Learner Objectives

- After this presentation you should:
  - 1) use sedated endoscopy appropriate for best evidence subgroups
  - 2) understand concept and limitations of sedated examinations in adults
  - 3) describe current best evidence on uvulopalatopharyngoplasty

Abbreviations

- OSA=Obstructive sleep apnea
- AHI= Apnea hypopnea Index
- SaO2=Oxygen saturation (%)
- DISE=Drug induced sedated endoscopy
- VOTE=Velum, Oropharynx, Tongue, Epiglottis classification scheme
- PSG=Polysomnogram
- ESS=Epworth sleepiness scale
- MM = Mueller maneuver, ModMal = Modified Malampatti
- UPPP= Uvulopalatopharyngoplasty
- BMI= Body Mass Index
- CPAP/BIPAP= continuous positive airway pressure/bilevel positive airway pressure
Adult Case 1

- 63 y/o retired firefighter/veteran
  - OSA AHI 44.2 / HR ESS 8
  - Post Traumatic Stress Syndrome
  - Insomnia
  - Failed CPAP for years / claustrophobia
  - DISE for possible Inspire

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Systematic Review

Awake Examination Versus DISE for Surgical Decision Making in Patients With OSA: A Systematic Review

Laryngoscope, 126:768-774, 2016

- 393 articles reviewed. 8 studies met criteria (535 pts)
  - Surgical treatment changed after DISE in 50.24% cases
  - Changes related to hypopharyngeal and laryngeal obstruction
  - Changes not associated with improved surgical outcomes
VOTE Class

- V=Velum, O=Oropharynx, T= Tongue Base, E=Epiglottis

<table>
<thead>
<tr>
<th></th>
<th>A-P</th>
<th>Lateral</th>
<th>Concentric</th>
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<tbody>
<tr>
<td>Velum</td>
<td></td>
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<tr>
<td>Oropharynx</td>
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<tr>
<td>Tongue Base</td>
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<tr>
<td>Epiglottis</td>
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</tbody>
</table>

Degrees of obstruction: 0, no obstruction (no vibration), -1-3, partial obstruction (vibration), 40% to 75%, 5, complete obstruction (no passage). A-P = anteroposterior.

DISE VIDEO #1

Question 2

- Palate VOTE scores for Video #1 are:
  A. V 1 O2 concentric
  B. V 1 O2 AP
  C. V2 O2 concentric
  D. V2 O2 AP
  E. other
Question 2

• Lower pharynx DISE findings using VOTE are:
  A. T0 E2
  B. T1 E2
  C. T2 E2
  D. other

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August 6-8, 2016   |   The American Club   |   Kohler, WI
• Procedure: UPPP, Expansion Sphincterplasty, Extended anterior posterior glossectomy

• Post operatively
  – 2 nights home sleep study with AHI of 1.2 and 2 events/hr
  – Continued insomnia

Airway Evaluation

\[ \text{Airway (t)} = \text{Structure (constant)} + \text{Physiology (t)} \]

• Observed characteristics at any time (t) vary.
• Balance of many forces
  – Muscle tone, airflow, effort, others….
Concept of Sleep Endoscopy

- "Waking behavior confounds upper airway examinations
- Goal
  1. **Dynamically** reproducing upper airway behavior similar to natural sleep by pharmacologically artificially inducing the patient into a light sleep may be more accurate

Problem: Sleep is complex

- Sleep ≠ not just reversible sedation
- (unresponsive to the environment)
  - Complex amalgam of physiologic processes

“Sleep” Apnea is a Misnomer

- Sleep has only minimal effect on muscle tone in OSA patients
- Sleep allows but does not directly cause apnea
Major loss of muscle tone is Periodic Breathing

- Arousal leads to hyperventilation and ventilatory overshoot.
- Sleep resumption then causes large decrease in respiratory drive

Goal / Methods

- Goal is to reduce muscle tone, identify flow limiting areas, and better understand structure
- Need:
  - Consistent method and drugs with gradual induction
  - Ramsey level V - Non-responsive to verbal stimuli (Bispectral Monitoring)
  - Snoring noise locations: palate (43%), tongue base (7%), epiglottis (3%), multiple (42%)
  - Results vary between snorers and OSA
Obstruction in OSA

- Primarily determined by choke point characteristics
  - (Choke point = Palate in 80%)
- Determined by
  - Passive resistance
    - Cross sectional area
    - Length
  - Lateral wall compliance
  - Conduit curvature

Fundamental Model = Tube Law

- Loss of muscle tone decreases airway size
- Collapse is non-uniform

Phenotypes
Case 1 DISE (Phenotypes)

Adenoid, Proximal Palate, Genu, Lateral Wall, Velum, Upper and Lower Tongue Base, Lingual Tonsil, Epiglottis

Conclusions Adult DISE

- DISE provides an alternative state to Wake (may not equate to sleep)

- Evaluate airway for:
  - Sites of abnormal resistance
  - Choke point characteristics
  - Lateral wall compliance
  - VOTE likely of minimal benefit
Sleep Apnea Surgery: Best Practices

- State of Art UPPP
- American Academy of Sleep Medicine Sleep Surgery Parameter will be revised 2018
- What's new since 2010

Maxillomandibular advancement


Uvulopalatopharyngoplasty - UPPP

- Excluded Extended uvulopalatal flap (EUPF), Lateral pharyngoplasty (Brazil), Expansion PPP


Surgical Intent (3 Goals)

- Ancillary
  - No specific AHI goal but improve device use
- Curative
  - AHI < 15 with improved symptoms
- Salvage
  - AHI < 50% with clinically meaningful disease burden reduction

AHI as Treatment Metric for OSA

- Severe OSA (AHI > 30) is cardiac treatment risk

Friedman Staging Otol HNS 2003

- Modified Malampatti
- Tonsil
SKUP3 Trial

• Inclusion criteria:
  – >18 years of age, AHI >15 /h ESS > 8 or other end BMI < 36 kg/m2 Friedman stage I or II failed CPAP/MRD (Friedman stage I BMI < 30 kg/m2 not required failed CPAP/MRD)

• Exclusion criteria
  – serious psychiatric, cardiopulmonary, or neurological disease ASA >3, previous tonsillectomy
Sub-Group Analysis

- No major effect of BMI <30
- Lower effect (p=NS) in tonsil 1-2, tongue position 5, Friedman II

Quality of Life and PPP

- Prospective multicenter study (n=68)

Weaver et al Otolaryngology – Head and Neck Surgery 2011

Quality of Life Outcomes

- Clinical improvement in sleepiness and multiple domains of QOL
Blood Pressure and UPPP

Table 1
Changes in SBP and DBP from baseline to six months follow-up in the intervention and control groups

<table>
<thead>
<tr>
<th>Interventional group</th>
<th>Baseline (n = 10)</th>
<th>Follow-up (n = 10)</th>
<th>p-value (T-test)</th>
<th>Difference at follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mm Hg)</td>
<td>120 ± 10</td>
<td>125 ± 15</td>
<td>0.053</td>
<td>5 ± 15</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>80 ± 10</td>
<td>85 ± 15</td>
<td>0.045</td>
<td>5 ± 15</td>
</tr>
</tbody>
</table>

- RCT and Intension to Treat

German UPPP Tonsil RCT
Somer et al. Dtsch Arztebl Int 2016; 113: 1–8

- 39 final surgery with 65% success (AH1 < 15, ESS < 10 or AH1 < 5)
- 1/39 bleeding requiring OR
- Method of Pirsig

Expansion sphincter-pharyngoplasty

- Rotation and suspension of the palatopharyngeal muscle onto the soft palate, sparing the uvula.
- Stabilizes palate and improves diameter of the oral airway.
- May be incorporated into the initial surgical approach with tonsillectomy or as a secondary procedure in patients who have persistent sleep apnea after T&A.
- Outcomes: reduction in AH1 in adults; limited evidence for children.
Systematic Review

- Significant improvement over conventional methods
- Significant heterogeneity

OSA Surgery Grades are Poor

1. Tracheotomy
2. MMA
3. UPPP

Reducing morbidity may be more important than improving benefit to improve GRADE. Evolution to "minimally invasive surgeries"

The Effect of Upper Airway Surgery on Continuous Positive Airway Pressure Levels and Adherence: A Systematic Review and Meta-Analysis

- Available evidence indicates surgery improves CPAP use
Serious Complications following UPPP Kezirian et al Laryngoscope 2004

- VA Surgical Quality Improvement Program (NSQIP) database
- N=3130, 49.8 years old, 97% males, 31% current smokers,
- No AHI severity data
Major complication 3%

Systematic Review of Complications

Tang et al, Otololaryngol HNS, 2017

Summary

- Do
  - DISE may change management but not outcomes
  - Use UPPP in Friedman I, and II (not Modified Malampatti 3) for curative intent
Summary

• Do not:
  – Use DISE for definitive treatment decisions
  – Minimize UPPP side effects