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An Alternative Airway Intervention to Preserve the Surgical Field in Oral and Maxillofacial Surgery

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Abstract

Background/need. Office-based sedation has become increasingly commonplace in dental offices in recent years, allowing for practitioners to provide broader scope of care for their patients. Maintaining high standards of safety is of utmost importance when sedation is utilized in the office-based setting, especially for patients deemed at a higher-risk for intraoperative airway obstruction. This demographic includes but is not limited to individuals with a medical history significant for obstructive sleep apnea, chronic obstructive pulmonary disease, and morbid obesity. Presently, a wide variety of airway devices exist for use in the event of airway obstruction. However, in the context of oral and maxillofacial surgery, placement of these devices can encroach upon the surgical field, extending the perioperative period and putting the patient at greater long-term risk for maintaining adequate oxygenation. *Methodology.* The authors describe a preliminary technique trialed in our offices which utilizes a size 5.0 endotracheal tube (5OET) as an adjunct supraglottic airway to help mitigate the issue of oxygen saturation maintenance, as well as unimpeded access to the oral cavity. Implementation of the device requires identifying appropriate candidates during preoperative screening and placing the device through the nare and securing it above the glottis. *Device Description.* The 'tube kit' is comprised of a standard size straight 5.0 cuffed oral ETT, a 5-mL syringe for inflation of the cuff post insertion, lubricant, flex extension tubing, end tidal sampling line for capnography, tape for securement of the 5OET, and an anesthesia breathing circuit. Optional equipment pieces include an elbow connecter and a foam piece for comfort. *Results/Current Status.* Preliminary results have demonstrated oxygen saturations maintained above 98% when the 5OET is placed preoperatively. Continued use of the trial device will inform the development of a tube by our clinicians, and its efficacy will be studied in our offices. The next steps will be to start developing a pilot cuff that will be submitted for patent approval after its use in IRB-approved clinical studies.

Keywords

maxillofacial surgery, Anesthesia, surgical education, outpatient sedation, clinical techniques, obstructive sleep apnea, airway intervention

Introduction

Advancements in anesthesiology and surgery have allowed providers to offer a broader scope of elective procedures with moderate to deep sedation in office-based practices.[1,2] As the demand for office-based procedures trends upward, maintaining high standards of patient safety and quality of care is of utmost priority for the practitioner. The treatment and sedation of patients with airway comorbidities such as obesity, obstructive sleep apnea (OSA), and chronic obstructive pulmonary disease (COPD) immediately pose an inherently higher risk for intraoperative airway obstruction during procedural sedation.[3-5] The primary issue at hand concerns the maintenance of a patent airway during the peri- and postoperative periods. Failure to address this concern can lead to consequences that include rapid deoxygenation, inadequate organ perfusion with resultant hemodynamic

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instability, laryngospasm, prolonged respiratory compromise with subsequent respiratory failure, arrhythmias, cerebral hypoxia, and death.[6,7]

In the event of rapid, life-threatening desaturation or apnea, guidelines provided by the American Society of Anesthesiologists' (ASA) difficult airway algorithm may be followed for appropriate airway intervention, including the use of a laryngeal mask airway (LMA) to reestablish adequate oxygenation.[6] However, when the oral cavity is the surgical field, an alternative method which safely secures the airway through minimally invasive measures and simultaneously permits unimpeded surgical access is warranted. In this regard, we have evaluated the use of a technical adjunct involving a size 5.0 Oral Endotracheal Tube (5OET) which would restore and maintain adequate oxygen saturation during procedural sedations using Total Intravenous Anesthesia (TIVA), while also allowing full access to the oral cavity. Preliminary technique has been explored in our ambulatory oral surgery office with promising results and is described below:

Prior to placement, indicators for potential difficult airway management during the preoperative evaluation period warranting 5OET include but are not limited to: patient history of OSA, chronic smokers, COPD, obesity classes II-III, reduced Thyromental Distance (TMD), macroglossia, Mallampati class scores III-IV, as well as reduced range of motion of the head and neck (Table 1).[2,4,8] After adequate lubrication, the 5OET can be inserted via the nasopharynx and passed beyond the base of the tongue to the supraglottic area, followed by cuff inflation, attachment to a flexible gooseneck tube with subsequent attachment to the anesthesia circuit (Figure 1). Careful insertion of the 5OET is of utmost priority to avoid trauma to the nasopharyngeal structures. Poor lubrication or insertion of the tube with undue force increases the risk for epistaxis and retropharyngeal perforation.[9] For more efficient placement, the office has used pre-assembled 5OET 'kits' (Table 2).

After appropriate placement of the 5OET, the cuff should be inflated with a 5-mL syringe to minimize air leak. The tube is then secured into place on the nare with

Table 1. Indications for Supraglottic Placement of 5.0 Oral Endotracheal Tube.

Obstructive sleep apnea
Chronic smoking
Chronic obstructive pulmonary disease
Obesity classes II-III
Thyromental distance ≤6 cm
Macroglossia
Mallampati classification scores III-IV
Limited atlantoaxial movement

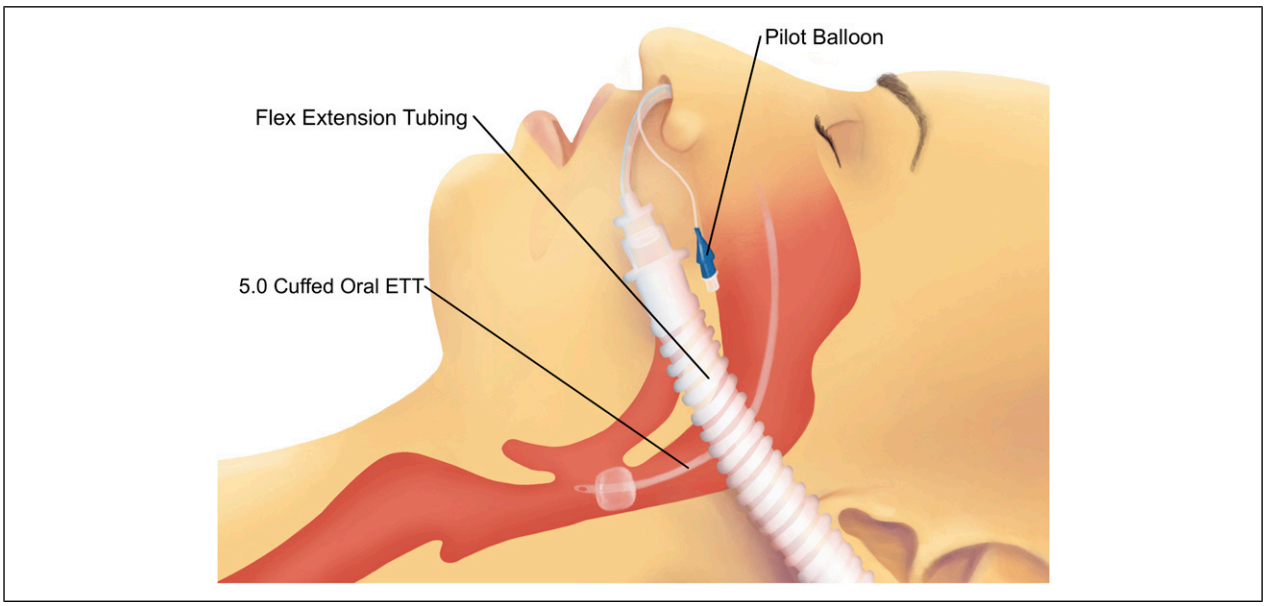

Figure 1. Sagittal view illustrating supraglottic 5.0 oral endotracheal tube placement.

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Table 2. 5.0 Oral Endotracheal Tube "Assembly" Kit.

Standard size straight 5.0 cuffed oral endotracheal tube
5-mL syringe
Lubricant
Flex extension tubing
End tidal sampling line
Tape
Anesthesia breathing circuit
Elbow connecter (optional)
Foam piece (optional)

tape. A flex extension tube may be attached to the 20 mm (15 mm) 5OET connector which may be taped directly onto the patient's forehead or onto a foam piece resting on the forehead. An elbow connector with an end tidal sampling line is attached. The circuit's oxygen flow rate should be adjusted to an appropriate value at the provider's discretion. Our office recommendation is to start at 2 L/min oxygen with increased titration as needed. Proper placement is confirmed through an observable spontaneous ventilation pattern with concurrent movement in the breathing bag with an open pressure-limiting valve.

Removal of the 5OET involves deflating the cuff and pulling the tube slightly out of the nare when appropriate to avoid airway irritation. The device should remain attached until the patient is responsive and then removed gently from the nare when the patient demonstrates adequate spontaneous ventilation and oxygenation. Postoperative monitoring to ensure the patient meets adequate discharge criteria should continue as normal.

The use of a 5OET in oral and maxillofacial surgery procedures allows for the surgeon to maintain unimpeded access to the oral cavity. Preemptive 5OET placement for patients who exhibit indicators of desaturation risk to prevent an intraoperative event altogether is also highly recommended. If the 5OET technique does not prevent a rapid desaturation event, continuing the interventional sequences of the ASA difficult airway algorithm is paramount.[1,6,8]

Absolute contraindications to placement of a 5OET are in line with contraindications to placement of a Nasoendotracheal Tube (NETT): apnea or impending respiratory arrest, suspected basilar skull fractures, coagulopathy, suspected epiglottitis, and midface instability.[10-12] Relative contraindications to consider include a patient history of epistaxis, nasal septum deviation, recent nasal surgery or trauma, and use of anticoagulants.[9,13,14]

While this article was written mainly to describe the current technique with a premade 5OET tube and cuff, we intend to develop a tube with a pilot cuff specifically for supraglottic airway placement. Preliminary use of the 5OET tube in practice has demonstrated increased and maintained oxygen saturation in patients with obstructive risk during surgery. Specifically, after identifying a candidate based on our criteria and placing the 5OET preoperatively, we have noted oxygen saturation levels maintained above 98% perioperatively. Placement and removal of the tube has not caused any major complications post-operatively. Our hope is to trial the new 5OET in the office as an intervention. We plan to determine its efficacy by measuring oxygen saturation, episodes of desaturation, and post-operative surgical outcomes.

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