Fiberoptic Nasotracheal Intubation in the Emergency Department for Severe Upper Airway Obstruction

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Abstract

Angioedema of the upper airway can pose a challenge in emergency airway management. The semi-awake fiberoptic nasotracheal intubation is an uncommonly performed procedure that allows for the establishment of a definitive airway without removing the patient's airway reflexes, protecting against the cannot intubate–cannot oxygenate scenario. Although common teaching in emergency medicine training, fiberoptic nasotracheal intubations are rarely performed. We report a case of successful intubation in a patient with an acute upper airway obstruction later found due to angioedema. Emergency physicians should have routine training and access to fiberoptic equipment to provide optimal patient care.

Introduction

Patients with airway compromise or high-risk airways may present with acute symptoms when immediate subspecialty consultation is not available and delaying care is not an option. Emergency physicians must be experts in airway management and master an entire range of airway management strategies. Due to the high success rates of orotracheal intubation, fiberoptic nasotracheal intubation remains a rarely performed procedure by emergency physicians despite being a standard component in training programs. A search of available literature reveals a paucity of data describing the use of the procedure in the emergency department (ED). Only small studies and descriptive literature exist regarding its use by emergency physicians. We report a case of successful fiberoptic nasotracheal intubation in a patient with acute severe upper airway obstruction, later found due to angioedema. We will briefly review the available literature and describe our rationale, approach, and technique.

Case Report

A 71-year-old male presented to the emergency department (ED) with facial swelling and shortness of breath. He awoke that morning with left facial swelling that worsened and radiated to the left neck as the day progressed. His wife reported two previous episodes of less severe swelling, the first treated with antibiotics while the second resolved without treatment, although he never received a diagnosis. Past medical history included hypertension managed with lisinopril for years and a history of asthma.

Physical examination revealed a patient in an upright position and leaning forward. His breathing was noisy with coarse stridor. In this position, his respiratory effort was unlabored, although he had difficulty speaking with a muffled voice. Pulse ox was 98% on a non-rebreather facemask. There was obvious edema of the lips, left face, tongue, uvula, and posterior pharyngeal soft tissues with near-complete obstruction of the upper airway. The submandibular space was swollen and indurated, more so on the left.

The initial differential included angioedema, anaphylaxis, and deep space neck infection. The patient was initially treated with intravenous diphenhydramine, dexamethasone, famotidine, and intramuscular epinephrine without improvement. Additionally, a fresh frozen plasma infusion was initiated. Advanced imaging to evaluate for deep space infection was desired, but not feasible with the patient's current respiratory status.

Given the degree of swelling and the patient's respiratory distress, the emergency physician elected to perform a fiberoptic nasotracheal intubation (detailed below). After the airway was secured, a computed tomography (CT) scan revealed superficial soft tissue reticulation and stranding without loculated fluid collection, and near complete upper airway obstruction consistent with angioedema (As seen in Images 1-5).
The patient was admitted to the intensive care unit (ICU) where his condition improved, and he was extubated 24 hours later. His lisinopril was discontinued.

Discussion

While the performance of flexible fiberoptic intubation is well established in the specialties of surgery and anesthesiology for unstable neck injuries and altered anatomy, its use in emergency medicine is far less common. Moreover, emergency physicians perform blind nasal intubations to intubate orally following rapid induction of anesthetic in difficult airways. Blind nasal intubation can result in trauma to the nasal turbinates and upper airway structures. Orotracheal intubation via direct laryngoscopy, while appropriate for most scenarios, is contraindicated in patients with potentially distorted airway anatomy and limited access to the mouth. Furthermore, the paralysis required for direct laryngoscopy may result in complete airway failure precipitating a cannot intubate, cannot oxygenate scenario.

Our patient presented with signs of upper airway compromise. His forward posture, labored breathing with coarse stridor, visible edema of the face, neck, and airway suggested his airway would be difficult to secure through traditional means. We elected to perform a fiberoptic nasotracheal intubation to protect this patient’s airway and allow for further evaluation and management. Patients with similar presentations to smaller facilities requiring transfer ideally should have their airway secured in the safest manner possible prior to transport. While there are new therapies for hereditary angioedema, they are cost prohibitive and not widely available. Thus, a full discussion of angioedema, its causes, and specific therapeutic options are beyond the scope of the current discussion.

Fiberoptic nasal intubation is considered by some to be the standard for airway management in spontaneously breathing patients with anticipated difficult airways, allowing the patient to remain upright and preserving airway reflexes and respiratory effort. In our case, we elected to use intravenous (IV) ketamine to induce a semi-awake state. When combined with a local anesthetic and topical nasal mucosal vasoconstrictive agent, the procedure is generally well tolerated.

In cases of pending airway compromise in which paralysis for orotracheal intubation may perpetuate airway collapse, fiberoptic nasal intubation is the preferred technique. Fiberoptic techniques and proper manipulation of the bronchoscope can be taught to novices to a level of proficiency equal to that of airway experts on simulators, making the use of a fiberoptic bronchoscope practical in the clinical setting of the ED. Regular practice may be necessary to guard against skill decay. In addition to maintaining proficiency, routine practice has been shown to reduce the time required to complete the procedure.

Notably, video laryngoscopes, which are becoming more common, may be useful adjuncts when managing difficult airways but are limited by anatomical considerations and an inability to pass the blade successfully to the pharynx. As with direct laryngoscopy, the blade of a video laryngoscope may trigger an airway collapse. Our ED has access to video laryngoscopy but opted to use a fiberoptic bronchoscope given the severity of edema, and the tripod position of the patient, which would make video laryngoscopy difficult to use.

While awake fiberoptic intubations are common practice for fields like Anesthesiology and Otolaryngology, there is limited published data regarding its use in emergency medicine. We report a case in which a patient with an at-risk airway was intubated successfully using fiberoptics in an ED to demonstrate its effectiveness as a management option and to advocate for routine training, privileges, and access to fiberoptic equipment in EDs.

Review of the Procedure

Patient Selection

Eligible patients for this technique include patients at risk of or with pending airway failure or obstruction who are spontaneously breathing and cooperative. Patients who are unconscious, apneic, or already severely hypoxic are not ideal candidates and require a different approach. Patients needing an interfacility transfer or another workup (i.e. a need for advanced imaging) should have their airway

Image 1. Panel A is an axial image from the patient’s CT scan showing extensive soft tissue swelling and airway edema surrounding the endotracheal tube. Panel B shows similar findings in a sagittal reconstruction. Panel C shows similar findings in a coronal reconstruction. Note the lack of air density surrounding the endotracheal tube.
secured prior to these events. Some patients may be successfully managed without intubation, but only if close monitoring in an ICU setting and subspecialty consultation is immediately available.

**Preparation**

Equipment for surgical airway management should be at the bedside and anatomical landmarks confirmed, possibly sonographically. Some of the authors’ preferred surgical airway tools include a 10-blade scalpel and gum elastic bougie, as well as a 14 gauge angiocatheter and 3-milliliter syringe. The patient should be on cardiac and pulse oximetry monitoring and have adequate IV access. End-tidal CO\(_2\) monitoring is also preferred. Pre-oxygenation should be optimized. In our case, we had equipment for direct and video laryngoscopy, as well as supraglottic rescue devices at bedside. All necessary and available personnel, including nursing and respiratory therapy, should be present at the bedside and available to assist if feasible.

If time allows, adequate anesthesia of the airway will improve the procedure and topical vasoconstrictors will decrease potential bleeding from the nasal mucosa. Multiple approaches may be used to achieve this goal. In this case, we used a mixture of oxymetazoline and 4% lidocaine atomized for the nasopharynx and oropharynx. To achieve anesthesia of the hypopharynx and glottic structures, we administered nebulized 4% lidocaine via facemask.

After application of atomized lidocaine/oxymetazoline, we placed a lubricated nasal trumpet (as seen in Image 2A, inset) to one of the nares to further decongest the nasal mucosa. IV ketamine (1 mg/kg) was administered to facilitate the uncomfortable procedure, yet maintain spontaneous breathing and airway tone and reflexes. Dexmedetomidine and other pharmacologic adjuvants have been described and should be considered based on availability and the treating physician’s experience. A 7-0 endotracheal tube was placed over a flexible adult bronchoscope with an outer diameter of 5.5 millimeters (as seen in Image 2B, inset).

Smaller diameter endotracheal tubes and bronchoscopes may be appropriate depending on the size of the patient’s nasal passage. The nasal trumpet was removed and the bronchoscope was carefully passed through the nose (as demonstrated in Images 2A and 2B), and guided through the glottic opening until the carina was visible (as seen in the progressive endoscopic naso-pharyngeal-tracheal anatomy, Images 3A-F), at which point the endotracheal tube was gently advanced and guided into the trachea over the bronchoscope. The balloon was inflated and placement was confirmed with end-tidal CO\(_2\) detection as well as other traditional means. The patient was able to be positioned supine and further sedation and analgesics were administered. He was safely transported to CT.

**Conclusion**

Preservation of the airway in patients with upper airway obstruction may be difficult via direct laryngoscopy, and the use of paralytics may precipitate a complete obstruction leading to a
cannot intubate, cannot oxygenate scenario. Fiberoptic intubation allows establishment of a definitive airway without removing the patient's airway reflexes and should be considered in certain scenarios. Emergency physicians should have routine training, privileges, and access to equipment for fiberoptic techniques in order to maintain proficiency and provide optimal patient care in all settings.

References