

Transoral robotic surgery for treatment of obstructive sleep apnea: factors predicting surgical response.

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Abstract

OBJECTIVES/HYPOTHESIS:

We reviewed our experience with the use of transoral robotic surgery (TORS) for base of tongue (BOT) reduction either alone or as part of multilevel strategy in the treatment of obstructive sleep apnea/hypopnea syndrome (OSAHS) in order to identify clinical characteristics that may be associated with surgical response.

STUDY DESIGN:

Case series.

METHODS:

Between June 2010 and May 2014, BOT reduction via TORS ± partial epiglottectomy ± uvulopalatopharyngoplasty were performed on 72 patients with OSAHS. Thirty-nine patients (15 females and 24 males) with complete preoperative and postoperative clinical information including polysomnograms were included in this study.

RESULTS:

Mean apnea-hypopnea index (AHI) was 43.9 ± 32.3 preoperatively and 21.9 ± 23.5 postoperatively and reflected a statistically significant ($P < 0.001$) AHI reduction of $50.9\% \pm 38.1\%$. Statistical significant reduction in daytime somnolence, as measured by Epworth Sleepiness Scale (15.6 ± 5.4 preoperatively vs. 5.7 ± 4.3 postoperatively; $P < 0.001$), was also achieved. No statistical significant difference was found between preoperative and postoperative body mass index (BMI) (32.9 ± 7.0 vs. 32.4 ± 7.3 ; $P = 0.270$). Surgical response, as defined by $> 50\%$ reduction in AHI and final AHI < 15 with resolution of daytime somnolence, was achieved in 21 patients (53.8%). Clinical characteristics found to be significantly different between the responders and nonresponders were BMI, AHI, and lateral velopharyngeal collapse. Patients with BMI < 30 , AHI < 60 , or absence of lateral velopharyngeal collapse have excellent surgical response rate of 88.2%, 67.9%, or 66.7%, respectively.

CONCLUSIONS:

We identified three clinical characteristics associated with increased surgical response rate. This finding may be useful for patient selection and counseling prior to surgery.

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KEYWORDS:

Obstructive sleep apnea/hypopnea syndrome; base of tongue reduction; epiglottectomy; glossectomy; robot-assisted; robotic surgery; sleep apnea; sleep apnea surgery; tongue base; transoral robotic surgery

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Addressing the Retrolingual Space in Obstructive Sleep Apnea: Outcomes Stratified by Friedman Stage in Patients Undergoing Transoral Robotic Surgery.

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Abstract

BACKGROUND/AIMS:

To stratify outcomes in patients with moderate to severe obstructive sleep apnea-hypopnea syndrome (OSAHS) undergoing transoral robotic surgery (TORS) ± multilevel procedures according to Friedman stage.

METHODS:

A total of 118 patients with moderate to severe OSAHS between 2010 and 2013 were stratified preoperatively by Friedman stage. All patients had TORS-assisted lingual tonsillectomy, either stand-alone or in combination with palatal surgery. Apnea-hypopnea index (AHI) was measured preoperatively and 3 months postoperatively. Success was defined as a decrease in AHI by 50% and AHI <20.

RESULTS:

The average pre- and postoperative AHI was 43.0 and 22.6, respectively, and the overall success rate was 63%. When stratifying by Friedman stage, success was seen in 75% of stage I, 70% of stage II, 66% of stage III, and 10% of stage IV patients. When stratifying by preoperative BMI, success was seen in 75% of stage II and 72% of stage III patients with BMI <30, compared to 58% of stage II and 56% of stage III patients with BMI >30.

CONCLUSIONS:

TORS-assisted lingual tonsillectomy ± multilevel procedures can be successful in treating patients with moderate to severe OSAHS with Friedman stage I-III anatomy. Success rates are even greater if patients are stratified according to preoperative BMI, as those with BMI <30 are more likely to achieve success even with Friedman stage II-III anatomy.

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Evaluation of coblation lingual tonsil removal technique for obstructive sleep apnea in Asians: preliminary results of surgical morbidity and prognosticators.

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Abstract

Retroglossal obstruction is one of the etiologies causing obstructive sleep apnea (OSA) and can be addressed by removing some tissues of the tongue base. However, because of its deep-seated location, its surgical removal is still challenging. Although coblation technique has been introduced, its efficacy and morbidity need further evaluation, particularly in Asians. This study aimed to assess its safety and effectiveness and to identify outcome prognosticators. Forty-seven OSA patients who underwent coblation lingual tonsil removal were included. Retroglossal obstruction was confirmed by drug-induced sleep videofluoroscopy. Attended full-night polysomnography was performed twice; before and 6 months after surgery in 27 patients. The tongue base was fully exposed with three deep-seated traction sutures, visualized with a 30° or 70° endoscope, and ablated using a coblator. Surgical success was defined with postoperative apnea hypopnea index (AHI) <20 and reduction >50 %. Postoperative morbidities were evaluated. Demographic and polysomnographic parameters between success and failure groups were compared. None of the patients had immediate postoperative hemorrhage. Postoperatively, one patient had delayed hemorrhage and one patient severe respiratory difficulty. Taste loss, tongue dysmotility, dental injury or severe oropharyngeal stricture were absent. A mean AHI decreased from 37.7 ± 18.6 to $18.7 \pm 14.8/h$ ($P < 0.001$). The success rate was 55.6 %. Their mean minimal oxygen saturation was significantly lower ($P = 0.004$) in the failure group. Coblation lingual tonsil removal technique showed minimal morbidity and favorable outcome in Koreans. The surgical outcome might be associated with the severity of single respiratory events.

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Endoscope-guided coblator tongue base resection using an endoscope-holding system for obstructive sleep apnea.

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Abstract

BACKGROUND:

Multilevel obstruction in obstructive sleep apnea commonly includes retroglossal obstruction. To improve surgical success rates, tongue volume reduction with posterior midline glossectomy and/or lingual tonsillectomy is widely performed.

METHODS:

Nasotracheal intubation was utilized, and the combined tongue procedure was performed as a final step after palatal surgery. The tongue was pulled maximally by a retraction suture and a McIVOR (Karl Storz, Tuttlingen, Germany) or Davis mouth gag (Karl Storz, Tuttlingen, Germany), and a medium-length tongue blade was applied to expose the tongue base. A 70-degree rigid endoscope was fixed by the holding system and introduced into the oral cavity. Endoscope-guided coblator tongue base resection was then performed.

RESULTS:

The surgeon could use both hands for the surgery, enabling a more delicate resection of tongue base tissue.

CONCLUSION:

This technique was acceptable and can be successfully used in patients with a large tongue, in whom exposing the tongue base for surgery is difficult. © 2015 Wiley Periodicals, Inc. *Head Neck* 38: 635-639, 2016.

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KEYWORDS:

coblator; endoscope; holder; sleep apnea; tongue base

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Transoral Robotic Surgery for Obstructive Sleep Apnea: A Systematic Review and Meta-Analysis.

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Abstract

OBJECTIVE:

To perform a systematic review of the international biomedical literature evaluating the effectiveness, complications, and safety of transoral robotic surgery (TORS) for the treatment of obstructive sleep apnea (OSA).

DATA SOURCES:

PubMed/MEDLINE, Embase, and EMB Reviews databases were searched up to November 27, 2015.

REVIEW METHODS:

Two authors systematically and independently searched for articles on TORS for the treatment of OSA in adults that reported either outcomes for the apnea-hypopnea index (AHI), lowest oxygen saturation percentage (LSAT) or changes in the Epworth Sleepiness Scale (ESS), and/or rates and types of complications associated with the operation.

RESULTS:

In total, 181 records were identified and 16 articles met inclusion criteria. Transoral robotic surgery was almost always combined with other sleep surgery procedures. The summary estimate of the decrease in AHI using TORS as part of a multilevel surgical approach was 24.0 (95% confidence interval [CI], 22.1-25.8; $P < .001$, $I^2 = 99\%$). The summary estimate of a decrease in ESS score was 7.2 (95% CI, 6.6-7.7; $P < .001$, $I^2 = 99\%$) and of the overall surgical "success" (defined as AHI < 20 and 50% reduction) was 48.2% (95% CI, 38.8%-57.7%; $P < .001$, $I^2 = 99\%$). Three large studies reported on their total complication rates with an average of 22.3% (range, 20.5%-24.7%).

CONCLUSIONS:

The initial results for the use of TORS as part of a multilevel surgical approach for OSA are promising for select patients. However, the cost and morbidity may be greater than with other techniques offsetting its advantages in visualization and precision. More prospective studies are needed to determine the optimal role of this tool.

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KEYWORDS:

TORS; base of tongue; obstructive sleep apnea; sleep-disordered breathing; transoral robotic surgery

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The Effect of Glossectomy for Obstructive Sleep Apnea: A Systematic Review and Meta-analysis.

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Abstract

OBJECTIVE:

Determine the effect of glossectomy as part of multilevel sleep surgery on sleep-related outcomes in patients with obstructive sleep apnea.

DATA SOURCES:

PubMed, Scopus.

REVIEW METHODS:

Two independent researchers conducted the review using PubMed-NCBI and Scopus literature databases. Studies on glossectomy for obstructive sleep apnea that reported pre- and postoperative apnea-hypopnea index (AHI) score with 10 or more patients were included.

RESULTS:

A total of 18 articles with 522 patients treated with 3 glossectomy techniques (midline glossectomy, lingualplasty, and submucosal minimally invasive lingual excision) met inclusion criteria. Pooled analyses (baseline vs post surgery) showed a significant improvement in AHI (48.1 ± 22.01 to 19.05 ± 15.46 , $P < .0001$), Epworth Sleepiness Scale (ESS; 11.41 ± 4.38 to 5.66 ± 3.29 , $P < .0001$), snoring visual analog scale (VAS; 9.08 ± 1.21 to 3.14 ± 2.41 , $P < .0001$), and Lowest O₂ saturation (76.67 ± 10.58 to 84.09 ± 7.90 , $P < .0001$). Surgical success rate was 59.6% (95% CI, 53.0%-65.9%) and surgical cure was achieved in 22.5% (95% CI, 11.26%-36.26%) of cases. Acute complications occurred in 16.4% (79/481) of reported patients. Glossectomy was used as a standalone therapy in 24 patients. In this limited cohort, significant reductions in AHI (41.84 ± 32.05 to 25.02 ± 20.43 , $P = .0354$) and ESS (12.35 ± 5.05 to 6.99 ± 3.84 , $P < .0001$) were likewise observed.

CONCLUSION:

Glossectomy significantly improves sleep outcomes as part of multilevel surgery in adult patients with OSA. Currently, there is insufficient evidence to analyze the role of glossectomy as a standalone

procedure for the treatment of sleep apnea, although the evidence suggests positive outcomes in select patients.

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KEYWORDS:

OSA; SMILE; glossectomy; lingualplasty; midline glossectomy; obstructive sleep apnea; sleep surgery; submucosal minimally invasive lingual excision

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Coblation endoscopic lingual lightening (CELL) for obstructive sleep apnea.

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Abstract

This study investigated the feasibility, safety and efficacy of Coblation endoscopic lingual lightening (CELL) surgery for obstructive sleep apnea (OSA). This study was a retrospective case series in a tertiary referral sleep center. Twenty-five adults with moderate to severe OSA and determined to have retropalatal and tongue base obstruction based on Friedman tongue position III and fiberoptic endoscopy underwent CELL in combination with modified uvulopalatopharyngoplasty, known as relocation pharyngoplasty. CELL involves transoral resection of tongue base muscle tissue and lingual tonsil using Coblation under endoscopic guidance. The mean operation time for CELL was 42.6 ± 13.7 min. Total blood loss for CELL plus relocation pharyngoplasty was <50 ml in all patients. Mean postoperative pain score (sum of total pain scores/sum of total hospitalization day, visual analog scale, 0-10) was 2.6 ± 0.6 . Postoperative bleeding and taste disturbance extending beyond 3 months occurred in one patient (4 %) individually. No patients reported tongue weakness or speech dysfunction. Epworth sleepiness scale improved from 9.6 ± 4.9 to 7.5 ± 4.3 ($p = 0.023$). Apnea-hypopnea index decreased from 45.7 ± 21.7 to 12.8 ± 8.2 events/hour ($p < 0.001$) 6 months after surgery. The overall response rate was 80 %. CELL is feasible, safe and effective in treating tongue base obstruction in OSA patients who underwent simultaneous relocation pharyngoplasty.

KEYWORDS:

Coblation endoscopic lingual lightening; Obstructive sleep apnea; Tongue base obstruction; Uvulopalatopharyngoplasty

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Efficacy of Coblation Endoscopic Lingual Lightening in Multilevel Surgery for Obstructive Sleep Apnea.

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Abstract

Importance:

Multilevel obstruction is involved in the pathogenesis of obstructive sleep apnea (OSA). Coblation endoscopic lingual lightening (CELL) is a variation of glossectomy to reduce tongue collapse and can be considered in the surgical management of adults with OSA.

Objective:

To evaluate the clinical and polysomnographic outcomes of tongue base reduction using CELL in multilevel surgery for OSA.

Design, Setting, and Participants:

A retrospective case-control study was performed to review the medical records of adults with OSA (apnea-hypopnea index [AHI], >20) and Friedman stage III (tongue position III and tonsil size I-II) who underwent combined CELL and relocation pharyngoplasty (group 1) or relocation pharyngoplasty alone (group 2) for OSA between January 1, 2012, and December 31, 2013, at a tertiary referral sleep center. The groups were matched by age, sex, body mass index, and AHI at baseline. The dates of the analysis were May 30 to June 29, 2014.

Intervention:

Coblation endoscopic lingual lightening.

Main Outcomes and Measures Methods:

The primary outcome measure was change in AHI after surgery (after ≥6 months). Other outcomes were differences in surgical response rates, perioperative apnea index, lowest oxygen saturation, and Epworth Sleepiness Scale score.

Results:

The study cohort comprised 90 participants. Their mean (SD) age was 40.7 (9.2) years, and 96% (86 of 90) were male. Group 1 patients (n = 30) underwent combined CELL and relocation pharyngoplasty, and group 2 patients (n = 60) underwent relocation pharyngoplasty only. The mean (SD) AHI decreased from 48.4 (16.9) to 16.5 (11.2) ($P < .001$) in group 1 and from 44.2 (19.3) to 20.1 (15.6) ($P < .001$) in group 2. Percentage change in AHI was significantly different between group 1 and group 2 (mean [SD], -65.5 [20.5] vs -53.2 [30.3]) ($P = .047$). The surgical response rate was greater in group 1 (73% [22 of 30]) than in group 2 (50% [30 of 60]) ($P = .04$).

Conclusions and Relevance:

Without increasing complications, combined CELL and relocation pharyngoplasty achieved greater AHI reduction and a higher surgical response rate among adults with OSA and Friedman stage III compared with relocation pharyngoplasty alone.

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Hyoid surgery alone for obstructive sleep apnea: A systematic review and meta-analysis.

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Abstract

OBJECTIVES/HYPOTHESIS:

The primary objective was to determine if sleep study variables (e.g., apnea-hypopnea index [AHI] and lowest oxygen saturation) and quantitative sleepiness data improve following isolated hyoid surgery for obstructive sleep apnea (OSA).

STUDY DESIGN:

Systematic review and meta-analysis.

METHODS:

Nine databases, including PubMed, were searched through September 5, 2015.

RESULTS:

Four hundred ninety-eight studies were screened, 64 were reviewed, and nine studies met inclusion criteria. A total of 101 patients were identified who underwent hyoid surgery alone for treatment of OSA. Subanalyses were performed for: 1) type of surgery, 2) primary versus secondary hyoid surgery, 3) positional versus nonpositional OSA, 4) age, and 5) body mass index. In patients undergoing isolated hyoid surgery, the AHI decreased from a mean \pm standard deviation of 37.3 ± 21.1 (95% confidence interval [CI]: 33.1, 41.5) to 23.0 ± 18.6 (95% CI: 19.3, 26.7) events/hour, which correspond to a 38.3% reduction ($P < .0001$). AHI reduced by 38.3% for hyoid myotomy with suspension, by 50.7% for hyothyroidopexy, and by 7.1% for hyoid expansion. The Epworth Sleepiness Scale decreased by 3.2 points from 10.3 ± 4.9 (95% CI: 8.8, 11.8) to 7.1 ± 4.2 (95% CI: 5.8, 8.4; $P = .0027$).

CONCLUSIONS:

Isolated hyoid surgery has reduced OSA severity and improved sleepiness in adults. Hyothyroidopexy provided a 50.7% reduction in AHI, followed by hyoid myotomy with suspension (38.3% reduction in AHI) and hyoid expansion (7.1% reduction in AHI). The current literature lacks high-quality evidence with regard to hyoid surgery, and additional studies are needed to further elucidate the effect of hyoid surgery in OSA.

LEVEL OF EVIDENCE:

NA Laryngoscope, 2015.

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KEYWORDS:

Obstructive sleep apnea; hyoid surgery; meta-analysis; systematic review

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