

Rural Airway Management: A Case of Severe Angioedema In a Small Community Hospital

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We present a case of severe angioedema in a small community hospital and the implications it has on emergent airway management in rural settings.

Introduction

Angioedema is a rare condition that results in localized swelling of subcutaneous or submucosal tissue in the oral cavity.^{1,2} Patients suffering from angioedema may require airway management depending on the degrees of severity and swelling.³ There are different airway management strategies to treat this condition, from noninterventional to a surgical airway.⁴ Assessing the airway and degree of airway compromise is critical in deciding a definitive treatment. Obtaining serial photographs in order to measure the amount of unoccupied area in the oral cavity using digital imaging is an effective way to guide that decision-making process.^{5,6}

If the swelling is minor, then the condition may be initially treated medically with the administration of antihistamines, steroids and/or epinephrine.⁷ If treated medically, it is still imperative to monitor the regression of swelling in the manner described above.⁶ However, if the case is severe, then there may not be time to evaluate with digital imaging, as the intervention to secure the airway may be urgent. With the time constraints placed depending on the severity, deciding on the best airway management technique is key, as changes to the intended plan may result in complications. A specialized airway device, such as a flexible fiber-optic bronchoscope (FFB), offers finesse and maneuverability in the oral or nasal cavity. This is beneficial due to the severe swelling, which limits the space of the oral cavity that is not occupied by the tongue. Additionally, as the case is oftentimes emergent and the patient is likely not “nothing by mouth” status, reducing the risk for aspiration by awake intubation is imperative.

Furthermore, management of these patients is more challenging in rural care settings.⁸ Less resources are available in the emergency department (ED) in these settings, and the patient may require transfer to the OR for management. With the lack of an ICU, transfer after definitive care to a tertiary care center may be required. Additionally, in an urgent case it is important to be able

to obtain the necessary equipment, local anesthetics for topicalization, etc., in a timely fashion, which may be more difficult in small community hospitals. We present

a case of severe angioedema in a small community hospital and the implications it has on emergent airway management in rural settings.

Case

An 86-year-old woman with a body mass index of 26.2 kg/m² and a history of hypertension presented to the ED of a small community hospital at 1:45 a.m. with severe swelling of the tongue and oral cavity. Anesthesia was consulted for airway management. Upon arrival and evaluation by a physician in the ED, the anesthesiologist assessed the airway and consulted general surgery

for backup in case a surgical airway was required. The patient had been treated with methylprednisolone, diphenhydramine and famotidine in the ED. The decision was made to transport the patient to the OR for awake nasal intubation with an FFB and minimal sedation (1 mg of IV midazolam and 25 mcg of IV fentanyl) (Figure 1A-O).





Figure 1, continued.

F. Oxygenation

Supplemental oxygen is essential. A nasal cannula was placed in the oral cavity for blow-by oxygen, as this was easily accessible.



G. Intubation: Upper Airway

The softened ETT was loaded onto the FFB. The FFB was introduced through the nares after a defogger was used. It is important to ensure that the end of the scope is clear of secretions and/or ointment, and to avoid edematous areas.

H. Visualization

A view of the vocal cords was obtained. The FFB should not be advanced farther after glottis is in view. The epidural catheter should be advanced to provide topicalization to the trachea.

I. Topicalization

The epidural catheter was advanced. Lidocaine 4% was sprayed to prevent coughing. The FFB may then be advanced farther.

J. Intubation: Lower Airway

The ETT was advanced through the nares using a clockwise-counterclockwise rotation. Concavity of the tube was maintained with the scope to ensure correct positioning. Air should be placed



in the cuff of the ETT and then pushed out in a proximal fashion to make the deflated cuff appear like an arrow.

K. Confirmation

Advance the FFB until a view of the carina is on the monitor. Place your fingertips on the FFB at the nare. Do not remove your fingertips and withdraw the FFB until the distal tip of the ETT is on the monitor. Use the Ovassapian method to measure the distance from the carina to the distal tip of the ETT, which equals the distance from your fingertips to the nare.

L. Disposition

The ETT was secured with tape.

Option A: Administer NMB and general anesthesia, and place patient on controlled ventilation (high risk if the ETT is dislodged and needs to be replaced).

Option B: Mildly sedate the patient and maintain spontaneous ventilation (risk for coughing and inadvertent extubation). Admit patient to the ICU or transfer to another institution.





Figure 1, continued.

M. Post-Evaluation

An ENT evaluated the regression of edema. The ENT advised to keep patient intubated for several days. It is important to consider the etiology of angioedema, treat it medically, and monitor the swelling.

N. Extubation

Patient was awake, alert, oriented, and vital signs were stable. The cuff of the ETT was deflated and a leak was present, indicating that edema had regressed. The patient was extubated safely.

O. Resolution

Supplemental oxygen was administered and a nasopharyngeal airway placed. The tongue was soft and swelling regressed, which improved the amount of unoccupied space in the oral cavity as measured using digital imaging.

ED, emergency department; **ENT**, ear, nose and throat specialist; **ETT**, endotracheal tube; **FFB**, flexible fiber-optic bronchoscope; **NMB**, neuromuscular block

Written consent and permission was obtained from the patient for use of the images.

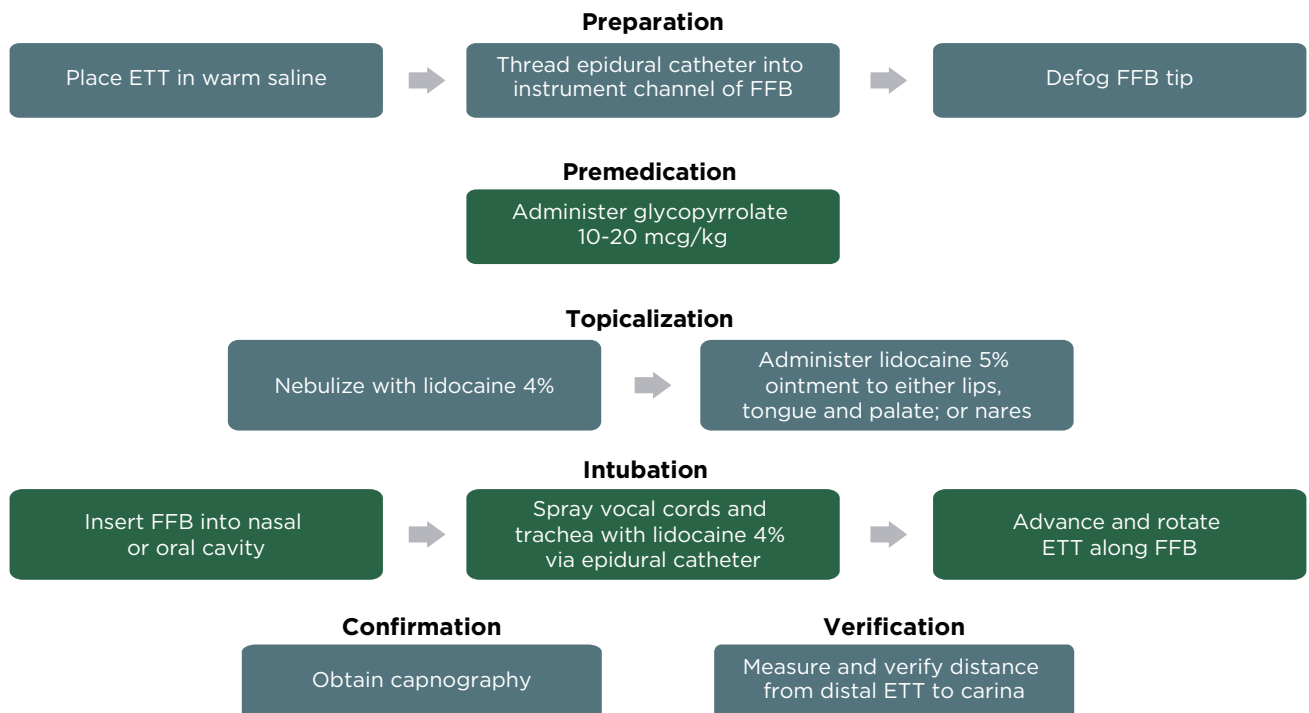


Figure 2. Steps in airway management of severe angioedema.

ETT, endotracheal tube; **FFB**, flexible fiber-optic bronchoscope

Overview of Technique

Preparation

Consider placing a smaller diameter endotracheal tube (ETT) in warm saline water, and wrap it with a warm blanket to soften the tube. Similarly, obtain a small-diameter FFB and defog it to ensure adequate visualization. Thread an epidural catheter through the instrument channel of the FFB in order to administer local anesthetic to the glottis.

Premedication

Premedicate with an antisialagogue to reduce secretions. It is also important to suction the oral and nasal cavities. Minimal sedation should be used to decrease the likelihood of complications related to oxygenation.

Topicalization

For nasal intubation, administer lidocaine 5% ointment to the nares. For oral intubation, administer to the tongue, palate and oral cavity using a tongue depressor and intubating oral airway.

Intubation

Insert the FFB, taking caution to avoid the edematous areas to avoid secretions and minimize bleeding. Once a view of the glottis is obtained, the lower airway should be topicalized with lidocaine 4% sprayed through the epidural catheter that was threaded in the instrument channel. The ETT may then be advanced using a clockwise-counterclockwise rotation (Figure 2).

Conclusion

As previously stated, time is of the essence in cases such as the one described. It is important to be able to easily and more efficiently obtain the resources required for airway management, especially in a rural hospital. We developed a checklist to have on hand in these cases to ensure the best possible preparedness, especially if the patient arrives in the middle of the night (Figure 3).

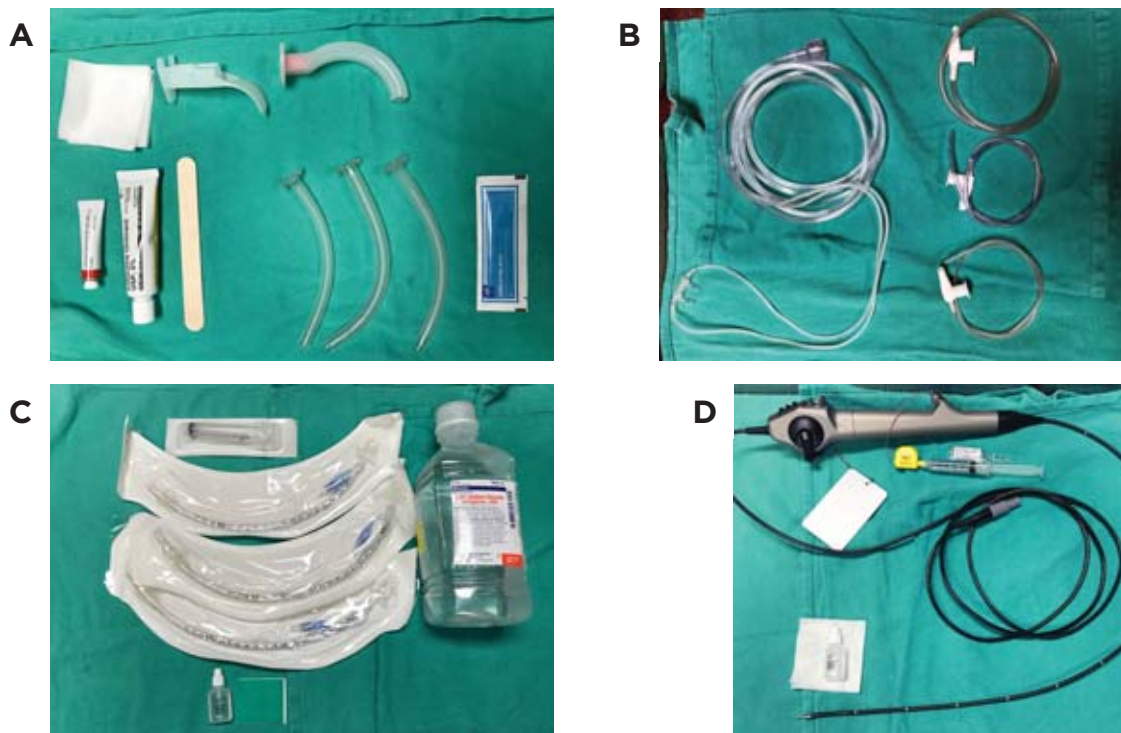


Figure 3. Angioedema airway checklist.

Ointments (A)

- 2 lidocaine 4% 5-mL vials (not shown)
- Nebulizer (not shown)
- Lidocaine 5% ointment
- Lidocaine 2% jelly (backup)
- Lubricating jelly
- Tongue depressor
- Gauze

Airways (A)

- Oral airway
- Ovassapian airway
- 28, 30, 34 Fr nasopharyngeal airways

Oxygen and Suction (B)

- Nasal cannula
- 10 Fr
- 14 Fr
- 18 Fr
- Yankauer (not shown)

Endotracheal Tubes (C)

- For oral/nasal use (0.5- to 1.0-mm smaller ID)
- 10-mL syringe
- Warm saline bottle to wrap in warm towel

Fiber-Optic Bronchoscope (D)

- FFB
- Defogger
- Epidural catheter with 5-mL syringe for lidocaine 4%

FFB, flexible fiber-optic bronchoscope; ID, interior diameter



Figure 4. Rural airway management—difficult airway tray setup.

A. The difficult airway tray setup with the essentials for the technique described:

Left: nasal cannula, gauze, tongue depressor, Ovassapian airway, tape, lidocaine 5% ointment, lidocaine 4% 5-mL vial, nebulizer, nasopharyngeal airways.

Right: suction catheters, FFB with epidural catheter threaded through instrument channel, ETT loaded on FFB, 10-mL syringe for ETT, 5-mL syringe for lidocaine 4%, defogger for the FFB, lubricant gel and warm saline water.

B. Plastic bag containing all of the supplies displayed in Figure 4A with the exception of the FFB and warm saline water.

ETT, endotracheal tube; FFB, flexible fiber-optic bronchoscope

In addition, we have found that having the resources on hand is most important in improving management in a small hospital to reduce the amount of time spent gathering supplies and going to the pharmacy, which may not be open late at night. For this reason, we have an angioedema kit in which all of the necessary resources are stored in a bag that may easily be

accessed in case of emergent airway management (Figure 4).

Ultimately, preparedness and proper evaluation of the patient are imperative for the management of angioedema. This may be done safely in a small community hospital if the necessary steps are done to minimize time and maximize the available resources.

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