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SUCCESSFUL INTUBATION OF A DIFFICULT AIRWAY USING A YANKAUER SUCTION CATHETER

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☐ **Abstract—Background: Endotracheal intubation (ETI) is used to effectively manage a patient's airway. Failure of ETI may lead to ineffective ventilation or oxygenation, potentially causing organ damage and eventually death. Approximately 8% of ETIs are difficult and 1% are unsuccessful. Tools and techniques to successfully obtain airway access are essential. Case Report: A patient with chronic obstructive pulmonary disease presented to the emergency department in acute respiratory distress. Noninvasive positive pressure ventilation was unsuccessful in improving the patient's tidal volume and work of breathing. The patient was unable to be intubated by conventional techniques because of a mass obstructing the view of her vocal cords. A cricothyrotomy was considered, but not initially performed because of her distorted anatomy. After multiple intubation attempts from several different physicians, the patient was successfully intubated with the aid of a suction Yankauer, which was used to move the mass peripherally and further served as a conduit through which a bougie was passed. Why Should an Emergency Physician Be Aware of This?: The risk for complications rises with each intubation attempt. While there are a variety of tools and aids that can be used to assist in difficult intubations, rapid airway access is essential, and common tools do not always work. We hope that knowledge of this novel, yet simple and effective technique will help physicians successfully intubate patients with distorted oropharyngeal anatomy who cannot be intubated using conventional methods.**

☐ **Keywords—airway management; bougie; difficult airway; difficult intubation; endotracheal intubation; ventilator support; Yankauer**

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INTRODUCTION

Monitoring of the airway is required for every patient that presents to the emergency department (ED), and advanced airway intervention is required in approximately 2.9 per 1000 ED visits (1). Endotracheal intubation (ETI) is the criterion standard for ensuring airway access, and is used to efficiently oxygenate, ventilate, and prevent aspiration (2). As many as 8% of intubations are categorized as difficult (3). A number of tools and techniques have been developed to guide physicians in successful intubation of these difficult airways, however as many as 1% of intubations fail (4). We present a case involving a patient with a difficult airway because of a previously unidentified oropharyngeal mass that precluded intubation with conventional methods. Access to the airway was achieved using a Yankauer suction catheter to both displace the mass and serve as a conduit for a bougie. This novel intubation technique provides physicians with another option when attempting to intubate patients with difficult airways.

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CASE REPORT

A 69-year-old female tobacco smoker with chronic obstructive pulmonary disease presented to the ED in respiratory extremis caused by acute onset shortness of breath. The patient was initially placed on continuous positive airway pressure (CPAP) by emergency medical services to reduce the effort of breathing and achieve better oxygenation. She arrived in a tripod position and was only able to speak in 3- to 4-word sentences. Initial vital signs obtained upon arrival to the ED were a pulse of 114 beats/min, blood pressure of 171/91 mm Hg, a respiratory rate of 24 breaths/min, and pulse oximetry of 96% on CPAP. She had diminished lung sounds upon auscultation. No obvious stridor was present. The patient was transitioned from emergency medical services continuous positive airway pressure to bilevel positive airway pressure (BiPAP). Steroids and bronchodilators were administered to improve her dyspnea. Even with BiPAP, the patient had low tidal volumes with increased work of breathing and persistent hypercapnia. A chest radiograph revealed no signs of an acute cardiopulmonary process. Recently, the patient had unintentionally lost 80 pounds and her voice had become increasingly hoarse. A computed tomography scan with intravenous contrast of her chest and neck soft tissue was ordered to assess for malignancy, pulmonary embolism, and oropharyngeal obstruction, but was not immediately obtained because of respiratory extremis. An arterial blood gas assessment, after 30 min on BiPAP, showed respiratory acidosis.

A decision to intubate was made because of persistent acidosis and low tidal volume, despite optimal BiPAP settings, with continued increased work of breathing and concerns for respiratory fatigue. Direct laryngoscopy was attempted with a Mac 4 blade, but a large friable bloody oropharyngeal mass was discovered to be obstructing the view of the vocal cords. Next, 2 attempts were made to pass a 6.5-mm endotracheal tube (ETT) around the mass with a Verathon GlideScope Cobalt Advanced Video Laryngoscopy video laryngoscope (Verathon, Inc., Bothell, WA); however, this was unsuccessful. The trauma team was called for consideration of tracheostomy. Cricothyrotomy was considered, however because of pickwickian neck anatomy and patient maintaining 100% on pulse oximetry with an oropharyngeal airway and easy bag valve mask ventilation, this was deferred as a last choice option.

Airway access was achieved by repositioning the mass peripherally with a standard large-bore suction Yankauer. The repositioning aided in the visualization of the vocal cords, and the Yankauer suction catheter was gently passed through the vocal cords. The Yankauer was used as a conduit to place a gum elastic bougie in the absence of lubrication, which slid easily through the suction device with the coude tip inserted first (Figure 1). The Yankauer was removed and the bougie was used to guide the placement of a 6.0-mm ETT without complication using a Seldinger technique (Figure 2). Proper positioning was confirmed with absence of sounds over the epigastrium, presence of bilateral breath sounds, and positive end-tidal CO_2. The patient never became hypoxic throughout the multiple intubation attempts. Subsequently, adequate position of the endotracheal tube was confirmed with chest radiography. Because of the severity of the patient's condition, the family decided to terminally extubate the patient and provide comfort care measures.

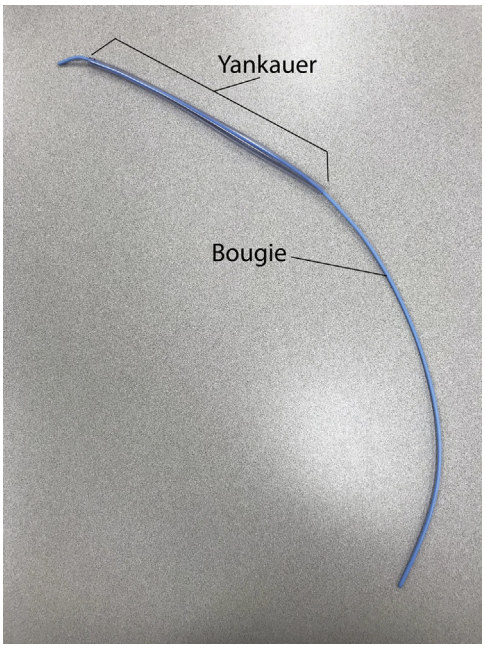

Figure 1. Bougie fed through a wide-bore Yankauer suction catheter.

DISCUSSION

Intubation can be complicated by a number of factors, including patients with a large tongue, lack of teeth,

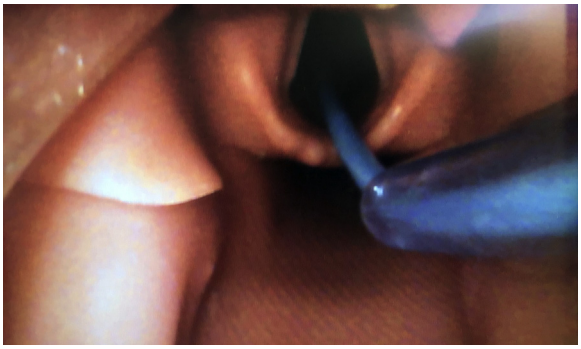

Figure 2. Airway access was obtained with Yankauer suction catheter on a simulation model. Using the Seldinger technique, a bougie was passed through the Yankauer and was subsequently used to direct placement of the endotracheal tube.

higher body mass index, and limited cervical mobility (4). An enlarged thyroid gland can also lead to intubation difficulty secondary to mass effect (5,6). Among patients with goiters undergoing thyroid surgery, 11.1% were difficult to intubate (5). Our patient was difficult to intubate because of a large mass obstructing the view of her vocal cords, in combination with pickwickian neck anatomy. Tumors are the most common cause of tracheal obstruction (7). Our patient was a 50-pack/year tobacco smoker with chronic obstructive pulmonary disease. In addition to causing 90% of lung cancers, smoking can cause laryngeal cancers, which may obstruct the view of the vocal cords (8). Even though there are multiple methods for evaluating the difficulty of intubation, these cases cannot always be predicted, and physicians should always be prepared with alternative methods (1,4).

Repeated attempts to successfully intubate a patient may increase the risk of complications (9,10). When orotracheal intubation is successful on the first attempt, only 14.2% of the patients had adverse effects (10). Among patients who required 2 attempts, 47.2% had adverse effects, and among patients who required 3 attempts, 63.6% had adverse effects (10). Repeated intubation attempts may cause inflammation, bleeding, aspiration, or hypoxia resulting in irreversible organ damage (2). Difficult intubations cannot always be predicted, especially with the presence of an unknown upper airway mass, and therefore emergency physicians should be aware of novel approaches to achieve airway access.

There are several guidelines for difficult intubations to help physicians rapidly identify the next best methodology to obtain airway access, including those from the Difficult Airway Society (11). Physicians may start with more advanced techniques (e.g., supraglottic techniques, nasopharyngeal devices, or cricothyrotomy) from the first attempt depending on the difficulty level of the intubation and the physician's comfort level. For our patient, several devices were used with limited success; however, because of our ability to maintain appropriate oxygen levels for the patient with a bag valve mask, further intubation attempts were warrented due to the anticiptated difficulty of a cricothyrotomy. As confirmation of the utility of this approach, 2 other case reports discuss the use of a Yankauer suction catetheter during emergent situations. The first was a comment, to a case report, that described the use of a Yankauer–bougie Seldinger technique, where a pediatric patient was intubated using a 22-Fr Yankauer as a conduit through which a 10-Fr bougie was passed (12). The second was for obtaining a biopsy specimen from a bleeding intraoral mass. While suctioning, the glottis became visible and the suction catheter was inserted and subsequently used as a guide for placement of an 8.0-mm ETT before being removed (13). Each case used the Yankauer suction catether for slightly different purposes. For our case and the pediatric case, the gum elastic bougie proved too flexible to adequately navigate the desired route; however, the rigidity of the suction catheter was beneficial in traversing the airway obstacles. Our technique can be used with various suction catheters and bougies, as long as the bougie diameter is smaller than the bore of the suction cather. Together these cases highlight the utility of a Yankauer suction catheter and its use as an additional rigid intubation tool that can prove beneficial in a variety of difficult emergent intubations.

WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

Airway management is a crucial component of emergency medicine. Emergency physicians have to determine the best method of maintaining the patient's airway in a short period of time. Patients with airway tumors, goiters, distorted anatomy, decreased cervical mobility, and large tongues are all at an increased risk of difficult intubation and may require advanced techniques for success on the initial attempt. Of patients with difficult airways, use of a bougie results in a 14% higher first-pass intubation rate than the sole use of an ETT with a stylet (96% and 82%, respectively) (14). Most EDs around the country rely on emergency physicians for intubations. If emergency physicians use the LEMON (look externally, evaluate the 3:3:2 rule, Mallampati score, obstruction, neck mobility) risk assessment tool before intubation, they may reduce the number of attempts and improve patient outcomes. However, intubations can be complicated and thus emergency physicians need other techniques to assist with these difficult intubations.

The standard first-line ETI techniques include direct laryngoscopy and video laryngoscopy. If the first-line intubation fails, physicians may resort to a supraglottic airway, such as the iGel, combitube, and king airway. The drawback to supraglottic airways is that they are not considered definitive airways and may still allow for aspiration. Additional adjuncts for a failed intubation attempt include bougies, fiberoptic devices, digital intubation, nasotracheal intubation, laryngeal mask airways, cricothyrotomy, and our new method of using a Seldinger technique with a Yankauer suction catheter and gum elastic bougie. Despite the additional time required for our multistep technique, for difficult cases, the benefit outweighs the extended time needed because achieving airway access is critical.

We hope this novel technique of using a Yankauer suction catheter as a conduit through which a bougie can be passed will help emergency physicians intubate patients who cannot be intubated using the conventional methods. This intubation technique is relatively simple and easy to

perform, and most EDs will have all of the necessary tools at their disposal.

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REFERENCES

1. Wong E, Ng YY. The difficult airway in the emergency department. Int J Emerg Med 2008;1:107–11.
2. Bernhard M, Becker TK, Gries A, Knapp J, Wenzel V. The first shot is often the best shot. Anesth Analg 2015;121:1389–93.
3. Divatia JV, Khan PU, Myatra SN. Tracheal intubation in the ICU: life saving or life threatening? Indian J Anaesth 2011;55:470–5.
4. Reed MJ, Dunn MJG, McKeown DW. Can an airway assessment score predict difficulty at intubation in the emergency department? Emerg Med J 2005;22:99–102.
5. Amathieu R, Smail N, Catineau J, Poloujadoff MP, Samii K, Adnet F. Difficult intubation in thyroid surgery: myth or reality? Anesth Analg 2006;103:965–8.
6. Srivastava D, Dhiraaj S. Airway management of a difficult airway due to prolonged enlarged goiter using loco-sedative technique. Saudi J Anaesth 2013;7:86–9.
7. Wood DE. Management of malignant tracheobronchial obstruction. Surg Clin North Am 2002;82:621–42.
8. Smoking and cancer. Overviews of diseases/conditions, tips from former smokers. Available at: https://www.cdc.gov/tobacco/campaign/tips/diseases/cancer.html. Accessed February 7, 2018.
9. Kim C, Kang HG, Lim TH, Choi BY, Shin YJ, Choi HJ. What factors affect the success rate of the first attempt at endotracheal intubation in emergency departments? Emerg Med J 2013;30:888–92.
10. Sakles JC, Chiu S, Mosier J, Walker C, Stolz U. The importance of first pass success when performing orotracheal intubation in the emergency department. Acad Emerg Med 2013;20:71–8.
11. Frerk C, Mitchell VS, McNarry AF, et al. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. Br J Anaesth 2015;115:827–48.
12. Masters J, Rope T. Suction tube-facilitated videolaryngoscopic intubation. Anaesthesia 2015;70:1003.
13. Aseem M, Palaria U, Bhadani U. Use of suction catheter as an aid to intubation in emergency situation of intraoral bleeding. Indian J Anaesth 2010;54:267–8.
14. Driver B, Dodd K, Klein LR, et al. The bougie and first-pass success in the emergency department. Ann Emerg Med 2017;70:473–8.