The use of flexible fiberoptic cystoscope for difficult endotracheal intubation in TMJ ankylosis patients: a case series

Taiseer Hussain Al-Khateeb1
and Daher K Rabadi2

Abstract

Background: Fiberoptic bronchoscopes might be vital for the safe performance of difficult endotracheal intubations. However, many hospitals in low or middle-income countries are unable to afford the equipment. We describe the use of a flexible fiberoptic cystoscope, as an alternative to a bronchoscope, for difficult nasoendotracheal intubation in patients with temporomandibular joint ankylosis.

Methods: Eight Jordanian patients (five females and three males) with severe restriction of mouth opening, due to ankylosis of the temporomandibular joint, underwent awake nasoendotracheal intubation using a flexible fiberoptic cystoscope under local anesthesia.

Results: The procedure was successful and well tolerated in all eight patients.

Conclusion: A flexible cystoscope can be a successful alternative to a flexible bronchoscope, for difficult nasoendotracheal intubation in hospitals at rural areas in low-or middle-income countries with limited financial resources.

Keywords: TMJ ankylosis, fiberoptic, cystoscope, intubation

Introduction

Congenital and acquired diseases or conditions may alter the airway anatomy to such extent that attaining and maintaining a patent airway during anesthesia may be difficult or impossible. One example of acquired conditions is temporomandibular joint (TMJ) disorders, notably bony ankylosis. During endotracheal intubation, the anesthesiologist typically attempts both rotational and translational movements of the TMJ to allow for the maximum opening of the patient’s mouth. This maneuver aids in successful direct visualization of the epiglottis and vocal cords, and consequently allows for the atraumatic passage of an endotracheal tube.

An updated report by the American Society of Anesthesiologists (ASA) Task Force on Management of the Difficult Airway specifically confirms that an airway physical examination, for acquired or congenital disease states, should be conducted before the initiation of anesthetic care

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and airway management in all patients. Fiberoptic-guided intubation was one of the main strategies for intubation of the difficult airway. However, there are hospitals in low and middle-income countries who do not have enough resources to acquire the equipment. In fact, purchasing these costly instruments would consume a significant part of their yearly budget. The Hashemite Kingdom of Jordan was classified by the World Bank as a country of “middle income”. Due to slow domestic growth, high energy and food subsidies and, lately, the Syrian refugee crisis, Jordan usually runs annual budget deficits. In Jordan, health care system services remain highly concentrated in the capital Amman with little and limited governmental health spending directed towards rural areas.

This article describes the use of a flexible fiberoptic cystoscope as a tool to nasoendotracheal intubation in eight patients with severe restriction of mouth opening due to ankylosis of the TMJ.

Methods

Between 2002 and 2015, eight patients (five females and three males) with severe restriction of mouth opening resulting from ankylosis of TMJs presented to King Abdullah University Hospital, Irbid, Jordan (Table 1). The age of patients ranged from eight to 40. All patients were classified an ASA1 physical status. During the preoperative anesthetic assessment, these patients were considered unsuitable for intubation after induction of general anesthesia due to uncertainty about the ability to ventilate or intubate after induction of general anesthesia. In the operating room, fiberoptic-guided awake intubation, under local anesthesia of the airway was planned. Due to financial restrictions, a flexible bronchoscope was not available, therefore, a flexible cystoscope was used instead.

**Technique**

The flexible cystoscope (Wolf Cystoscope Model # 7305-006, USA) was checked for size match relative to the lumen of the endotracheal tube. The insertion cord of the cystoscope was lubricated to move freely within the lumen of the endotracheal tube. After establishing a reliable intravenous access and standard monitoring placement, lidocaine 4% was used for topical anesthesia and vasoconstriction of nasal mucosa to prevent bleeding. Sprays (4-5 puffs) of 4% lidocaine were delivered onto the tongue base and the adjoining lateral pharyngeal walls. Topical anesthesia of the trachea, larynx and hypopharynx was obtained by passing a 25-gauge needle through the cricothyroid membrane. After aspiration of air to confirm settlement within the tracheal lumen, 3 mL of 4% lidocaine was injected.

Following routine pre-induction administration of oxygen, the endotracheal tube, lubricated with lidocaine gel, was inserted gently through the prepared nostril into the oropharynx. To prevent the tube from entering

<table>
<thead>
<tr>
<th>patients</th>
<th>Age (yrs)</th>
<th>Gender</th>
<th>Mouth opening</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>F</td>
<td>8mm</td>
<td>Left TMJ bony ankylosis</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>F</td>
<td>10mm</td>
<td>Left TMJ bony ankylosis</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>F</td>
<td>7mm</td>
<td>Left TMJ bony ankylosis-recurrent</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>F</td>
<td>6mm</td>
<td>Bilateral TMJ bony ankylosis</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>M</td>
<td>10mm</td>
<td>Bilateral fibrous ankylosis of TMJ</td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>M</td>
<td>4mm</td>
<td>Bilateral Post-radiation fibrosis</td>
</tr>
<tr>
<td>7</td>
<td>19</td>
<td>M</td>
<td>10mm</td>
<td>Bilateral TMJ bony ankylosis</td>
</tr>
<tr>
<td>8</td>
<td>34</td>
<td>F</td>
<td>13mm</td>
<td>Bilateral TMJ bony ankylosis-recurrent</td>
</tr>
</tbody>
</table>
the hypopharynx and being directed away from the midline, thus interfering with laryngeal exposure, the tube was not advanced too far distally. The secretions were suctioned through the endotracheal tube, and the cystoscope was inserted through its lumen into the oropharynx. Once the epiglottis and vocal cords were seen, the endotracheal tube was advanced into the larynx and the cystoscope was withdrawn. Successful intubation was noted when the patient was unable to phonate, humidification within the endotracheal tube was noted with ventilation, and carbon dioxide was noted on the capnograph. IV induction of general anesthesia was then commenced.

**Ethics approval**

A written informed consent was obtained from each patient prior to the use of the flexible fiberoptic cystoscope. Due to the retrospective nature of the study and the fact that no experiments were done, no ethical approval was necessary. No parts of any patient is shown.

**Results**

The procedure was successful in all eight cases, and all patients tolerated the procedure well. No complications were encountered.

**Discussion**

Most of the techniques and devices routinely used in clinical practice (awake intubation, blind oral or nasal intubation, fiberoptic intubation, intubating stylet or tube-changer, supraglottic airway or, most recently, light wand videolaryngoscope) maintain airway patency by way of manipulation of the structures of the upper airway. Failure to securing and sustaining a patent airway certainly results in hypoxic brain injury or death. Despite the fact that during the last three decades, mortality figures associated with anesthesia dropped to 0.04-7 per 10,000 patients administered anesthetics, a qualitative analysis of mortality associated with anesthesia found that 10% of the anesthesia-related deaths were associated with inadequate respiratory management.

A famous cause of difficult airway is a restricted mouth opening. If the mouth opens less than 25 mm, it is unlikely that any part of the larynx will be visualized by direct laryngoscopy. Restricted mouth opening results from a number of disorders that affect the TMJ and its adjacent structures. It can be classified according to the location of the problem (intra or extra articular), type of tissue involved (osseous, fibrous) and the extension of the fusion (complete or incomplete). TMJ ankylosis precludes or excessively restrains the range of mandibular motion. When it occurs before facial growth is completed, it produces micrognathia, especially if the disease is bilateral. Deviation of the mandible to the affected side occurs when it is unilateral. The difficult intubation in TMJ ankylosis classically results from severe restriction of mouth opening that is often associated with mandibular underdevelopment with an abnormal laryngeal position.

For intubation of patients with a difficult airway (e.g. restricted mouth opening), the updated practice guidelines of the ASA recommends the following algorithm:

1. Assess the likelihood and clinical impact of basic management problems, including difficulty with: patient cooperation, mask ventilation, supraglottic airway placement, laryngoscopy, intubation, or surgical airway access.
2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management.
3. Consider the relative merits and feasibility of basic management choices including:
   - Awake intubation vs. intubation after induction of general anesthesia
   - Non-invasive technique vs. invasive techniques for the initial approach to intubation
   - Video-assisted laryngoscopy as an initial approach to intubation
   - Preservation vs. ablation of spontaneous ventilation
4. Develop primary and alternative strategies.

There are no absolute contraindications for awake intubation other than a true allergy to local anesthetics. Relative contraindications include patient refusal and...
the uncooperative patient. A flexible scope facilitates awake tracheal intubation because, under good topical anesthesia, the procedure is painless and well tolerated by patients. Spontaneous ventilation keeps the airway open, and deep breathing can assist the endoscopist in locating the glottis when airway anatomy is distorted. We used the method of awake intubation under topical anesthesia because we feel that it is safer to intubate a conscious patient breathing spontaneously when the airway is compromised or tracheal intubation cannot be guaranteed. This is particularly true in our situation of limited equipment and work force imposed by the poor financial resources.

In our cases, as the patient’s maximal mouth opening ranged from 4-13 mm. We chose trans-nasal fiberoptic intubation under local anesthesia, with the patient breathing spontaneously. In addition to minimizing the patient’s discomfort and aiding tolerability of the procedure, local anesthesia also helped to avoid the possibility of laryngospasm.

Modern fiberoptic technology has improved the visualization of hidden or obscure structures and enabled health professionals to perform non-invasive and less traumatic laparoscopic, endoscopic, and arthroscopic procedures. However, the cost of the equipment is frequently unaffordable to many hospitals in the developing world. We have found that the use of fiberoptic cystoscopes can be helpful in managing difficult airways when a bronchoscope is unavailable. The use of a cystoscope for endoscopy of the airway has previously been published in two case reports. However, we are the first to report its use in a case series. The main drawback of its use is that, unlike a bronchoscope, the flexible cystoscope provides a relatively small field of vision and rough images.

In conclusion, although the bronchoscope is better suited for the airway endoscopy, we have found that the use of a flexible fiberoptic cystoscope can be helpful in managing difficult airways when a bronchoscope is not available in hospitals in low or middle-income countries with limited financial resources.
References


3. **Sharp JM:** Jordan: Background and US Relations. *Congressional Research Service;* 2015, Sept. 3-16.


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**Predictable and complete reversal**

- 98% of BRIDION patients recovered to a TOF ratio of 0.9 from reappearance of T₁ within 5 minutes¹
- 97% of BRIDION patients recovered to a TOF ratio of 0.9 from 1 to 2 PTCs¹ within 5 minutes²

**Rapid reversal**

- BRIDION rapidly reversed patients from reappearance of T₂ in 1.4 minutes³
- BRIDION rapidly reversed patients from 1 to 2 PTCs¹ in 2.7 minutes³

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Neuromuscular blockade is required within 24 hours of BRIDION administration, a non-depolarizing neuromuscular blocking agent should be used instead of rocuronium or vecuronium. The most commonly reported adverse reactions were dysgeusia (metal or bitter taste) and anesthetic complications (movement, coughing, pinching, or suiting the endotracheal tube). In patients treated with BRIDION, a few cases of awareness were reported. The relation to BRIDION is uncertain. In a few individuals, allergic-like reactions (ie, flushing, erythema, rash) following BRIDION were reported. Cancers should be prepared for the possibility of allergic reactions and take the necessary precautions. In a trial of patients who received BRIDION, 1 patient reported a 2 PTCs and a causal relationship could not be fully excluded.

Volunteer studies have demonstrated a slight (117-229%) and transient (<34 minutes) prolongation of the prothrombin time (activated partial thromboplastin time (APTT)) with BRIDION; however, clinical studies have demonstrated no clinically relevant effect on post- or preoperative bleeding complications with BRIDION alone or in combination with anticoagulants. As BRIDION has demonstrated an in vitro pharmacodynamic interaction with anticoagulants, caution should be exercised. In patients on anticoagulation for a pre-existing or concomitant condition. This pharmacodynamic interaction is not clinically relevant for patients receiving routine postoperative prophylactic anticoagulation. Although general interaction studies have not been conducted, no drug interactions were observed in clinical trials. Preclinical data suggest that clinically significant drug interactions are unlikely with the possible exception of terfenadine, histidine acid, and hormonal contraceptives.

² Non-depolarizing
³ Second twitch

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