Dexmedetomidine as sole sedative for awake intubation in management of the critical airway

Basem Abdelmalak MD (Staff Anesthesiologist)\textsuperscript{a,b,*}, Laila Makary MD (Resident in Anesthesiology)\textsuperscript{c}, Jeremy Hoban MD (Staff Anesthesiologist)\textsuperscript{a}, D. John Doyle MD, PhD (Staff Anesthesiologist, Professor of Anesthesiology)\textsuperscript{a,d}

\textsuperscript{a}Department of General Anesthesiology, Cleveland Clinic, Cleveland, OH 44195, USA
\textsuperscript{b}Department of Outcomes Research, Cleveland Clinic, Cleveland, OH 44195, USA
\textsuperscript{c}Division of Anesthesiology, Critical Care Medicine and Comprehensive Pain Management, Cleveland Clinic, Cleveland, OH 44195, USA
\textsuperscript{d}Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH 44195, USA

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Abstract We report a series of successful awake fiberoptic intubations in patients with critical (unstable, difficult) airways using the \(\alpha_2\)-agonist, dexmedetomidine. Dexmedetomidine has several desirable pharmacologic properties, including sedation, anxiolysis, hypnosis, analgesia, amnesia, antisialagogue effects, and a unique respiratory-sparing effect. Dexmedetomidine appears to be a useful agent for sedation during awake fiberoptic intubation in difficult airway patients.

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1. Introduction

In an ASA closed claims study [1], adverse clinical outcomes related to respiratory events constituted the single largest class of injury to anesthetized patients, with death or brain damage occurring in 85% of cases. Because such events carry an enormous toll for all parties, ongoing efforts to improve the management of patients with difficult airway are important. In particular, techniques that contribute to the success of awake intubation are of special interest to clinicians and patients alike.

Available conventional sedatives such as benzodiazepines, opioids, and propofol cause respiratory depression, especially when used in high doses. Dexmedetomidine, an \(\alpha_2\)-agonist, has none to minimal respiratory depressant effects, which is clearly a great advantage in handling a critical (unstable, difficult) airway while inducing sedation. We present the use of dexmedetomidine in a series of awake fiberoptic intubations. The purpose is to demonstrate the suitability of dexmedetomidine as the sole sedative agent...
in such settings, to document the hemodynamic and oxygenation effects, and to assess whether the sedative effect would be adequate to allow awake fiberoptic intubation.

2. Case reports

2.1. Case 1

The first patient was a 67-year-old woman with a medical history significant for gastroesophageal reflux disease, tobacco abuse (50 pack-years), and T2N1M0 squamous cell carcinoma of the left tonsil and oropharynx, for which she underwent bilateral neck dissection, as well as chemotherapy and radiotherapy. As a result of the radiation, she had significant dysphonia, as well as esophageal stenosis manifested by dysphagia.

Unable to control secretions, she developed repeated episodes of aspiration pneumonitis. She later presented to our emergency department with progressive shortness of breath, inspiratory stridor, expiratory wheezing, and another episode of aspiration pneumonitis. She was admitted to the hospital for intravenous antibiotic treatment and was scheduled for an urgent tracheostomy for long-term airway management.

In the operating room (OR), she required 4 L/min of oxygen via nasal cannulae to maintain her arterial oxygen saturation more than 90%. She was unable to lie in a fully supine position because of airway obstruction from the pooling of secretions in the laryngeal/hypopharyngeal area. She was very anxious, agitated, and in tears. Because of her neck anatomy and her previous radiation, we and her surgeon judged her airway to be extremely difficult. The surgeon’s initial plan was to perform an awake tracheostomy. However, we were able to secure the airway using awake fiberoptic intubation with topical anesthesia and dexmedetomidine sedation. Details of the topical anesthesia and the dexmedetomidine infusion used for this patient, as well as the following four patients in the series, are provided in the “Technique” section, whereas other clinical information is presented in Table 1.

2.2. Case 2

The second patient was a 71-kg, 76-year-old woman who presented for a right hemithyroidectomy. She was transferred from another hospital with stridor secondary to tracheal compression from a 7 × 6 cm right thyroid mass. The patient had noted increasing difficulty with respiration, and significant tracheal deviation was noted on chest radiography. A new upper respiratory tract infection caused acute deterioration of the patient’s respiratory status and required urgent intervention. Airway examination showed an extremely deviated trachea secondary to the thyroid mass, as well as a Mallampati class III airway.

2.3. Case 3

Our third case was a 110-kg, obese, very anxious 51-year-old man with squamous cell carcinoma of the nasopharynx who presented for tracheostomy. His medical history included atrial fibrillation, congestive heart failure, chronic obstructive pulmonary disease, and obstructive sleep apnea (OSA) requiring the use of a continuous positive airway pressure mask at home. The patient’s nasopharyngeal mass had worsened his OSA, and he was unable to lie supine because of airway obstruction. At another hospital, he underwent an unsuccessful attempt at fiberoptic intubation. Airway examination showed a Mallampati class IV airway with limited neck extension.

2.4. Case 4

Our fourth patient was an 82-kg, 43-year-old man who presented for rigid tracheoscopy and direct laryngoscopy for a new subglottic mass. The patient’s medical history included a supracricoid laryngectomy with radiation therapy, asthma, tobacco abuse, and gastroesophageal reflux disease. Airway

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Synopsis of clinical data for the 5 cases a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>Initial blood pressure (MAP), mmHg</td>
</tr>
<tr>
<td>1</td>
<td>115/65 (82)</td>
</tr>
<tr>
<td>2</td>
<td>150/68 (95)</td>
</tr>
<tr>
<td>3</td>
<td>210/130 (157) c</td>
</tr>
<tr>
<td>4</td>
<td>105/85 (92)</td>
</tr>
<tr>
<td>5</td>
<td>102/60 (74)</td>
</tr>
</tbody>
</table>

MAP = mean arterial pressure; bpm = beats per minute.

a Hypotension was transient in patients 1 and 3, resolving spontaneously; however, in patients 2 and 4, it required the use of medication.
b Immediately following induction of general anesthesia.
c This very high blood pressure was attributed to his extreme anxiety and stress. His usual pressure was near 120/70 mm Hg.

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examination showed a Mallampati class III airway with full neck range of motion.

2.5. Case 5

Our fifth patient was a 120 kg, 31-year-old woman with a history suggestive of OSA who presented with progressive respiratory difficulty from a submandibular abscess. The abscess caused trismus and soft tissue swelling and necessitated emergency irrigation and debridement. The patient was very anxious and in tears. We could not assess her Mallampati score because of her severe trismus.

3. Technique

We used the following technique for topical anesthesia of the airway and for the dexmedetomidine infusion. In the OR, standard ASA monitors were applied while oxygen was delivered and end-tidal carbon dioxide was measured using a MAC SAFE nasal cannula (Hull Anesthesia, Inc, Huntington Beach, CA). Sedation was initiated in the OR with an infusion of dexmedetomidine beginning with a loading dose of one μg/kg for 10 minutes, except in the first patient for whom the loading dose was given for 18 minutes (anesthesiologist’s choice), followed by a maintenance infusion of 0.6 μg/(kg·h). Topicalization of the oropharynx was accomplished with nebulized 4% lidocaine and 2% lidocaine gel. Additional 4% lidocaine was applied using a “spray-as-you-go-technique” through the bronchoscope in case 5 because of her trismus. During the dexmedetomidine infusion, all patients maintained a spontaneous respiratory pattern. Awake fiberoptic intubation was started as soon as the patient reached a Ramsay sedation scale score of 4 [2].

Through an oral airway in cases 1 to 4, and through the right nares in case 5, the fiberoptic bronchoscope was advanced until the vocal cords were visualized. The bronchoscope was then passed through the vocal cords to a level slightly above the carina, and a Parker endotracheal tube with either a 6.0- or a 6.5-mm internal diameter was placed. After withdrawal of the bronchoscope, endotracheal intubation was further confirmed with capnography. All patients tolerated the procedure well with minimal discomfort. After successful intubation, general anesthesia was induced with propofol, midazolam (only in case 3 per anesthesiologist’s choice), fentanyl, and sevoflurane; rocuronium was used for muscle relaxation. A summary of the hemodynamic changes encountered, time to achieve adequate sedation levels, and time to intubate each patient’s trachea is shown in Table 1. The dexmedetomidine infusion was discontinued after induction of general anesthesia. After surgery, patients whose tracheas remained intubated were successfully weaned after meeting appropriate extubation criteria and, together with the tracheostomy cases, they were admitted to the postanesthesia care unit in stable condition.

4. Discussion

With difficult or critical airways, in which the anatomy is significantly deviated from normal or in which comorbid conditions may lead to complete loss of the airway, strict attention must be paid to the drugs used to achieve sedation and analgesia. Conventional agents such as opioids, benzodiazepines, and propofol carry the risk of respiratory depression, with possible inability to ventilate the patient.

Dexmedetomidine is an α2-adrenoreceptor agonist with several unique properties that make it ideally suited for the management of difficult and critical airways. First, a dexmedetomidine infusion provides a unique form of sedation in which patients appear to be sleepy but, if stimulated, are easily roused, cooperative, and communicative [3]. Second, dexmedetomidine has anxiolytic, moderate analgesic [4], and antisialagogue [5] effects. Third, dexmedetomidine causes minimal respiratory impairment, even when given in large doses [6,7], and PaCO2 levels resemble those found in normal sleep [8]. The fact that patients maintain spontaneous breathing with dexmedetomidine while attempts are made to secure their airway makes it an ideal agent for use in critical airways.

As a result of these considerations, we elected dexmedetomidine over conventional sedatives to avoid any iatrogenic respiratory depressant effect, especially in this group of patients with already compromised airways. All of our patients reported being comfortable during the procedure. The use of a dexmedetomidine infusion allowed us to safely accomplish sedation and analgesia while keeping the patient responsive to commands and breathing satisfactorily. We were able to intubate the trachea of all patients on the first attempt. In fact, the dexmedetomidine enabled us to convert cases 1 and 3 from the initial plan of an awake tracheostomy to tracheostomy during general anesthesia after successfully securing the airway. This change in the surgical plan was very much appreciated by all parties concerned. Another advantage of dexmedetomidine concerns its amnestic properties [4]. Four of the patients in our case series had no recall of the awake fiberoptic intubation, and the one who remembered part of her intubation experience (case 5) was not disturbed by the procedure.

Although dexmedetomidine is not without hemodynamic adverse effects such as bradycardia and hypotension, the effects found in our series were acceptable, and only two patients required treatment (Table 1). Also, we did not encounter any initial hypertensive response. This response usually occurs when using high doses of dexmedetomidine given at a fast rate, secondary to stimulation of the peripheral α2-receptors [8].

In conclusion, dexmedetomidine appears to be a useful agent for sedation during awake intubation in difficult or critical airways. It provides sedation, anxiolysis, analgesia, amnesia, and antisialagogue effects, with minimal respiratory impairment. Additional experience and studies are needed to
further clarify the role of dexmedetomidine as a sole agent for sedation in awake fiberoptic intubation.

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References


