"	• It might be too invasive for patients • The recovery will be long	• Patients have excellent tolerance and recovery • Satisfaction is high

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Bariatric Surgery

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Bariatric Surgery

- Consider in patients with BMI>35
- AHI reduction after surgery ranges from **30-70%**
- Not uniformly curative
- In my practice I tend to see a reduction in AHI but there is often residual sleep apnea.

Anandam A, Akinnusi M, Kufel T, et al. Effects of bariatric surgery on obstructive sleep apnea: a meta-analysis. *Sleep*. 2013;36(1):57-63.

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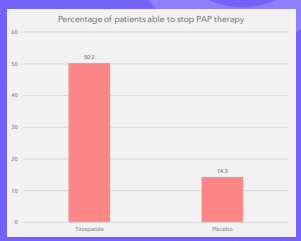
Weight Loss: Tirzepatide and Sleep Apnea

- Obese patients (mean BMI 38.7) with baseline AHI 29.3
- At one year 50.2 % of patients treated with Tirzepatide had either an AHI below 5 or no symptoms with an AHI below 15
- Body Weight reduction was 19.6% in treatment group compared to 2.3% in placebo (p<0.001)



1. Malhotra A, et al.; SURMOUNT-OSA Investigators. Tirzepatide for the Treatment of Obstructive Sleep Apnea and Obesity. N Engl J Med. 2024 Oct 3;391(13):1193-1205.

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Role of the Sleep Physician

- Evaluation
- Coordination and **communication** with surgeons
- Sleep studies
- Educate patient (expectations)
- Post-op follow-up

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Summary and Q&A

- CPAP remains first-line therapy for obstructive sleep apnea.
- Surgery is an important alternative, after discussion regarding expectations.
- HGNS is often second line for moderate to severe OSA in my practice.
- Sleep physicians must lead collaborative care.
- Thank you!

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"Can't you have some quotes that don't relate to tennis?"
– Victoria

Questions??

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