

Update in Surgical Management of OSA

Mary Frances Musso, DO
Surgical Sleep Director
Associate Chief of Surgery, West Campus
Texas Children's Hospital

1

Learning Objectives

- Review changes in updated tonsillectomy guidelines
- Discuss tonsillectomy vs. tonsillotomy
- Identify methods used to evaluate sites of persistent sleep obstruction
- Discuss treatment modalities for persistent OSA

2

Tonsillectomy Guidelines

Guideline

Clinical Practice Guideline: Tonsillectomy in Children

Reginald F. Baugh, MD¹, Sanford M. Archer, MD², Ron B. Mitchell, MD³, Richard M. Rosenfeld, MD, MPH⁴, Raouf Amin, MD⁵, James J. Burns, MD⁶, David H. Darrow, MD, DDS⁷, Terri Giordano, MSN, CRNP, CORLN⁸, Ronald S. Litman, DO⁹, Kasey K. Li, MD, DDS¹⁰, Mary Ellen Mannix, MRPE¹¹, Richard H. Schwartz, MD¹², Gavin Setzen, MD¹³, Ellen R. Wald, MD¹⁴, Eric Wall, MD, MPH¹⁵, Gemma Sandberg, MA¹⁶, and Miles M. Patel, MS¹⁷


Otolaryngology: Head and Neck Surgery 144(11):51-526
© American Academy of Otolaryngology-Head and Neck Surgery Foundation 2011
Reprints: sagepub.com/journalsPermissions.nav
DOI: 10.1177/0145561310385497
<http://oto.sagepub.com>
SAGE

Guideline

Clinical Practice Guideline: Polysomnography for Sleep-Disordered Breathing Prior to Tonsillectomy in Children

Peter S. Roland, MD¹, Richard M. Rosenfeld, MD, MPH², Lee J. Brooks, MD³, Norman R. Friedman, MD, DABSM⁴, Jacqueline Jones, MD⁵, Tae W. Kim, MD⁶, Siobhan Kuhar, MD, PhD, DABSM⁷, Ron B. Mitchell, MD⁸, Michael D. Seidman, MD⁹, Stephen H. Sheldon, DO¹⁰, Stephanie Jones¹¹, and Peter Robertson, MPA¹¹

Otolaryngology: Head and Neck Surgery 145(11):51-515
© American Academy of Otolaryngology-Head and Neck Surgery Foundation 2011
Reprints: sagepub.com/journalsPermissions.nav
DOI: 10.1177/0145561310385497
<http://oto.sagepub.com>
SAGE



3

New Tonsillectomy Guidelines

- Ages 1-18
- Does **not** apply to partial tonsillectomy
- New evidence includes:
 - Clinical practice guidelines: 1
 - Systematic reviews: 23
 - Randomized control trials: 13
- 15 Statements

Clinical Practice Guideline: Tonsillectomy in Children (Update)

Ron B. Mitchell, MD¹, Sanford M. Archer, MD², Stacey L. Ishman, MD, MPH³, Richard M. Rosenfeld, MD, MPH, MBA⁴, Sarah Coles, MD⁵, Sandra A. Finestone, PsyD⁶, Norman R. Friedman, MD⁷, Terri Giordano, DNP⁸, Douglas M. Hildrew, MD⁹, Tae W. Kim, MD, MEHP¹⁰, Robin M. Lloyd, MD¹¹, Sanjay R. Parikh, MD¹², Stanford T. Shulman, MD¹³, David L. Walner, MD¹⁴, Sandra A. Walsh¹⁵, and Lorraine C. Nnacheta, MPH¹⁵

Otolaryngology: Head and Neck Surgery 2019, Vol. 140(10): 342
© American Academy of Otolaryngology-Head and Neck Surgery Foundation 2018
Reprints and permission: sagepub.com/journalsPermissions.nav
DOI: 10.1177/0145561318781175
<http://oto.sagepub.com>
SAGE

4

Statements #1, 2 & 3 – Discuss Paradise Criteria

- Candidates for tonsillectomy for recurrent throat infections should have had:
 - At least 7 episodes in the past year
 - At least 5 episodes per year in the past 2 years
 - At least 3 episodes per year in the past 3 years
- Episodes should have been accompanied by sore throat
- Episodes further characterized by T >38.5 °C, cervical nodes >2 cm, tonsil exudate, or culture positive for GABHS
- Episodes should be documented in the patient's medical record

Paradise et al, NEJM, 1984



5

Statements #1, 2 & 3 – Recurrent Tonsillitis

- Statement #1 – Paradise criteria not met
 - **Strong** recommendation for watchful waiting
- Statement #2 – Paradise criteria met
 - Option for tonsillectomy
- Statement #3 – Paradise criteria not met, but should assess for modifying factors
 - PTA, PFAPA, antibiotic allergy or intolerance



6

Statements #4-8, 12 – Obstructive Sleep Disordered Breathing (oSDB)

Original Guideline (2011)

Statement 4 Tonsillectomy for SDB: Clinicians should ask caregivers of children with SDB and tonsil hypertrophy about comorbid conditions that might improve after tonsillectomy, including growth retardation, poor school performance, enuresis, and behavioral problems.
Recommendation

Updated Guideline (2019)

Statement 4 Tonsillectomy for **oSDB**: Clinicians should ask caregivers of children with oSDB and tonsil hypertrophy about comorbid conditions that might improve after tonsillectomy, including growth retardation, poor school performance, enuresis, **asthma**, and behavioral problems.
Recommendation

Changes Made to Reflect Recent Literature

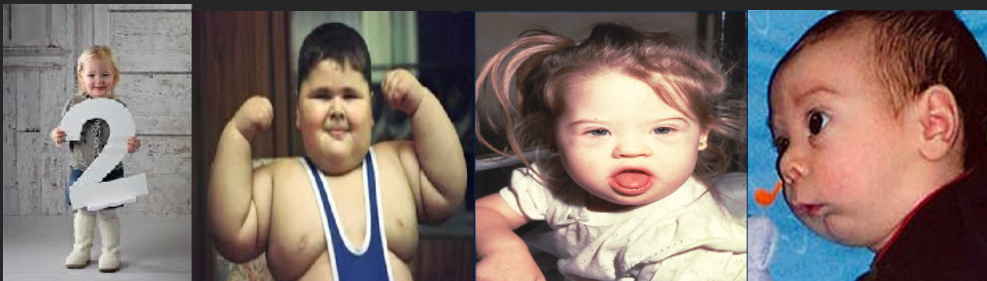
Changed to obstructive sleep disordered breathing (oSDB) Throughout document
"Asthma" added to the list of co-morbid conditions that may improve



7

Statement #5 – PSG Related

- Before performing tonsillectomy, the clinician should refer children with oSDB for PSG if they are **under 2 years of age**, or exhibit any of the following: **obesity, Down Syndrome, craniofacial abnormalities, neuromuscular disorders, sickle cell disease or mucopolysaccharidoses** **Recommendation to refer**
- PSG confirms indications and appropriateness of tonsillectomy, helps plan perioperative management, and provides a baseline of OSA severity
- **Consider: Feasibility, cost, does it alter management?**

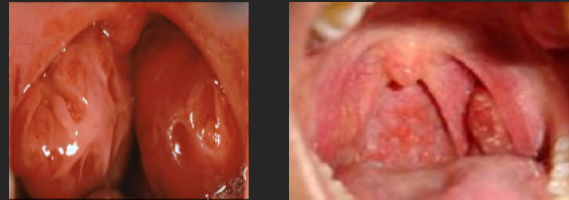


8

Statement # 6 Additional Recommendations for Preoperative PSG

Clinician should advocate for PSG prior to tonsillectomy for oSDB in children without comorbidities listed in statement 5 when:

- Need for tonsillectomy is uncertain
- Discordance between PE and the reported severity of oSDB
- Recommendation to advocate



Statement #7 Tonsillectomy for OSA

Clinicians should recommend tonsillectomy for children with obstructive sleep apnea (OSA) documented by overnight polysomnography. **Recommendation** based on randomized controlled trial and observational before-and-after studies with a preponderance of benefit over harm.

- Definition of OSA left intentionally vague
- Text statement of tonsil size: "There is recognition that any decision to recommend tonsillectomy **should not** be based solely on PSG findings but also on clinical history, examination, and the likelihood that tonsillectomy will improve sleep and lead to improvements in day and nighttime symptoms."
- Text statement on exclusions: "There is a paucity of outcomes data in children with significant comorbidities and it remains unknown if tonsillectomy should be a first line treatment in these children, especially with mild OSA."

Statement #8, 9 – Educate Caregiver

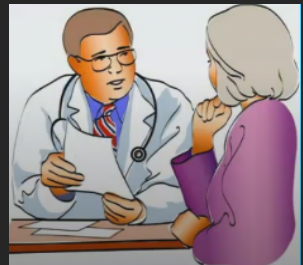
Statement 8. Counseling on persistent oSDB

Clinicians should counsel patients and caregivers and explain that oSDB may persist or recur after tonsillectomy and may require further management. **Recommendation** based on a randomized, controlled trial and observational studies, case-control and cohort design, with a preponderance of benefit over harm.



Statement 9. Perioperative pain counseling

The clinician should counsel patients and caregivers regarding the importance of managing post-tonsillectomy pain as part of the perioperative education process, and should reinforce this counseling at the time of surgery with reminders about the need to anticipate, reassess, and adequately treat pain after surgery. **Recommendation** based on randomized controlled trials with limitations and observational studies with a preponderance of benefit over harm.



11

Statements # 10 & 11 – Perioperative Medications

- Statement #10 – Clinicians should **not** administer or prescribe perioperative antibiotics to children undergoing tonsillectomy
 - Strong recommendation against
- Statement #11 – Clinicians should administer a single, intraoperative dose of IV dexamethasone
 - Strong recommendation

12

Statement #12 Who to Admit Postop...

- Clinicians should admit children with for inpatient, o/n monitoring after tonsillectomy:
- Under age 3 years
- **Severe OSA** – AHI of 10 or more obstructive events/hr
- Oxygen saturation nadir <80%
 - Recommendation to arrange monitoring



13

Definition of Severe OSA

Oto-HNS	AAP	AASM
Severe OSA defined by following PSG findings: <ul style="list-style-type: none"> • Obstructive AHI ≥ 10 • Nadir oxygen sat <80% 	Severe OSA defined by following PSG findings: <ul style="list-style-type: none"> • AHI >24 • Nadir oxygen sat <80% • Significant hypercapnia (peak CO₂ >60 mmHg) 	No recommendation made in guideline

Admit based on risk factors for individual patients and postoperative clinical state

14

Statements #9, 13, & 14 – Perioperative Medications

- Statement #9 – Recommendation to counsel patients and caregivers on importance of managing post tonsillectomy pain as part of perioperative education process & reinforce this counseling at time of surgery
- Statement #13 – Strong recommendation to use ibuprofen, acetaminophen, or both for pain control after tonsillectomy
- Statement #14 – Strong recommendation against administering codeine containing medications after tonsillectomy to children younger than 12 years



15

Statement #15 – Last One! Post-tonsillectomy Hemorrhage

- 15 a-Recommendation to follow up with patients and /or caregivers after tonsillectomy and document in medical record if bleeding occurred
- 15 b-Recommendation for clinicians to track personal post tonsillectomy bleed rate

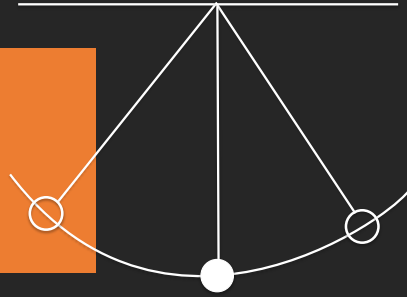


16

Partial Intracapsular Tonsillectomy (PIT)

Prior to 1930's

Partial Intracapsular Tonsillectomy(PIT):
Partial tonsillectomy,
Subtotal tonsillectomy,
Tonsillotomy



2003 Koltai revisited PIT
Persistent Concerns:
prolonged pain and
delayed hemorrhage

1930's

Fowler – Total Tonsillectomy (TT)



17

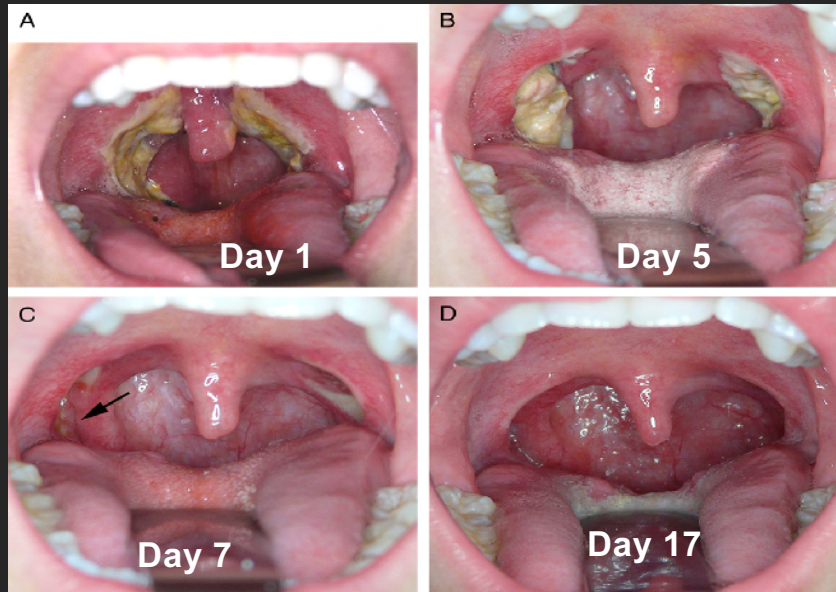
Partial Intracapsular Tonsillectomy (PIT)

PIT preserves the tonsil capsule- no violation of pharyngeal muscles-provides biological “dressing”



18

Post-tonsillectomy Healing



Isaacson G. et al.
Pediatrics Vol. 130
No. 2 August 1, 2012
pp. 324-334



19

Total vs Partial Tonsillectomy

Total Tonsillectomy (TT)	Partial Intracapsular Tonsillectomy (PIT)
Benefits: No tonsil regrowth Able to perform possible pharyngoplasty	Benefits: <u>Systematic reviews:</u> Walton et al- fewer days before resolution of pain Mean of 5 with PIT vs 7 with TT Lower secondary hemorrhage rates PIT <1%, TT 3% Zhang et al- return to normal diet reduced by 2.8 days with PIT vs TT group
Risks: 2-3% postop hemorrhage Pain management	Risks: 2-3% regrowth rate (potentially greater in Down Syndrome population) Persistent chronic tonsillitis

Outcomes

- Systematic reviews provide comparative information between PIT & TT regarding pain, bleeding & regrowth
- Limited data comparing effectiveness in treatment of OSA and recurrent acute tonsillitis including QOL
- Limited long term outcomes in PIT



20



Persistent OSA

21

Persistent OSA

Otolaryngology-Head and Neck Surgery (2006) 130, 975-980

ORIGINAL RESEARCH

The effectiveness of tonsillectomy and adenoidectomy in the treatment of pediatric obstructive sleep apnea/hypopnea syndrome: A meta-analysis

Scott E. Brietzke, MD, MPH, and Daniel Gallagher, MD, Washington, DC

- Published 2006
- 14 studies included- 355 subjects
- Treatment success of T&A **82%**
- Excluded: craniofacial syndromes, neuromuscular disorders, morbid obesity
- Included: subjects up to 18 years of age

Otolaryngology-Head and Neck Surgery (2009) 140, 800-808

LITERATURE REVIEW

Updated systematic review of tonsillectomy and adenoidectomy for treatment of pediatric obstructive sleep apnea/hypopnea syndrome

Michael Friedman, MD, Meghan Wilson, MD, Hsin-Ching Lin, MD, and Hsueh-Wen Chang, PhD, Chicago, IL; and Kaohsiung, Taiwan

- Published 2009
- 23 studies included-1079 subjects
- Treatment success of T&A was **66%**
- Excluded : craniofacial syndromes, chromosomal disorders & neuromuscular disorders
- Included : obese subjects, up to 20 years of age



22

Risk Factors for Persistent OSA after T&A

Craniofacial/mandibular anomalies
(Pierre Robin sequence, Treacher Collins)



Severe OSA prior to surgery

AHI >10

Obesity



Genetic disorders



Neuromuscular disorders



Asthma in non-obese children



Texas Children's
Hospital

23

Where is the Persistent Obstruction??

PSG provides data on degree of OSA, does not identify level or levels of obstruction

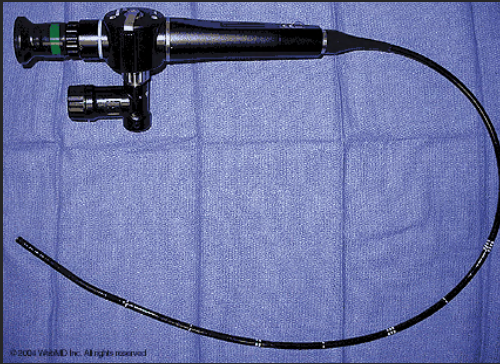
Anatomic Sites Where Obstruction Can Occur:

1. Nose and nasopharynx
2. Posterior oropharynx
3. Lateral pharyngeal walls
4. Level of hypopharynx / obstruction of BOT
5. Larynx

Source	Procedure
Nasal Cavity	
Septal deviation	Septoplasty
Turbinate reduction	Radiofrequency reduction Turbinoplasty Submucosal ablation
Nasopharynx	
Adenoid hypertrophy	Adenoidectomy
Maxillary hypoplasia	Maxillary advancement
Oropharynx	
Tonsillar hypertrophy	Tonsillectomy Tonsillectomy (Partial tonsillectomy)
Soft Palate redundancy	Uvulopalatopharyngoplasty (UPPP)
Tongue	
Lingual hypertrophy	Lingual tonsillectomy
Retrolingual narrowing	Posterior Midline Glossectomy
Glossopexy	Tongue Suspension
Hyoid myotomy and suspension	Hyoid myotomy and suspension
Genioglossal advancement	Genioglossal advancement
Mandibular advancement	Mandibular advancement
Larynx	
Laryngomalacia - congenital	Supraglottoplasty
Laryngomalacia - sleep state dependent	Supraglottoplasty

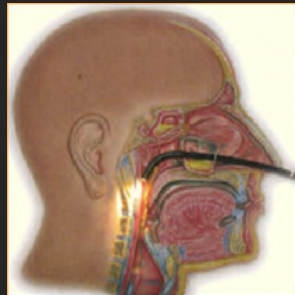
24

Drug Induced Sleep Endoscopy (DISE)



Flexible laryngoscope

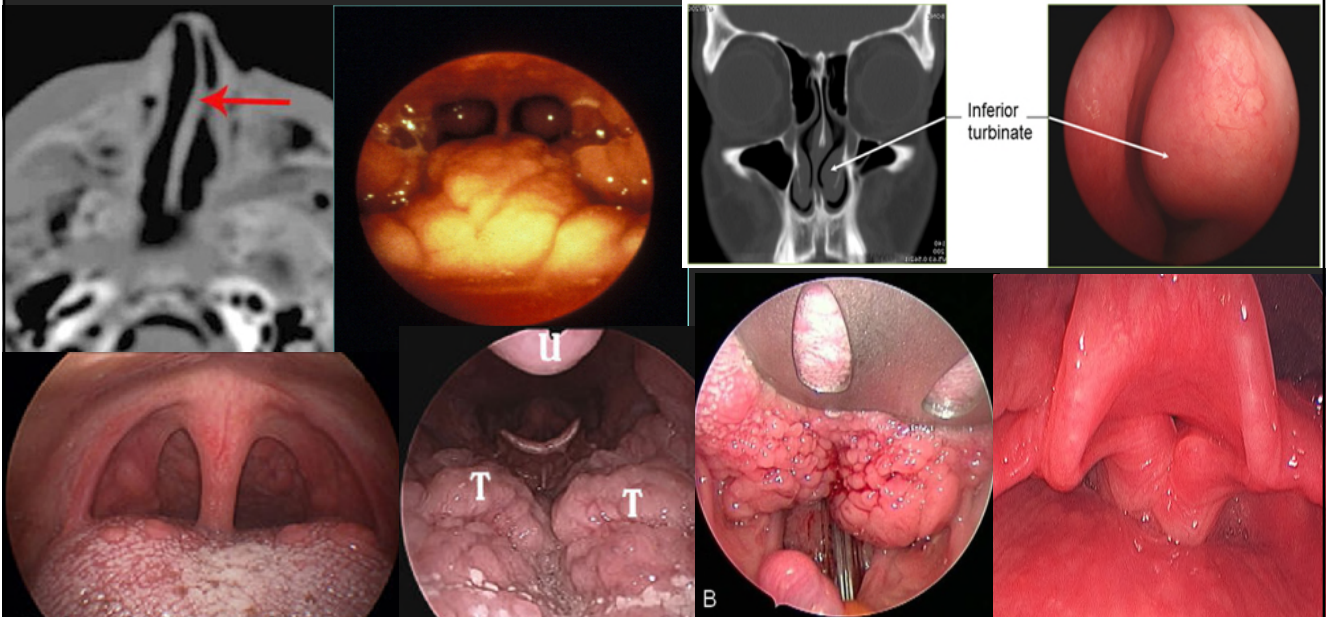
+



DLB set

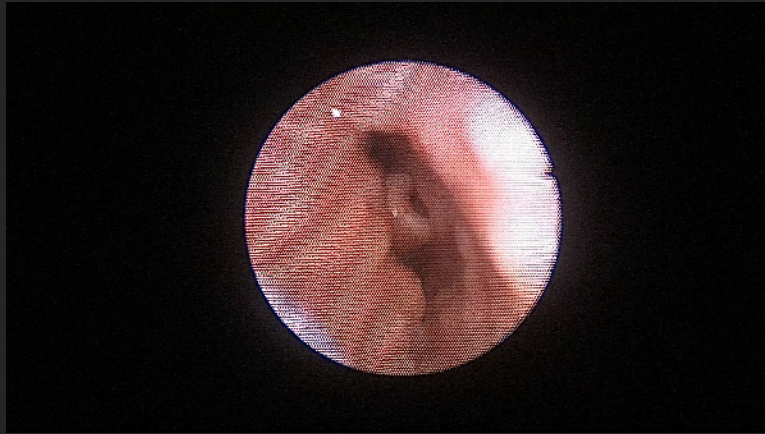
25

DISE Findings



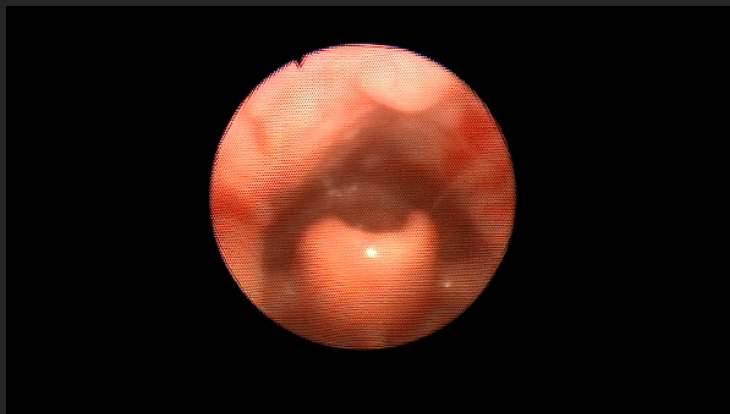
26

Dise Video 1 – Base of Tongue Obstruction



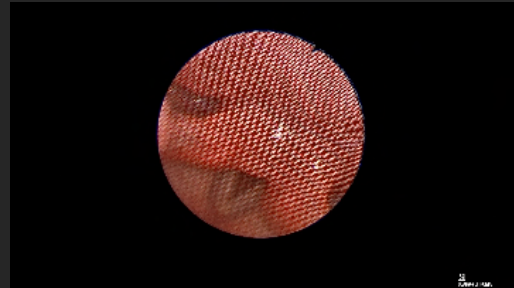
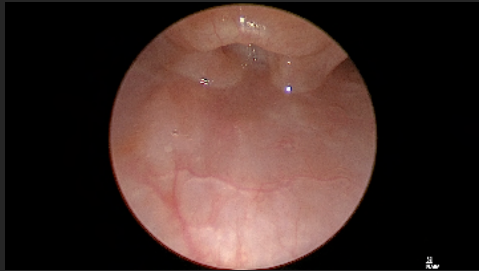
27

Dise Video 2 – Epiglottitis Obstruction

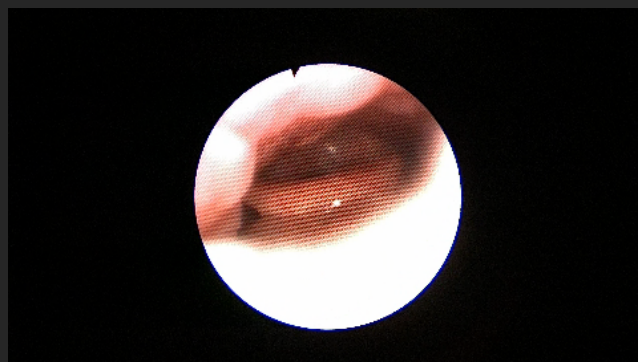


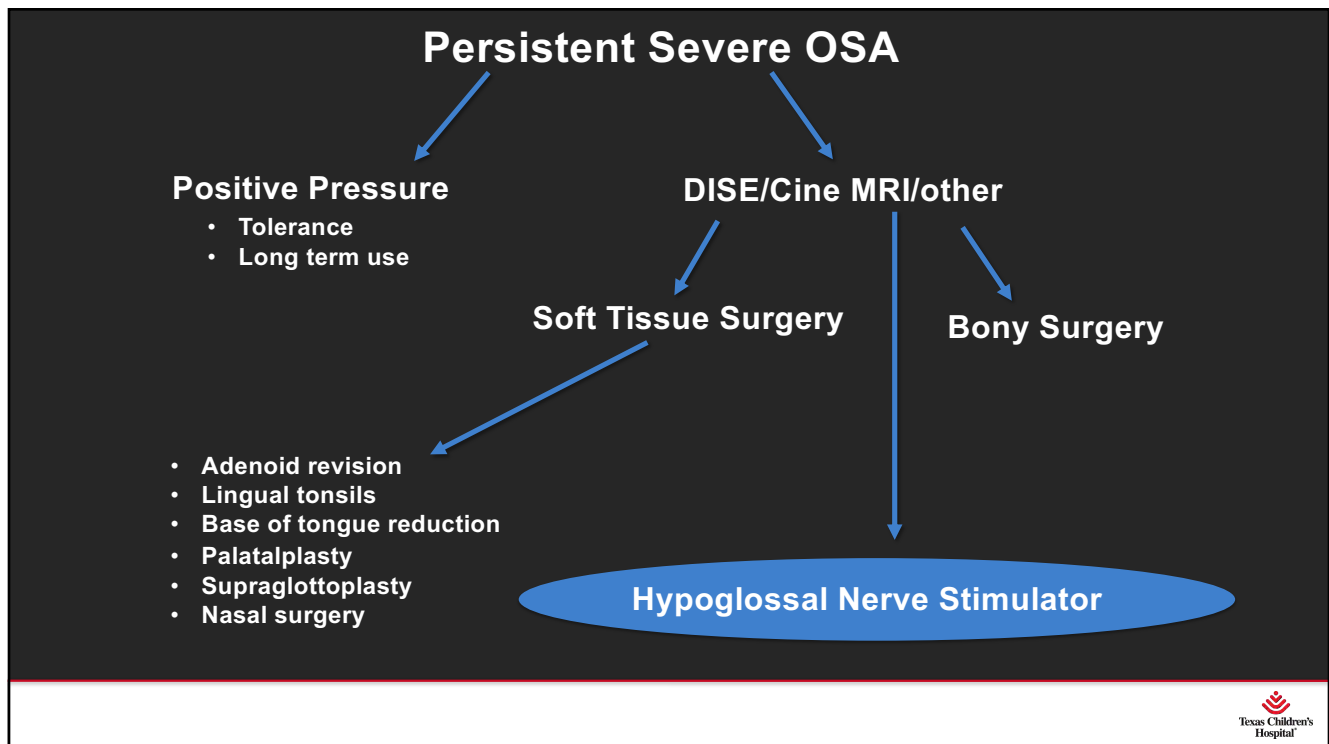
28

Sleep State Laryngomalacia



Palatal Obstruction





31

Preliminary Studies in Adults

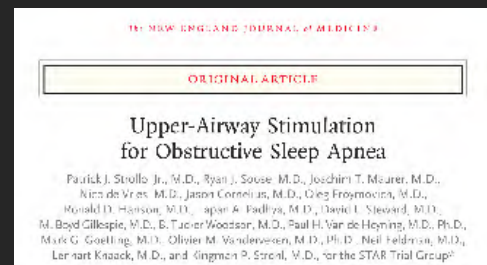
Multi-center, prospective,
single group cohort (N = 126)

- Inclusion: moderate-severe OSA $20 < \text{AHI} < 50$, BMI < 32 , no cardiopulmonary disease, no neuromuscular disorder

46 consecutive responders randomized to therapy withdrawal or maintenance groups (N = 23/group)

Outcomes:

- Primary: AHI reduction by 50% and score < 20 or ODI reduction of 25%
- Secondary: Subjective QOL (ESS and FOSQ questionnaires)



Strollo et al. Upper-airway stimulation for obstructive sleep apnea. NEJM 2014; 270 (2): 139-149.

32

Pediatric HGNS Implantation Starting Point...

Phase I: Initial Pilot Study

- Small n (4-6)
- Safety / Efficacy



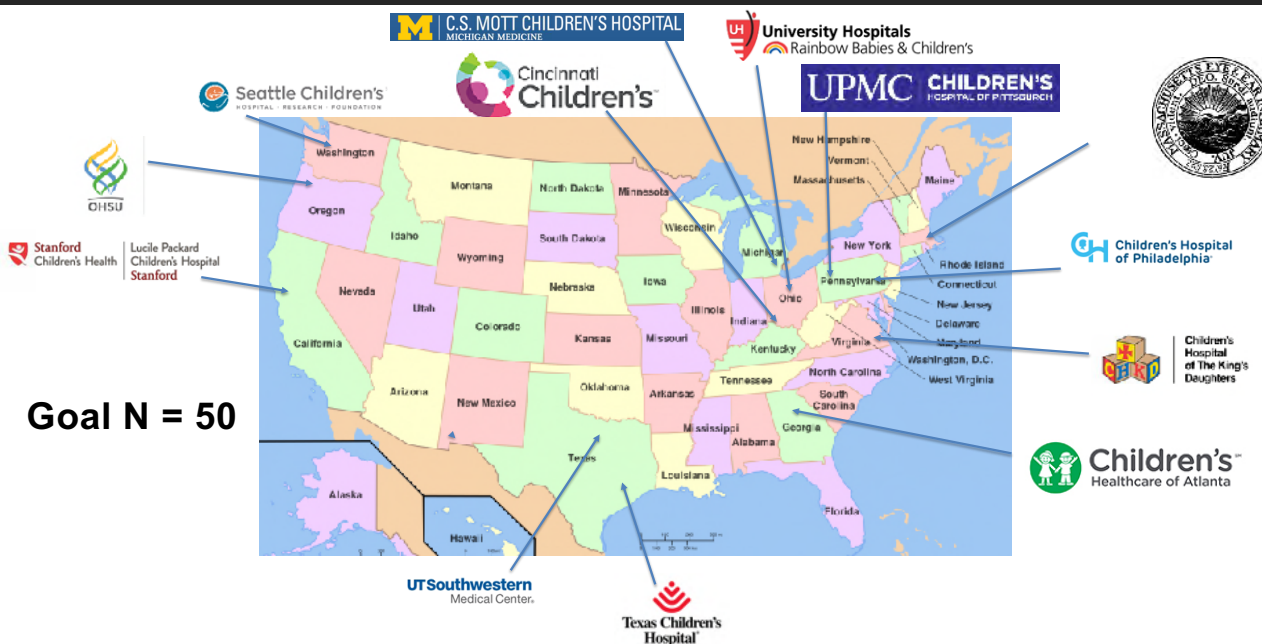
Phase II: Expanding Pilot Study

- Slightly larger n (15-20)
- Efficacy and outcomes



33

Phase III: Pivotal Study – 13 Sites Nationally



34

Inclusion Criteria

- Adolescents/young adults with Trisomy 21 (aged 10-21)
- Persistent OSA post T&A
- Moderate to Severe OSA – AHI between 10-50
 <25% central apneic events contributing to AHI
- BMI <95%
- Unable to tolerate positive pressure or tracheostomy dependent



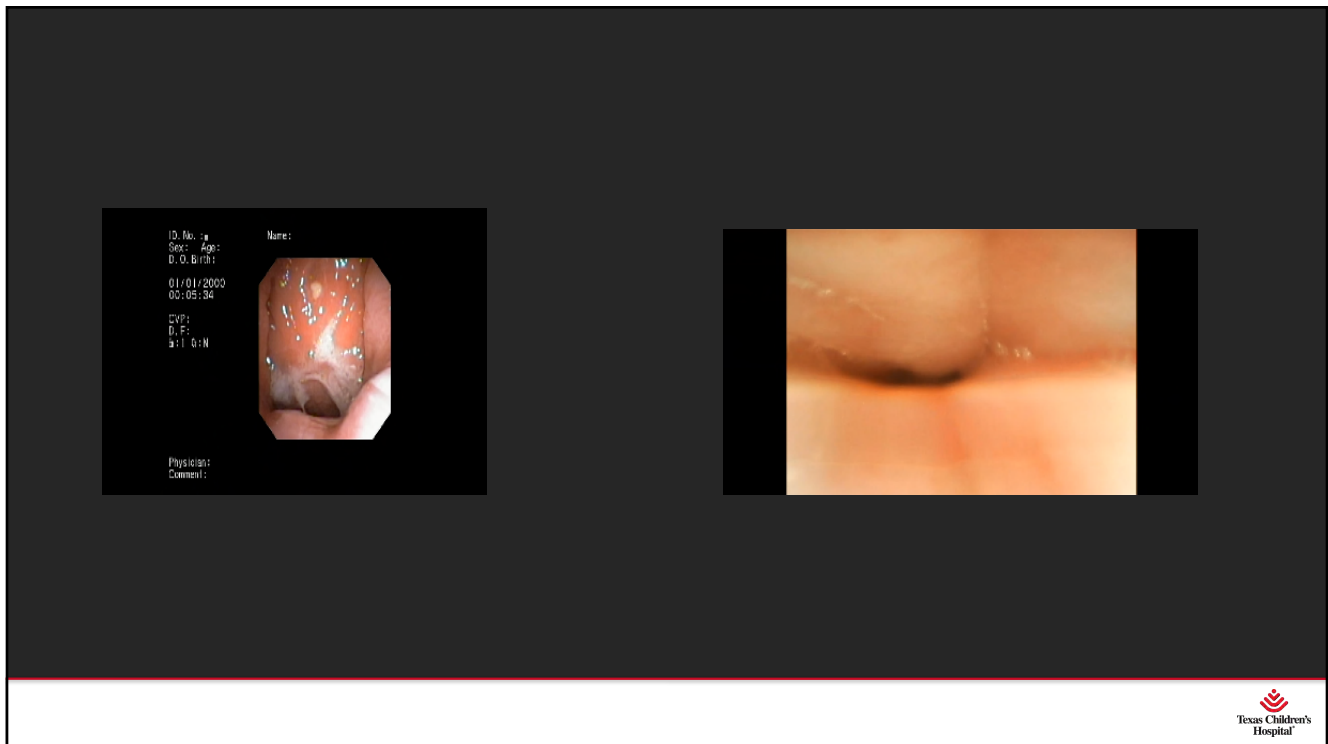
35

Exclusion Criteria

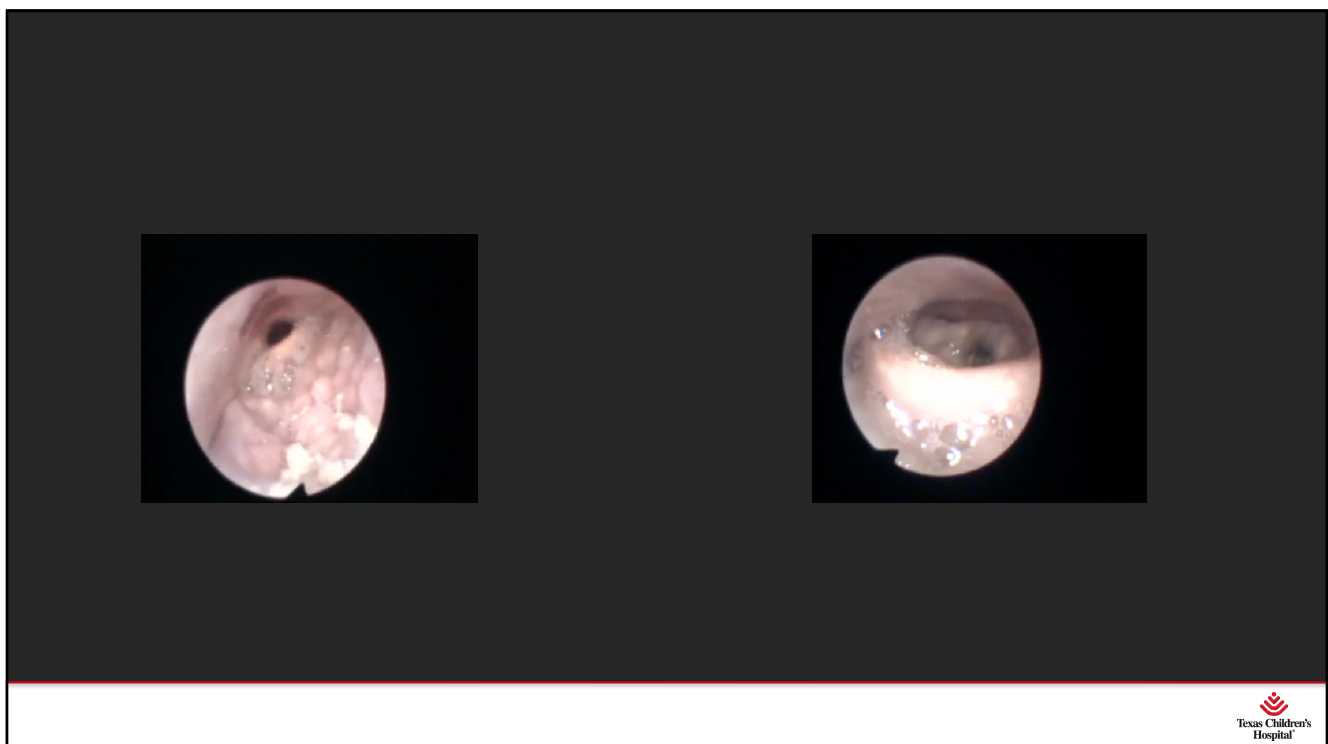
- Recent open heart surgery, immunosuppression, chronic lung disease, or aspiration
- Serial MRI of chest
- Unfavorable pattern of collapse



36

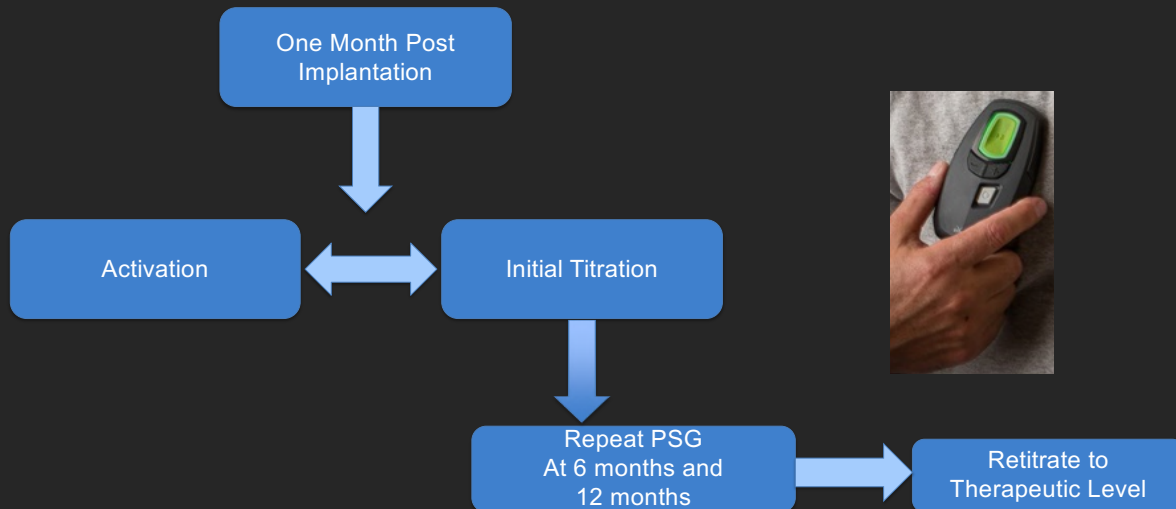


37



38

HGNS in Children with Down Syndrome: Tolerability



Diercks GR, Wentland C, Keamy D, et al. Hypoglossal Nerve Stimulation in Adolescents With Down Syndrome and Obstructive Sleep Apnea. *JAMA Otolaryngol Head Neck Surg.* 2017;144(1):37–42.



39

Outcomes – 12 Month AHI

- 12 children currently at the 12 month mark
- Postop AHI: 2.58 (from 27.1)
- Postop reduction in AHI (%): 90%



40

Outcomes

- Average use of stimulator by subjects 39-70 hrs/wk (Group average 62 hrs/week or **8.8 hrs/night**)
- Compliance with therapy was significantly higher than mean adherence to CPAP therapy in adult patients
 - Has been previously reported to be as low as 3.3hrs/night



41

Key Points

- PIT may offer some benefits over TT for length of recovery and secondary hemorrhage
- Up to 30% of children can have persistent OSA after T&A
- Children that continue to be symptomatic and children who are at higher risk for persistent OSA should undergo a sleep study after T&A
- DISE is a common tool used to identify sites of obstruction for children with persistent OSA



42



Thank You