

Sedation in Bronchoscopy A Review



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KEYWORDS

• Bronchoscopy • Sedation • Anesthesia • Review

KEY POINTS

- Sedation is generally recommended for all patients undergoing bronchoscopic procedures unless contraindications exist.
- Topical sedation is frequently used as an adjunct to systemic medications to optimize the procedure. Lidocaine is currently the most popular topical anesthetic.
- The use of a combination of benzodiazepines and opiates for bronchoscopic sedation is common, as it offers the antitussive properties of opioids, with the amnestic effect of benzodiazepines. This co-administration allows for an overall improved sedation with a smaller required total dose.
- Propofol is increasing in popularity because of its amnestic properties, with a quicker onset and faster recovery time and improved patient perception of sedation, anxiolysis, procedure tolerance, and overall reduction in cough.
- Several other agents are emerging as acceptable alternatives for sedation during bronchoscopy, such as ketamine and dexmedetomidine.

METHODS

A literature search was conducted on MEDLINE from 1969 to 2017, and appropriate data were reviewed. Randomized, controlled trials and prospective cohort studies were considered of highest impact.

BACKGROUND

Bronchoscopy has long been used as a diagnostic and therapeutic tool in medicine, with a wide range of appropriate sedative options. Flexible bronchoscopy can be performed with or without sedation, the choice of which is generally left to the practice pattern of the performing bronchoscopist. The concept of sedation is complex, with varying degrees of consciousness. These range from anxiolysis (minimal sedation), to conscious sedation (moderate sedation), to deep sedation, to

general anesthesia. Most institutions throughout the United States use moderate sedation, defined as a drug-induced decreased level of consciousness in which the patient is able to respond to verbal commands, with adequate spontaneous ventilation and normal cardiovascular function.¹ Some rigid and navigational bronchoscopic procedures are performed under general anesthesia with hopes of producing a higher diagnostic yield with greater patient tolerance, but evolving evidence suggests that moderate sedation may be comparable.^{2,3} A consensus statement from the American College of Chest Physicians suggests that “optimal procedural conditions are achieved when patients are comfortable, physicians are able to perform the procedure, and risk is minimized.”⁴ This article is a comprehensive review of existing data regarding sedation during bronchoscopy.

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NO SEDATION

Initially bronchoscopy was more commonly performed with little or no sedation, owing to concern of associated adverse effects. Studies comparing bronchoscopy with and without sedation found no difference in rates of complication, and, as such, bronchoscopy without sedation was thought to be safe. These studies, however, did not assess patient tolerance, comfort, or willingness to undergo a repeat procedure.⁵ The procedure itself is uncomfortable, with patients often experiencing difficulty breathing, cough, pain, fear, anxiety, and airway irritation. The use of sedation during bronchoscopy has improved outcomes, such as patient tolerance, reduction in cough, and patient likelihood to undergo a repeat future procedure, without increased complications.^{6,7}

TOPICAL ANESTHESIA

As time and medicine have advanced, so too have the options regarding sedation. Topical anesthesia is commonly used either alone or as an adjunct to systemic medications to optimize the procedure. Topical anesthesia is available in solution, gel, or spray and can be administered in a variety of ways, including syringe, soaked cotton pads, spray, nebulizer, nerve block, or transtracheal or transtracheal injection.

Benzocaine and tetracaine spray were long-standing popular choices for anesthesia of the nasopharynx and posterior oropharynx. These are usually administered before initiation of bronchoscopy in an attempt to decrease the gag reflex and increase patient tolerance. However, the use of these methods is decreasing because of a narrow therapeutic window and concern for toxicity. If topical dosing of benzocaine exceeds 3 sprays, these medications can be associated with methemoglobinemia, in which the presence of elevated levels of oxyhemoglobin prevent oxygen binding and transport to the tissues, leading to cyanosis and potentially fatal complications (**Table 1**).^{8–10} These complications are especially more likely in patients with preexisting anemia.¹⁰

Lidocaine is widely used as a topical anesthetic and can be administered in direct drip solution, nebulized spray, or gel forms. By decreasing ion transport across neuronal membranes, it blocks nerve impulse conduction, affording properties of anesthesia and cough suppression. A randomized controlled trial by Antoniadis and Worsnop,¹¹ compared direct administration of lidocaine through a bronchoscope with placebo and found a significant reduction in both cough and total required sedation. Lidocaine is generally well

accepted because of its wide therapeutic safety margin, short half-life, and minimal risk for toxicity.¹¹ Cardiac and neurologic toxicity are dose related and are often seen when the serum level exceeds 5 mg/L or topical dose is greater than 7 mg/kg.¹² We recommend close monitoring of the amount of lidocaine used, especially for prolonged cases and procedures performed in pediatric patients. Studies have found no significant difference in the anesthetic properties or reduction in cough in 1% versus 2% concentration of lidocaine, suggesting that the lower concentration is less likely to lead to potential toxicity.¹³ Greater care must be used in special populations, such as those with congestive heart failure and liver dysfunction, out of concern for further cardiac toxicity or poor metabolism, respectively.

Nebulized lidocaine is another option for analgesia delivery, although supporting evidence in this area remains less convincing. One study found no difference in cough frequency or patient discomfort when comparing nebulized lidocaine to the placebo, nebulized saline.¹⁴ Notably, the onset of action of nebulized lidocaine is approximately 15 to 20 minutes, whereas direct drip lidocaine typically works within seconds of administration.

Although useful for its vasoconstrictive properties leading to shrinkage of nasal mucosa (best for transnasal approach), cocaine has fallen out of favor because of the increased risk of myocardial infarction secondary to coronary vasoconstriction and intracoronary thrombus formation, as well as its habit-forming properties and abuse potential.^{15,16}

Transtracheal or transtracheal direct injection of topical anesthetics, such as lidocaine or lignocaine is another alternative option to achieve effective topical anesthesia. The upper trachea is anesthetized by injection via the cricothyroid membrane or between the tracheal rings. This approach is thought to be associated with a reduction in cough and improved patient tolerance when compared with nebulized or directly administered lidocaine through the working channel of the bronchoscope, without an increase in complications.¹⁷ An Irish single-blinded study found that use of transtracheal lignocaine significantly improved patient perceived ease of procedure and frequency of cough.¹⁸ This approach has more potential complications when compared with other routes of topical anesthesia administrations, such as swelling, paratracheal abscess formation, hematoma or bleeding from puncture of the inferior thyroid artery, or subcutaneous emphysema formation. Graham and colleagues¹⁷ only found minimal intratracheal mucosal bleeding and no significant difference in complication rates.

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