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Penn Medicine

Management of difficult airway COVID patients - Emphasis on Angioedema of the Upper Airway

Key Points:

- Maximal medical management should be immediately initiated in patients presenting with angioedema of the upper airway
- The decision to escalate to awake fiberoptic intubation should be based on worsening signs and symptoms of upper airway obstruction, but should not include repeated flexible fiberoptic examinations due to their aerosol-generating potential.
- Aerosols should be minimized or contained as much as possible through avoidance of nebulizers, topical sprays, or any cough-inducing maneuvers.
- Rapid COVID-19 testing should be performed where available to determine the necessary level of safety precautions, but care should not be delayed in anticipation of the final result.
- Appropriate PPE should be worn at all times during aerosol-generating procedures, including flexible fiberoptic laryngoscopy and fiberoptic intubation

Triage and Initial Management:

In patients presenting with upper airway swelling or obstruction who are not in immediate respiratory distress, maximal medical therapy should be implemented immediately. For patients with angioedema, this includes:

- Systemic antihistamines: Diphenhydramine 25-50 mg IV +/- Famotidine 20 mg IV
- Systemic steroids: Methylprednisolone 125 mg IV
- Systemic epinephrine: 0.5 mg IM if process appears to be anaphylactic or allergic-mediated

Other treatment options include:

- Fresh frozen plasma: 2 units for angiotensin-converting enzyme inhibitor-induced (ACEi-induced) angioedema [6]
- Tranexamic acid: 1 g IV over 10 minutes for ACEi-induced angioedema [7]
- Bradykinin pathway inhibitors: if available for hereditary angioedema

Assessment of the patient should include:

- A complete head and neck exam as well as fiberoptic evaluation of the upper aerodigestive tract.
- Because these procedures can also be potentially aerosol-generating, appropriate personal protective equipment (PPE) should be worn.
- A powered air-purifying respirator (PAPR) is preferred. If this is unavailable, a properly fitted N95 mask, covered with a surgical mask with attached eye shield (meant to preserve the N95 in case of need for reuse), combined with a full face shield can also be used. A gown and gloves should also be worn. Topical anesthesia should be avoided.
- The fiberoptic exam should assess the degree and levels of obstruction to help guide further management.
- In addition, a targeted airway ultrasound may be performed to obtain a baseline assessment of airway edema, if the provider has expertise in airway evaluation through this modality [8]. Ultrasound evaluation can be limited by anatomical variables including a short neck and obesity.

Escalation of Care:

- Frequent clinical reassessment of the patient's symptoms must be performed.
- If the patient remains clinically stable, the airway may be serially reassessed through ultrasound as described previously (Schick 2016).
- Frequent fiberoptic reexaminations are not recommended due to their aerosol generating potential, unless the patient is confirmed to be COVID-19 negative.
- Signs of increased work of breathing, stridor, hoarseness, intolerance of secretions, worsening swelling, fatigue, and oxygen desaturations despite maximal medical management should prompt the provider to prepare for intubation.
- In patients demonstrating oropharyngeal edema, generally limited to the uvula and soft palate, without hypopharyngeal or laryngeal edema, early elective rapid-sequence intubation with video laryngoscopy (following standard intubation protocols including for PPE in patients with unknown COVID status) may be performed. In such cases where progression of airway edema is likely and the current anatomy is favorable for video laryngoscopy, it may be preferable to secure the airway in this way, as the degree of aerosolization can be more easily controlled compared to an awake fiberoptic intubation.
- If available, rapid SARS-CoV-2 testing should be performed [9]. However, care should not be delayed in anticipation of the final test result. Given the high rate of asymptomatic COVID-19-positive patients, the PPE described above should be worn by the treatment team during any aerosol generating procedure until the patient is confirmed to be negative by testing. Arguably, given the high false negative rate of some tests [10], the treatment team should wear such PPE for all patients regardless of test results.

Awake Fiberoptic Intubation:

For cases such as angioedema, awake fiberoptic intubation is typically preferred when securing the airway as the use of medications that cause muscle relaxation and decreased airway tone for direct or video laryngoscopy may lead to a "cannot ventilate, cannot intubate" situation. However, awake fiberoptic intubation often involves adequate topicalization for mucosal anesthesia, instrumentation of the nasopharynx, and significant coughing with endotracheal tube placement, all of which are highly aerosolizing and can increase the risk of transmission.

Recommendations for performing awake fiberoptic intubation in COVID-19 positive or PUI patients

Location

The procedure should be performed in a negative pressure room to minimize the risk of transmission.

Personnel

Team members in the room should be kept to the minimal critical number, and preferably with highly experienced personnel. Three people should be present (one maneuvering the fiberoptic scope, one assisting with tube advancement, and one administering anesthesia).

Proper donning and doffing of PPE for each person in the room is essential. As an intubation is considered an aerosol-generating procedure, airborne and droplet precautions should be followed. Each person should wear a head covering, a powered air-purifying respirator (PAPR), gown, and gloves. If a PAPR is not available, a properly fitted N95 mask covered with a surgical mask with attached eye shield, a full face shield, head covering, gown, and gloves should be used. Higher rates of transmission in healthcare workers has been shown in groups who did not wear PPE for airborne precautions [11].

Procedure

Minimizing aerosolization during the procedure itself is critical. An oral fiberoptic intubation is preferable, as instrumentation of the nasal cavity and nasopharynx should be avoided due to the higher viral load in the nasal cavity and nasopharynx compared to the oral cavity and oropharynx [12].

Anesthesia: Nebulized or atomized topical anesthesia should be avoided. Topicalization should be performed with liquid or viscous lidocaine that can be swished and gargled by the patient. Lidocaine ointment should also be applied to the posterior oral tongue, base of tongue, and palate via a coated oral airway device. Local nerve blocks are preferred, including bilateral superior laryngeal nerve blocks, unilateral recurrent laryngeal nerve block, and bilateral glossopharyngeal nerve blocks [13]. These can also be performed under ultrasound guidance for improved efficacy [14]. Transtracheal injections should be avoided to reduce coughing.

Sedation should be used with extreme caution. Dexmedetomidine affords relative protection of respiratory drive while producing anxiolysis and some drying of secretions [15]. Opioids are all respiratory depressants and should be used with caution but can afford profound cough-suppression that is important in the COVID-19 patient. Remifentanil is an ultra short-acting opioid (half-life 3 min) that has been used as a primary sedative for awake airway management [16]. Similarly ketamine is a sedative that preserves respiratory drive and produces dissociative sedation and reflex blunting that can facilitate airway management [17]. Glycopyrrolate may also be given to reduce the amount of secretions at a dose of 0.1 mg IV.

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Intubation: Once adequate anesthesia and sedation has been achieved, an endoscopy mask should be secured to the patient, which would assist in containing secretions and aerosols generated from coughing during the procedure while still allowing access for the scope and passive oxygenation [18].

A disposable bronchoscope is preferred. Once the vocal cords are visualized, final topicalization with 2-3 mL of 2% or 4% lidocaine solution through the bronchoscope directly onto the vocal cords and into the trachea may be performed. Previously administered medications and nerve blocks should help reduce coughing from this maneuver. This final administration of topical anesthetic should help to minimize vigorous coughing once the scope and endotracheal tube are advanced past the vocal cords.

Once the endotracheal tube is placed and the scope is removed, the cuff should be fully inflated and a viral filter should be placed in line with the circuit. Ventilation should not commence until this is performed. Tube placement should be confirmed with end tidal CO2 and appropriately secured. Hospital protocol for decontamination of non-disposable equipment exposed to secretions of COVID-19 patients upon completion of the procedure should be followed. Management of intubated patients should follow standard hospital guidelines depending on COVID-19 status.

In the event of rapid progression and failure of intubation, providers should be prepared for an emergency surgical airway in a “can’t intubate, can’t ventilate” situation. Given the high degree of aerosolization in an emergency surgical airway, adopting an approach of early oral intubation is preferred and recommended.

Recommendations for extubation

Standard criteria for extubation should be followed, using cuff leak to help determine candidacy. A fiberoptic examination prior to or immediately following extubation is not recommended for the aerosol-generating potential. Decisions for reintubation should be made on clinical findings, including a complete head and neck exam as well as consideration of repeat airway ultrasound. Unless the patient has been proven to be COVID-negative, extubation should be performed in a negative pressure room. The number of providers in the room should again be kept to a minimum essential number and appropriate PPE (PAPRs or N95 with closed eye protection) should be worn by all.

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