Circumferential oropharyngeal stenosis after single-stage transoral robotic surgery and standard uvulopalatopharyngoplasty for surgical treatment of obstructive sleep apnea: a report of five patients

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Abstract
OBJECTIVES: 1) To report circumferential oropharyngeal stenosis (OPS) as a complication of single-stage transoral robotic surgery (TORS) and uvulopalatopharyngoplasty (UPPP) for the treatment of obstructive sleep apnea (OSA). 2) To identify risk factors which increase the likelihood of oropharyngeal stenosis for improved preoperative planning and patient selection.

STUDY DESIGN: Retrospective consecutive case series from 2008-2013

RESULTS: Five adult patients (4 female, 1 male) developed symptomatic OPS after multilevel single-stage surgery. The prevalence for OPS was thus determined to be 7.8%. Patients were treated with intraoral pharyngoplasty procedures. Preoperative average AHI prior to initial surgery was 15.3, while post-correctional average AHI was 4.4. There was significant improvement of functional and objective outcomes after surgical correction. To our knowledge this is a previously underreported complication in the adult population.

CONCLUSION: Circumferential oropharyngeal stenosis (OPS) is a potential complication of combined single-stage TORS and UPPP surgery for treatment of OSA. Caution should be used in patients with a history of keloid formation when using single-stage OSA surgery. For this reason, multilevel surgery for OSA should be staged whenever possible. Though still an effective surgery for treatment of OSA, the surgeon must be aware of OPS and should proceed with caution during preoperative planning, counseling, and patient selection.

Introduction
Oropharyngeal stenosis (OPS) is a rare and potentially morbid complication after multilevel, single-stage upper airway surgery. OPS is a narrowing of the upper aerodigestive tract at the junction of the nasopharynx and oropharynx, which includes the soft palate, lateral pharyngeal walls, and tongue base. Symptomatic patients may exhibit dysphagia, dyspnea on exertion, poor weight gain, pain, or worsened OSA. Conversely, some patients with OPS may be asymptomatic. With the diagnosis of OSA on the rise, some patients are unable to tolerate positive-pressure breathing treatments for a myriad of reasons, including claustrophobia, inability to keep a device on, and dry mouth. Additionally, patient’s often have multilevel upper airway obstruction as seen on drug-induced sleep endoscopy or Mueller’s Maneuver. Treatment trends have previously been to treat multilevel upper airway obstruction with multilevel procedures performed simultaneously, including UPPP, lingual tonsillectomy, tongue base reduction, or epiglottidectomy. We review our experience with multilevel, single-stage surgery involving TORS and UPPP in the adult population and discuss incidence and management of OPS.

Methods and Materials
After the discovery of several patients who developed OPS after combined single-stage TORS and UPPP for surgical treatment of OSA, medical records were reviewed for patients who underwent UPPP from January 2008 to October 2013 at Harper University Hospital in Detroit, Michigan. Medical records reviewed included clinical notes, operative reports, consented photography, polysomnography, and Epworth Sleepiness scores from preoperative, postoperative, and post-correctional periods. Data was collected in a de-identified manner from a password secured server. Treatment of OPS was examined, including timing and amount of triamcinolone injections, timing and nature of pharyngoplasty procedures, and whether allograft material was implanted during pharyngoplasty.

Table 1: Treatment Case Series

<table>
<thead>
<tr>
<th>Patient #</th>
<th>Preoperative AHI &amp; ESS</th>
<th>Post-correctional AHI &amp; ESS</th>
<th># Triamcinolone Injections</th>
<th>Timing of Pharyngoplasty Procedure(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AHI: 15.3 ESS: 15</td>
<td>AHI: 6.2 ESS: 6</td>
<td>0</td>
<td>5 months: pharyngoplasty, Alloderm implant</td>
</tr>
<tr>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
<td>4 months: pharyngoplasty, Kenalog injection</td>
</tr>
<tr>
<td>3</td>
<td>AHI: 12 ESS: 19</td>
<td>AHI: 2.9 ESS: 7</td>
<td>0</td>
<td>5 months: pharyngoplasty, sleep endoscopy</td>
</tr>
<tr>
<td>4</td>
<td>AHI: 18.4 ESS: 10</td>
<td>AHI: 7.9 ESS: 2</td>
<td>0</td>
<td>3 months: pharyngoplasty</td>
</tr>
<tr>
<td>5</td>
<td>AHI: 15.5 ESS: N/A</td>
<td>AHI: 0.5 ESS: N/A</td>
<td>14</td>
<td>3 months: pharyngoplasty, Kenalog injection, 7 months: pharyngoplasty, Alloderm implant, Kenalog injection</td>
</tr>
</tbody>
</table>

Discussion and Conclusion
Previously, OPS was described as a rare complication after tonsillectomy with or without adenoidectomy. Several etiologies have been suggested regarding the development of OPS including deep dissection of the lower tonsillar pole and removal of adjacent lingual tonsil tissue, excessive cautery, and oropharyngeal infection. Although previously described in pediatric populations as 8.2%, the prevalence and management of OPS in adults has yet to be fully explored.

Although the etiology of OPS after multilevel single-staged airway augmentation is debated, it appears that the formation of a cicatricial scar is paramount in order to develop OPS. Further animal studies may prove such hypothesis. Additionally, caution should be used in patients with a history of keloid formation when using sleep endoscopy or Mueller’s Maneuver. Further animal studies may prove such hypothesis. Additional, the prevalence of OSA can be higher at risk for OPS. For this reason, multilevel surgery for OSA should be staged whenever possible. Though still an effective surgery for treatment of OSA, the surgeon must be aware of OPS and should proceed with caution during preoperative planning, counseling, and patient selection.

References