Beyond UPP: Advanced Surgical Options for Sleep Apnea

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- Research support (Gyrus Olympus)
- Consultant for new device development for maker of Repose system (Medtronic, Jacksonville, FL).
Role of Surgery for Sleep-Disordered Breathing

- Alternative to CPAP
- Adjunct to CPAP
- Salvage of CPAP Failure
Surgical Salvage of CPAP Failure

Should be seriously considered if:

- Moderate or severe sleep apnea, especially if CV risk factors present
- CPAP non-compliance and persistent symptoms after 3 to 6 months.
- Failure of non-invasive CPAP adjuncts: education, nasal sprays, humidity, auto-PAP, BiPAP, certain sleep aids
- Failure of less invasive CPAP adjuncts: Nasal surgery
The Efficacy of Surgical Modifications of the Upper Airway in Adults With Obstructive Sleep Apnea Syndrome

An American Sleep Disorders Association Review

Aaron E. Sher¹, Kenneth B. Schechtman² and Jay F. Piccirillo³

Summary: This paper, which has been reviewed and approved by the Board of Directors of the American Sleep Disorders Association, provides the background for the Standards of Practice Committee’s parameters for the practice of sleep medicine in North America. The intent of this paper is to provide an overview of the surgical treatment of obstructive sleep apnea syndrome, to provide the basis for the American Sleep Disorders Association’s practice parameters on this subject and to share our findings of metanalysis of previously published studies regarding uvulopalatopharyngoplasty. We searched MEDLINE from January 1966 through April 1993, with an update in February 1995, to provide a review of the application of surgical modifications of the upper airway to treat adults with obstructive sleep apnea syndrome. Operations to treat obstructive sleep apnea syndrome include nasal septal reconstruction; uvulopalatopharyngoplasty; uvulopalatopharyngoglossectomy; laser midline glossectomy; lingual-plasty; inferior sagittal mandibular osteotomy and genioglossal advancement, with hyoid myotomy and suspension (the entire process is referred to as GAHM); maxillomandibular osteotomy and advancement, and tracheotomy. Papers included in metanalysis provided preoperative and postoperative polysomnographic data on at least nine patients treated with uvulopalatopharyngoplasty for their obstructive sleep apnea. Analysis of the uvulopalatopharyngoplasty papers revealed that this procedure is, at best, effective in treating less than 50% of patients with obstructive sleep apnea syndrome. The site of pharyngeal narrowing or collapse, although identified by different and unvalidated methods, has a marked effect on the probability of success of uvulopalatopharyngoplasty. Patients who achieve a favorable response with uvulopalatopharyngoplasty tend to have less severe obstructive sleep apnea than those who do not. For patients who demonstrate retrolingual narrowing or collapse, other surgical modifications have been described, such as lingualplasty, GAHM, and maxillomandibular osteotomy and advancement. The studies to support the use of the surgical treatment of obstructive sleep apnea syndrome contain biases related to small sample size, limited follow-up and patient selection.
Table 8—Response rates correlated to definition of response based on location of pharyngeal narrowing or collapse

<table>
<thead>
<tr>
<th>Variable used to measure response</th>
<th>Type I (n = 111)</th>
<th>Type II or III (n = 57)</th>
<th>Unknown location (n = 177)</th>
<th>p valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% Decrease in AI</td>
<td>65/78 (83.3)</td>
<td>4/21 (19.0)</td>
<td>60/97 (61.9)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>50% Decrease in RDI</td>
<td>47/70 (67.1)</td>
<td>9/38 (23.7)</td>
<td>56/97 (57.7)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>50% Decrease in either AI or RDI</td>
<td>83/109 (76.1)</td>
<td>12/57 (21.1)</td>
<td>100/171 (58.5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>50% Decrease in RDI and a postoperative RDI &lt; 20 or a 50% decrease in AI and a postoperative AI &lt; 10</td>
<td>57/109 (52.3)</td>
<td>3/57 (5.3)</td>
<td>77/171 (45.0)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

137/337 = 40.7%
UPPP: Palate v Tongue Obstruction

<table>
<thead>
<tr>
<th>Improvement (%)</th>
<th>Palate Obstruction</th>
<th>Tongue Obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al</td>
<td>75</td>
<td>23</td>
</tr>
<tr>
<td>RDI</td>
<td>33</td>
<td>7</td>
</tr>
<tr>
<td>LSAT</td>
<td>25</td>
<td>13</td>
</tr>
</tbody>
</table>

Adapted from Table 7

Sher et al. SLEEP 1996;19:156-177
Clinical Predictors of Obstructive Sleep Apnea

M. Friedman, H. Tanyeri, M. LaRosa, R. Landsberg, K. Vaidyanathan, S. Pieri, D. Caldarelli

The Laryngoscope 1999;109:1901-7
Surgical Selection Factors

Friedman tongue position

Tonsil size

Body mass index
Friedman Tongue Position I
Friedman Tongue Position II
Friedman Tongue Position

III
Friedman Tongue Position IV
Surgical Selection Factors

Friedman tongue position
Tonsil size
Body mass index
Tonsil Size 0
Tonsil Size 1
Tonsil Size 3
Tonsil Size 4
Surgical Selection Factors

- Friedman tongue position
- Tonsil size
- Body mass index (weight kg/height m²)
## Anatomic Staging

<table>
<thead>
<tr>
<th>FS</th>
<th>MMP</th>
<th>Tonsils</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1, 2</td>
<td>3+, 4+</td>
</tr>
<tr>
<td>II</td>
<td>1, 2</td>
<td>0, 1+, 2+</td>
</tr>
<tr>
<td></td>
<td>3, 4</td>
<td>3+, 4+</td>
</tr>
<tr>
<td>III</td>
<td>3, 4</td>
<td>0, 1+, 2+</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>BMI ≥ 40</td>
</tr>
</tbody>
</table>

Friedman Oto—HNS 2002
Distribution of Patients with OSAHS by Stage

Friedman OSAHS Stage

- I: n = 31
- II: n = 29
- III: n = 74

Percentage of Patients

Friedman OSAHS Stage
Results

75% of patients can be stratified to:

Stage I (80.6% success rate)

or

Stage III (8.1% success rate)
UPPP vs. Hypopharyngeal/Tongue Procedures: All Patients

Success (%)

UPPP

Tongue

Procedures

Improvement (%)

Sher et al. SLEEP 1996;19:156-177
Oral Appliances

- Specially trained dentist
- Requires adjustment
- Snoring; mild/mod apnea
- Most forms of hypopharyngeal collapse.
- Partial relief of palatal collapse.
- Fairly expensive $1000-1500
- Must wear for effect
- May cause TMJ issues
Hypopharyngeal Surgery

- Genioglossus advancement
- Tongue base radiofrequency ablation
- Lingual tonsillectomy
- Midline glossectomy
- Hyoid myotomy and suspension
- Tongue suspension
- Maxillomandibular advancement
  (requires trach and interdentate fixation; best option for severe retrognathia with poor cosmesis)
# Best Hypopharyngeal Surgery?

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Grade</th>
<th>Success (AHI)</th>
<th>EDS/QOL</th>
<th>Predictors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genioglossus Advancement</td>
<td>C</td>
<td>62%</td>
<td>56/91</td>
<td></td>
</tr>
<tr>
<td>Mortised Genioplasty</td>
<td>C</td>
<td>48%</td>
<td>16/33</td>
<td>BMI, AHI</td>
</tr>
<tr>
<td>Tongue Radiofrequency</td>
<td>B/C</td>
<td>35%*</td>
<td>95/269</td>
<td>Yes</td>
</tr>
<tr>
<td>Midline Glossectomy</td>
<td>C</td>
<td>50%</td>
<td>37/74</td>
<td></td>
</tr>
<tr>
<td>Hyoid Suspension</td>
<td>C</td>
<td>50%</td>
<td>51/101</td>
<td>+/-</td>
</tr>
<tr>
<td>GA + HS</td>
<td>C</td>
<td>55%</td>
<td>180/328</td>
<td>BMI, AHI</td>
</tr>
<tr>
<td>Tongue Suspension</td>
<td>C</td>
<td>35%*</td>
<td>27/77</td>
<td>+/-</td>
</tr>
</tbody>
</table>

Source: Kezirian EJ, Goldberg AN. Archives Oto—HNS 2006. Table 7
Sleep Endoscopy

- 1980’s- applied during sleep; difficult due to patient tolerance; logistics of performing in sleep lab at night.

  
Evaluation of Sleep-Disordered Breathing

Polysomnography as Gold Standard:
- Establishes presence of SDB
- Measure if severity of SDB
- Allows determination of CPAP effectiveness

But....
- SDB is a multi-level disorder
- Fails to localize level of obstruction
- Fails to indicate which patients are likely to succeed with non-CPAP therapy
Methods of Anatomic Localization in SDB

- Awake Endoscopy with Müeller- poor correlation
- Sleep Endoscopy
- Pressure catheters- positioning and placement
- Cephalometry- poor soft tissue definition
- CT scans- radiation; awake state
- Fluoroscopy- radiation; logistics
- Dynamic MRI- expense
Methods of Anatomic Localization in SDB
Methods of Anatomic Localization in SDB

MRI Animation Showing Obstructive Sleep Apnea.
Sleep Endoscopy

- Easy to perform
- Low relative cost
- Visualization of all 3 levels - Nasal, OP, HP
- Real-time correlation with oximetry data
- Safe
- Improve surgical outcomes -
  1. Site selective surgery
  2. Avoid unnecessary surgery
- Identify patients likely to benefit from oral appliance.
Sleep Endoscopy

Principle Indication

- *Moderate or severe sleep apnea (AHI > 15)* patients who failed CPAP - presence of palatal collapse (UPPP) and/or hypopharyngeal collapse (oral appliance, lingual tonsillectomy, tongue base RFA, tongue base suspension, genioglossus advancement, hyoid suspension)
Sleep Endoscopy
MUSC Technique - Drug-Induced Sleep

- Need team cooperation and understanding of pathophysiology - ENT, anesthesia, nursing.
- Pulse oximetry; BP; EKG; BIS
- High resolution flexible nasopharyngoscopy with digital camera and high resolution video monitor
- Airway Preparation:
  - 0.4 mg glycopyrrolate
  - Oxymetazolam nasal spray
- Sleep maintenance: 50-75 mcg/kg/min propofol
- Endoscopy during snoring/ witnessed obstruction; BIS target 50-70
Sleep Endoscopy
MUSC Technique- Airway Assessment

- **Nasopharyngeal View** - palatal flutter (RF?), uvular flutter (uvulectomy), AP palatal collapse (UPPP) versus lateral/concentric collapse (advancement palatoplasty; oral appliance)

- **Oropharyngeal View** - tonsils (tonsillectomy), lateral walls (UPPP; oral appliance)

- **Base of Tongue View** - Lingual tonsils (RF, lingual tonsillectomy), base of tongue hypertrophy (submucosal glossectomy), decreased lingual tone (oral appliance, genioglossal advancement, Repose)
Sleep Endoscopy

MUSC Technique - Airway Assessment

- **Laryngeal View** - Epiglottic contact with posterior wall (hyoid suspension; partial laser epiglottectomy); supraglottic collapse (laser supraglottoplasty)

- **Tracheal and Distal Airway View** - Assessment of tracheomalacia/bronchomalacia in morbidly obese; COPD; high CPAP pressures (>16 cm)
Sleep Endoscopy

MUSC Technique- Surgical Treatment

- Proceed with general anesthesia
- Surgical treatment of identified site of obstruction.
Sleep Endoscopy
Video Case 1

Findings:
- Anteroposterior (AP) palatal collapse
- Large, full tongue base (macroglossia)

Surgical Options:
If AHI < 30; Low O2 Sat > 80%; and BMI < 30
UPPP, Tongue Base Radiofrequency Ablation
and/or oral appliance

If AHI > 30; Low O2 Sat < 80%; or BMI > 30
UPPP, Midline Glossectomy
Tongue Base Radiofrequency Ablation (RFA)

- Mean AHI reduction of 10.4
- Mean Epworth reduction of 3.4
- Required average of 3.3 treatments of 6500J (±3800)
- Sustained after mean follow-up of 23 months
- Better option for patients with mild-to-moderate apnea (baseline AHI < 30) with airway obstruction due to large tongue base.

When Hypopharyngeal Surgery?

- AHI “success” higher with UPPP + tongue RF than UPPP alone in FS II/III
- Improved daytime somnolence
  - ESS 15.2 to 8.3*
- Friedman Oto—HNS 2003

<table>
<thead>
<tr>
<th>FS</th>
<th>UPPP Only</th>
<th>UPPP RF Tongue</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>38%</td>
<td>55%</td>
</tr>
<tr>
<td>III</td>
<td>8%</td>
<td>33%</td>
</tr>
</tbody>
</table>
Submucosal Minimally-Invasive Lingual Excision (SMILE)

- Requires pre-treatment identification of course of lingual artery by doppler.
- Stab incision made in midline tongue 1cm. anterior to circumvallate papillae.
- Coblator wand (Coblator II; Arthrocare Corp, Sunnydale, CA) passed into incision with controlled submucosal ablation of tissue on 1cm of midline on either side of the tongue.
- Stab incision left open for drainage.
Submucosal Minimally-Invasive Lingual Excision (SMILE)
ORIGINAL ARTICLE

TRANSORAL ROBOTIC SURGERY OF THE TONGUE BASE IN OBSTRUCTIVE SLEEP APNEA-HYPOPNEA SYNDROME: ANATOMIC CONSIDERATIONS AND CLINICAL EXPERIENCE

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Midline Glossectomy
Midline Glossectomy
Submucosal Minimally-Invasive Lingual Excision (SMILE) Results

- Longitudinal, multi-institutional study of 96 patients
- 48 underwent SMILE and 48 TBRFA in non-randomized fashion as part of multi-level upper airway surgery. No significant baseline differences between groups.
- SMILE groups experienced a mean reduction of 54% in AHI, and 32% reduction in ESS.
- SMILE experienced success (50% AHI reduction and final AHI< 20) in 65% versus 42% for the TBRFA group.
- Better option for patients with severe apnea (AHI>30) with airway obstruction by large tongue base.

Sleep Endoscopy
Video Case 2
Sleep Endoscopy
Video Case 2

Findings:
- AP palatal flutter
- Large lingual tonsils
- Epiglottic collapse

Surgical Options:
- Soft palate RFA
- Lingual tonsillectomy (Laser, Cautery, Coblation, Microdebrider, etc.)
- Hyoid Suspension (vs. Supraglottoplasty)
Coblation Lingual Tonsillectomy
Coblation Lingual Tonsillectomy
Coblation Lingual Tonsillectomy
Coblation Lingual Tonsillectomy
Outcomes of Hyoid Myotomy and Suspension Using a Mandibular Screw Suspension System

M. Boyd Gillespie, MD, MSc¹, Christopher M. Ayers, MPH¹, Shaun A. Nguyen, MD, MA¹, and Michael R. Abidin, MD²

- Consecutive case series of 33 patients undergoing hyoid myotomy and suspension using Repose suspension system
Hyoid Myotomy and Suspension (HMS)

- Thyrohyoidopexy technique of Riley & Powell most commonly performed.
- Immobilizes base of tongue reducing posterior collapsibility.
- Reported mean success rate of 50% (range, 17-78%)
- Low rate of complications
- Used alone or in combination with other techniques
Hyoid Suspension
Repose Suspension

- Introduced in 1990’s a method to stabilize and advance tongue base.
- Immobilizes base of tongue reducing posterior collapsibility.
- Later adapted by surgeons as a method to suspend hyoid from the mandible.
Hyoid Myotomy and Suspension
Hyoid Myotomy and Suspension
Study Objectives

- Describe outcomes of hyoid myotomy and suspension (HMS) using the Repose system as a component of multi-level upper airway surgery in a moderately large group of consecutive patients.
- Describe a less invasive modification of the Repose HMS technique.
Study Design

- Retrospective case series from 2 institutions
- All patients undergoing HMS with Repose system over 4 year period.
- Data obtained from office charts and electronic medical record.
- Data abstracted—demographics, pre/post ESS, pre/post AHI, pre/post lowest O2 saturations, extent of multi-level surgery, HMS technique, complication rate.
- **Surgical Success** = 50% reduction in AHI and a total AHI < 20
- IRB-approval granted.
Patient Evaluation

- All patients with OSA with failed CPAP trial.
- Compromised hypopharyngeal airspace on awake supine endoscopy with evidence of epiglottic prolapse against posterior pharyngeal wall.
## HMS Procedure

<table>
<thead>
<tr>
<th>Standard Technique (n=16)</th>
<th>Minimally-invasive Technique (n=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ 4 to 5 cm incision over hyoid</td>
<td>▪ 2 cm incision over hyoid</td>
</tr>
<tr>
<td>▪ complete skeletonization of central hyoid with dissection of supra/infra hyoid musculature.</td>
<td>▪ dissection of overlying connective tissue with minimal release of hyoid musculature</td>
</tr>
<tr>
<td>▪ Use of Penrose drain</td>
<td>▪ Closure without drain.</td>
</tr>
</tbody>
</table>
Hyoid Myotomy and Suspension
## Results

<table>
<thead>
<tr>
<th>Patient Variable</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>10 (30)</td>
</tr>
<tr>
<td>Male</td>
<td>23 (70)</td>
</tr>
<tr>
<td>Mean Age</td>
<td>54 years (range, 33 to 73)</td>
</tr>
<tr>
<td>Mean BMI</td>
<td>32 (range, 23 to 45)</td>
</tr>
<tr>
<td>Median ESS score</td>
<td>12 (range, 4-22)</td>
</tr>
<tr>
<td>Mild Apnea (AHI &lt; 15)</td>
<td>3 (9)</td>
</tr>
<tr>
<td>Moderate Apnea (AHI 16-30)</td>
<td>14 (42)</td>
</tr>
<tr>
<td>Severe Apnea (AHI &gt; 30)</td>
<td>16 (49)</td>
</tr>
<tr>
<td>Associated Procedures:</td>
<td></td>
</tr>
<tr>
<td>HMG alone</td>
<td>2 (6)</td>
</tr>
<tr>
<td>UPPP</td>
<td>20 (61)</td>
</tr>
<tr>
<td>Septoplasty/Turbinate Reduction</td>
<td>7 (21)</td>
</tr>
<tr>
<td>Radiofrequency Palate</td>
<td>3 (9)</td>
</tr>
<tr>
<td>Radiofrequency Tongue Base</td>
<td>2 (6)</td>
</tr>
</tbody>
</table>

Note.—Numbers in parentheses are percentages, except where indicated.
Results

Complication Rate

- 4 (17%) patients had post-operative complications related to HMS.
- 3 neck seromas within 1 week of surgery
- 1 tongue edema requiring 48-hour hospital stay for IV steroids.
- No cases of prolonged (> 48 hrs.) dysphagia
- All complications (4/16) occurred with standard HMS technique compared to none (0/17) using minimally-invasive technique (p=0.04)
## Results

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Pre</th>
<th>Post</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(n=23)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHI (s.d.)</td>
<td>40.9</td>
<td>18.6</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(25.1)</td>
<td>(21.2)</td>
<td></td>
</tr>
<tr>
<td>Lowest O2 Saturation (s,.d.)</td>
<td>79.1</td>
<td>80.7</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>(11.7)</td>
<td>(9.6)</td>
<td></td>
</tr>
<tr>
<td>Epworth Sleepiness Scale (s.d.)</td>
<td>12.1</td>
<td>6.2</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(5.2)</td>
<td>(3.8)</td>
<td></td>
</tr>
<tr>
<td>Surgical Success ( &gt;50% reduction in AHI and final AHI&lt;20)</td>
<td>16/23 (70%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final AHI &lt; 10</td>
<td>10/23 (43%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note.—standard deviation (s.d.)

P values calculated by paired t test (AHI; Lowest O2 sat.) and Wilcoxon signed rank test (Epworth).
Hyoid Myotomy and Suspension

APNEA-HYPOPNEA INDEX

Apnea-Hypopnea Index / Hour
# Results

<table>
<thead>
<tr>
<th>Dependent Variable: Surgical Success</th>
<th>Coefficient</th>
<th>t statistic</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.0654</td>
<td>1.261</td>
<td>0.79</td>
</tr>
<tr>
<td>Age (years)</td>
<td>-0.00412</td>
<td>0.720</td>
<td>0.72</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.000542</td>
<td>0.976</td>
<td>0.98</td>
</tr>
<tr>
<td>Pre-op AHI</td>
<td>-0.00184</td>
<td>0.752</td>
<td>0.75</td>
</tr>
<tr>
<td>Associated UPPP</td>
<td>0.0802</td>
<td>1.481</td>
<td>0.75</td>
</tr>
<tr>
<td>HMS technique*</td>
<td>-0.278</td>
<td>0.322</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Note—*P* values calculated by using a multiple linear regression model.

* Univariate analysis demonstrated significant difference in surgical success between standard (2/6) and minimally-invasive technique (14/17) (*p*=0.045).
Discussion

- Present study demonstrates a 70% surgical success rate in patients undergoing multi-level surgery with HMS with Repose system.

- Possible reasons for better success than published literature:
  1. Patient selection- epiglottic prolapse; effect of HMS on hyoepiglottic ligament.
  2. Anterior-superior vector allows for more hypopharyngeal displacement than anterior-inferior vector of thyrohyoidopexy.
  3. Avoiding extensive skeletonization avoids potential worsening of tongue base stability.
Study Limitations

- Retrospective, non-randomized design
- Limited sample size
- Mixed effects of HMS with associated surgical procedures
- 10/33 (30%) patients refused to undergo post-operative sleep study.
- Improvement in AHI but no improvement in lowest oxygen saturation. Mean oxygen saturation or oxygen desaturation index may be a parameter that better captures the effect of surgery.
Conclusions

HMS with the Repose suspension system
- Effective method with which to address hypopharyngeal collapse in multi-level surgery for OSA.
- Can be performed with a small incision, minimally-invasive approach with minimal complications.
- Future randomized studies are needed to clarify more precisely the association of HMS with changes in polysomnographic parameters.
Findings:
- AP palatal flutter
- Normal, ptotic tongue with collapse against posterior pharyngeal wall.

Surgical Options:
If $AHI < 30$; Low $O2$ Sat $> 80%$; and $BMI < 30$
Palate RFA, Tongue base suspension

If $AHI > 30$; Low $O2$ Sat $< 80%$; or $BMI > 30$
Palate RFA, Genioglossal advancement v. mortised genioplasty v. maxillomandibular advancement
Tongue Suture Suspension

- Permanent suture
- Recent data has demonstrated long-term effectiveness
Tongue Suture Suspension

- 57 patients randomized to either UPPP/Tongue Suspension (Repose) or UPPP/TBRFA
- Success rate (>50 reduction in AHI and final AHI< 15) was 52% for UPPP/TBRFA versus 57% for UPPP/Tongue Suspension
- BMI main predictor of success; Success rates of only 10% and 13% in obese patients.
- Tongue suspension associated with more complications than TBRFA.
- Tongue suspension better option for non-obese with ptotic, normal sized tongues.

Genioglossal Advancement (GA)
Future Directions
Tracheostomy

- Completely bypasses region of upper airway obstruction.
- Significant economic and QOL issues
- Significant long-term risks (tracheomalacia/stenosis)
- Reserved for most severe OSA patients (eg. heart failure)
Sleep Endoscopy
Safety

- MUSC Experience- 50 cases over 12 months without complication; currently training anesthesiology staff in technique.
- Advanced laryngoscopic and tracheotomy tools available.
Sleep Endoscopy
Effectiveness of Site-Specific Treatment

Improved UPPP Success Rates 69-75%

Improved LAUP Success Rates

Improved Oral Appliance Success Rates 95%
Sleep Endoscopy
Limitations

- Natural versus Drug-Induced Sleep
- Subjective/Qualitative versus Objective Assessment
- Lumen versus Surrounding Soft Tissue
- Inability to assess all airway level simultaneously

Therefore, further study needed to:
- Standardize protocols
- Objectify observations (Grading Scale?)
- Validate effectiveness
- Establish cost-effectiveness
Sleep Endoscopy Practice Issues

- Easiest to perform immediately prior to planned surgical intervention.
- Approval for anticipated surgery by insurance carrier prior to surgery.
- Codes include flexible laryngoscopy (31575) and/or diagnostic bronchoscopy
- Will improve understanding of airway dynamics
- Better results will enhance sleep surgery practice and referrals.
Charleston Sleep Surgery Course
February 24-26, 2012
Charleston, SC

- Cadaver dissection
- Robotic sleep surgery
- Hypopharyngeal Procedures
- Office-based snoring surgery

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