Topical and Regional Anesthesia For Tracheal Intubation

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A wake tracheal intubation commonly is used where ordinary intubation—for example, attempting direct laryngoscopy following the induction of general anesthesia—is expected to be difficult or hazardous. Possible examples include patients with large glottic tumors, patients with unstable cervical spines, and patients known to be difficult to intubate from previous anesthetic misadventures.

Regardless of the reason that awake intubation is warranted, however, several underlying principles hold. The first is that whereas sedatives such as midazolam, fentanyl, and dexmedetomidine (Precedex, Hospira) undoubtedly are useful adjuncts to performing an awake intubation, the “secret recipe” is obtaining decent anesthesia to the airway structures; with good airway anesthesia, minimal or even no sedation is required, and patient cooperation is much easier to achieve.

The process begins by making some important airway management decisions, considered in Table 1. One important decision is whether to use needle-based airway blocks, described in Table 2. Table 3 lists some adjunctive drugs that may be useful and Table 4 details the steps for topicalization for awake intubation. This article also provides potentially useful clinical pearls and explains why clinicians may prefer to use lidocaine rather than benzocaine to obtain airway anesthesia.
### Table 1. Key Decisions When Planning Awake Intubation

1. **Oral versus nasal route:** In patients with severe trismus, for example, a nasal approach generally is necessary. In addition, the surgeon sometimes will request nasal intubation to make the procedure go more smoothly.

2. **Are needle-based local anesthetic blocks warranted?** Two schools of thought exist: Use topical anesthesia exclusively, or employ needle-based airway blocks in addition to topical anesthesia (Table 2). The author’s preference is the first approach. However, readers seeking more details on the use of needle-based airway blocks should consult the review by the New York School of Regional Anesthesia.1

3. **Sedation protocol:** Options include no sedation; midazolam, fentanyl, and propofol in various doses; dexmedetomidine; and other methods (Table 3). The author frequently administers 1 mg of midazolam, 50 mcg of fentanyl, and later 10 to 20 mg of propofol immediately before inserting the bronchoscope.

4. **Should glycopyrrolate be given as an antisialogogue?**

5. **Which method of intubation?** Options include fiber-optic intubation, video laryngoscopy, regular direct laryngoscopy, or another technique.

### Table 2. Three Popular Airway Blocks for Awake Oral Intubation

Where topical anesthesia is not desired or is proven to be ineffective, nerve blocks can be used. Needle blocks are at least relatively contraindicated in patients with coagulopathies or who are on anticoagulation. Always aspirate before injecting to ensure that the needle is not in a blood vessel. Potential complications of these blocks include bleeding, nerve injury, and seizures from intravascular injection.

The following 3 upper airway blocks often are used:

<table>
<thead>
<tr>
<th>Block</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Glossopharyngeal Block</strong></td>
<td>The glossopharyngeal block numbs the oropharynx by anesthetizing the glossopharyngeal, or ninth cranial, nerve—a mixed nerve that provides sensation to the posterior third of the tongue, the vallecula, the anterior surface of the epiglottis (via the lingual branch), the tonsils (via the tonsillar branch), and the pharyngeal walls (via the pharyngeal branch). The glossopharyngeal nerve can be blocked by injecting approximately 5 mL of local anesthetic, such as 2% lidocaine, submucosally at the caudal aspect of the posterior tonsillar pillar where it crosses the palatoglossal arch. The block also can be achieved using direct mucosal application by pledgets soaked with local anesthetic, or even by spraying topical anesthesia onto the region. Some clinicians prefer to avoid needles for this block because it obviates the possibility of seizures triggered by accidental injection into the carotid artery. Finally, although a glossopharyngeal block facilitates intubation by blunting the gag reflex, it is not adequate as a solo technique.</td>
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<tr>
<td><strong>Superior Laryngeal Block</strong></td>
<td>The superior laryngeal block numbs the larynx above the cords. The internal branch of the superior laryngeal nerve originates lateral to the greater cornu of the hyoid bone and passes approximately 2 to 4 mm inferior to the greater cornu of the hyoid bone, where it pierces the thyrohyoid membrane to innervate the tongue base, the posterior surface of the epiglottis, the aryepiglottic folds, and the arytenoids. To perform this block, the patient is placed in a supine position with the head extended. The hyoid bone is identified, and a 25-gauge needle is advanced until it makes contact with the greater cornu of this structure on the side to be blocked. The needle is then walked off the bone inferiorly and advanced 2 to 3 mm. After a negative aspiration test, 2 to 3 mL of local anesthetic is injected, with an additional 1 to 2 mL administered as the needle is withdrawn. Similar to the glossopharyngeal block, the superior laryngeal block is inadequate as a solo technique.</td>
</tr>
<tr>
<td><strong>Translaryngeal Block</strong></td>
<td>The translaryngeal block numbs the larynx and trachea below the cords by anesthetizing the recurrent laryngeal nerve, which provides sensation to the trachea and vocal cords. To perform this block, a 5-mL syringe filled with 4% lidocaine and fitted with a 22- or 20-gauge IV catheter is advanced through the cricothyroid membrane until air is aspirated into the syringe. The needle is removed, leaving the IV catheter. Then 4 mL of 4% lidocaine is injected, inducing coughing, which scatters the local anesthetic.</td>
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Clinical Pearls for Airway Anesthesia for Awake Intubation

Topical anesthetics are available as a regular solution, a viscous solution, a gel, an ointment, or in a spray can. Topicalization is the easiest method for anesthetizing the airway; simply spray local anesthetic directly onto the airway mucosa. Nebulization of lidocaine 2% to 4% by oral nebulizer for 15 to 30 minutes also can be effective.

Saliva acts as a barrier between the anesthetic agent and the mucosa; the administration of glycopyrrolate can help reduce the production of saliva.

When gargling topical anesthetics such as 2% viscous lidocaine, most patients prefer to be sitting rather than supine. In addition, the patient can be encouraged to hold and control the Yankauer sucker to remove any excess anesthetic or to use after they have “had enough.”

Cotton pledgets soaked in local anesthetic can be applied to targeted mucosal surfaces for 5 to 15 minutes to obtain selective blockade of underlying nerves.

For nasal intubation, adding vasoconstrictors such as epinephrine at a concentration of 1:200,000, or phenylephrine at a concentration of 0.05%, to the local anesthetic solution can prolong the block and help reduce mucosal bleeding.

Needle-based airway blocks (Table 3) are far more complicated than noninvasive methods of providing anesthesia to the airway and generally are unnecessary to achieve good results.

If the patient gags with the introduction of an airway guide (such as the Ovassapian or Williams airway), additional topicalization is needed.

Performing elective fiber-optic intubation in routine cases in asleep patients will help the clinician master the use of the bronchoscope for intubation. Remember, however, that a jaw thrust from an assistant usually is needed to ensure that the scope passes easily.

Remember that even if you see the tracheal rings through the fiber-optic bronchoscope, the endotracheal tube (ETT) may still occasionally end up in the esophagus, resulting in the patient coughing with attempted passage of the tube. Never put the patient to sleep until the capnogram waveform is what you expect!

Table 3. Commonly Used Adjunctive Medications for Awake Intubation in Adults

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage, Route, and Timing*</th>
<th>Action</th>
<th>Reversal Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycopyrrolate</td>
<td>0.2-0.4 mg IV or IM given 15-30 min preprocedure</td>
<td>Antisialogogue</td>
<td>None</td>
</tr>
<tr>
<td>Midazolam</td>
<td>0.5-4 mg IV (titrated to effect)</td>
<td>Sedative</td>
<td>Flumazenil</td>
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<tr>
<td>Fentanyl</td>
<td>25-100 mcg IV (titrated to effect)</td>
<td>Sedative</td>
<td>Naloxone</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>Loading dose: 0.75 mcg/kg Infusion rate: 0.075 mcg/kg/min(^b)</td>
<td>Sedative</td>
<td>Naloxone</td>
</tr>
<tr>
<td>Dexametomidine</td>
<td>Loading dose: 1 mcg/kg/h over 10 min Infusion: 0.7 mcg/kg/h(^c)</td>
<td>Sedative</td>
<td>None</td>
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</tbody>
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* These are guidelines only; lower doses may be appropriate for frail patients and higher doses may be appropriate for other patients.
\(^b\) From reference 2.
\(^c\) From the manufacturer.
Table 4. Key Steps in Performing Airway Anesthesia for Awake Intubation

<table>
<thead>
<tr>
<th>Step 1 (preparation): clinical review, equipment check, explanation to patient and assistants, oxygen via nasal cannula, Yankauer suction, bronchoscope suction, apply patient monitors, check patient IV, possibly administer glycopyrrolate, possibly administer sedation.</th>
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<tbody>
<tr>
<td>Step 2: Have patient gargle 2% viscous lidocaine (delivered in sitting position using a small disposable drinking cup) (Figure 1).</td>
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<tr>
<td>Step 3: Power spray 4% lidocaine to oropharyngeal and glottic structures (Figure 2).</td>
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<tr>
<td>Step 4: Insert airway guide (if fiber-optic intubation is planned) (Figure 3).</td>
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<tr>
<td>Step 5: Administer more 4% lidocaine through the airway guide using the MADgic Laryngo-Tracheal Mucosal Atomization Device (Figure 4).</td>
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<tr>
<td>Step 6: Conduct immediate preintubation review: tracheal tube taped to the fiber-optic scope, scope suction working, image quality check, supply of propofol attached to the IV line.</td>
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<tr>
<td>Step 7: Insert the fiber-optic scope, identify the epiglottis and the vocal cords, pass the bronchoscope past the cords, identify the carina, pass the tracheal tube, connect the patient breathing circuit, check for correct tracheal tube positioning clinically and by capnography.</td>
</tr>
<tr>
<td>Step 8: Induce anesthesia (both IV and inhalational methods can be used).</td>
</tr>
</tbody>
</table>

(Note that although the discussion here applies to the use of a fiber-optic bronchoscope, the use of a video laryngoscope also is possible [Figure 5]).

**Figure 1.** Viscous lidocaine 2% (Roxane Laboratories) can be given using a small disposable drinking cup.

**Figure 2.** An oxygen-driven power sprayer can be used to deliver lidocaine to oropharyngeal and glottic structures. Oxygen at 15 Lpm is used (EZ-Spray, Intertex Research).

**Figure 3.** Airway guides can be useful to facilitate passage of the bronchoscope. Left to right: Berman, Williams, and Ovassapian airways. Courtesy of www.airwaycam.com.

**Figure 4.** The LMA MADgic Laryngo-Tracheal Mucosal Atomization Device (Teleflex) can be useful to assist in the delivery of topical anesthesia to the periglottic structures.

**Figure 5.** A video laryngoscope such as the GlideScope (Verathon Medical) sometimes is used for awake intubation.
The Trouble With Benzocaine

Administration of benzocaine is sometimes complicated by methemoglobinemia, the presence of elevated methemoglobin levels within circulating erythrocytes. Methemoglobin, being darkly pigmented, causes blood to appear chocolate-colored and the patient to look cyanotic. Dark arterial blood and cyanosis disproportionate to the extent of respiratory distress is suggestive of methemoglobinemia, which incidentally can be caused by factors besides benzocaine administration, including the antimalarial drugs chloroquine and primaquine, nitrates, nitrates, inhaled nitric oxide, and nitroprusside.

As an example, Sachdeva et al describe a case of a man who underwent transesophageal echocardiography for evaluation of endocarditis and topical 20% benzocaine spray was administered for oropharyngeal anesthesia. Before topicalization, the patient’s oxygen saturation by pulse oximetry was 97% on room air, but following the administration of benzocaine spray, it fell to 80% despite oxygen administration. Clinically, the patient was cyanotic. Methemoglobinemia was suspected, and arterial blood gas evaluation by CO oximetry (with the patient on 6 L oxygen via nasal cannula) revealed the following: pH, 7.42; PO₂, 248; PCO₂, 34; oxygen saturation, 99%; and methemoglobin, 41.8% of total hemoglobin. After treatment with IV methylene blue at a dose of 2 mg/kg, cyanosis resolved, and a repeat methemoglobin level 2 hours later was 2.8%.

Abdel-Aziz et al similarly described methemoglobinemia with the use of benzocaine spray for awake fiber-optic intubation. Ferraro-Borgida et al described methemoglobinemia in a 34-year-old woman after perineal application of an over-the-counter cream containing 20% benzocaine.

Finally, clinicians and parents will be interested to know that benzocaine is the active ingredient in many over-the-counter teething pain gels and liquid medications; for the reasons discussed, the FDA advises against the use of such products in children under age 2 years.

References

1. New York School of Regional Anesthesia. www.nysora.com/techniques/nerve-stimulator-and-surface-based-ra-techniques/head-and-neck-blocks/3022-regional-topical-anesthesia-for-endotracheal-intubation.html. (Note that dexmedetomidine dose in the article is incorrect. It should be loading dose: 1 mcg/kg over 10 min, infusion rate: 0.2–0.7 mcg/kg per hour.)