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CASE REPORT

Airway

An intubation technique using hyperangulated video laryngoscopy and a DuCanto suction catheter preloaded with a bougie: A case report with a video demonstration

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Abstract

Video laryngoscopy outperforms direct laryngoscopy for successful orotracheal intubation in the emergency department. When performing video laryngoscopy, emergency physicians may use a standard geometry blade or a hyperangulated blade. Hyperangulated video laryngoscopy is easier when using a rigid hyperangulated stylet instead of a standard malleable stylet. The angulation of the hyperangulated blade makes it difficult to use an endotracheal tube (ETT) introducer ("bougie"). We describe a case report using a DuCanto suction catheter (SSCOR) with a preloaded bougie to perform orotracheal intubation during hyperangulated video laryngoscopy. An adult patient presented to the emergency department in status epilepticus and was intubated for airway protection. Hyperangulated video laryngoscopy was performed with a LoPro S4 (GlideScope) blade; a DuCanto suction catheter was used to deliver a bougie through the vocal cords. The bougie was advanced down the trachea, and the DuCanto suction catheter was removed. The bougie successfully delivered a size 8.0 ETT. Visualization of the larynx with hyperangulated video laryngoscopy is usually easy, but ETT delivery into the trachea can be challenging. Rigid hyperangulated stylets were created to facilitate ETT delivery, but these stylets are expensive and often not available. Traditional teaching says that a bougie cannot be used while intubating with a hyperangulated blade. This case report describes a method to deliver a bougie via a DuCanto suction catheter during hyperangulated video laryngoscopy. It allows for the use of a bougie with a hyperangulated blade and offers a technique to perform hyperangulated video laryngoscopy without a rigid stylet.

KEYWORDS

airway management, bougie, critical care, endotracheal tube introducer, hyperangulated blade, intubation, video laryngoscopy

1 | INTRODUCTION

Video laryngoscopy (VL) has better first-pass success rates for orotracheal intubation when compared with direct laryngoscopy (DL).[1] VL can be performed with a standard geometry (SG) blade or a hyperangulated (HA) blade. SG blades allow for both direct and video visualization of the vocal cords. On the other hand, HA blades only allow for video visualization of the vocal cords. First-pass intubation success rates are similarly high for both SG and HA blades.[2]

The procedure of endotracheal intubation can be broken down into two distinct sub-procedures: laryngoscopy and endotracheal tube (ETT) delivery. With SG blades, ETT delivery follows a relatively straight path and is typically straightforward. If the larynx is poorly visualized, edematous, or presents other anatomical challenges, an ETT introducer ("bougie") can be used to enter the larynx, go down the trachea, and provide a "railroad track" for the ETT to be advanced over the bougie and intubate the trachea. With HA blades, ETT delivery follows a dramatically curved path around the base of the tongue and then anteriorly to the larynx, which can be difficult to achieve with a bougie or standard malleable stylet. A rigid HA stylet is helpful for ETT delivery because it parallels the shape of the HA blade and allows the ETT to bend around the base of the tongue, and then angles anteriorly to approach the larynx. The rigidity of the stylet maintains its shape if any airway structures are impacted on the way to the larynx, which can bend a malleable stylet out of shape and make intubation impossible.

Although rigid HA stylets have been shown to be superior to standard malleable stylets for HA blade intubations,[3] their widespread availability may be limited in many locations because of their high cost. Despite being reusable, they are sometimes inadvertently thrown away after use. Unlike with SG blades, bougies are classically taught to be very difficult, if not impossible, to use effectively with HA blades because the amount of anterior bend needed to reach the larynx precludes passage of the bougie down the trachea.

To enable bougie-aided intubations with HA blades, especially if the emergency physician does not have rigid HA stylets, we describe a method to easily introduce a bougie to the larynx and down the trachea with HAVL. The DuCanto suction catheter (SSCOR)[4] is a wide-bore rigid suction catheter with a 6.6 mm lumen and a shape that approximates an HA blade. It can accommodate a standard adult-sized bougie, which is 5 mm in diameter. Recently, a peer-reviewed case report of using a DuCanto suction catheter as a bougie delivery system was published using an SG blade during a difficult airway requiring copious suctioning.[5] Herein, we describe a modification of this technique by performing HAVL with a bougie preloaded into a DuCanto suction catheter to deliver the bougie to the larynx and then down the trachea for rapid, successful intubation.

2 | CASE REPORT

Upon arriving the emergency department (ED), the patient had a generalized tonic-clonic seizure that self-terminated after 1 min. Without returning to neurologic baseline, the patient had a second seizure 2 min later and was given 4 mg of intravenous (IV) midazolam, and after approximately 1 min the patient was given an additional 5 mg of IV midazolam, which terminated the second seizure. They were loaded with 4.5 g of IV levetiracetam. Several minutes later, the patient had a third seizure and received an additional 9 mg of IV midazolam (5 mg IV, then 4 mg IV). The decision was made to intubate the patient for status epilepticus and airway protection.

FIGURE 1 GlideScope Lo Pro S4 blade with bougie preloaded through DuCanto suction catheter.

The patient was pre-oxygenated with a non-rebreather face mask and nasal cannula to an oxygen saturation of 100% for 2 min. For rapid sequence intubation, 30 mg of IV etomidate and 140 mg of IV succinylcholine were administered. Prior to placing the laryngoscope, the oropharynx was suctioned using a DuCanto suction catheter attached to wall suction. Then, an HA blade (GlideScope LoPro S4)[6] was placed into the oropharynx. After obtaining a view of the larynx appropriate for an HA blade (Cormack-Lehane 2B view), the DuCanto suction catheter—preloaded with a bougie with the coudé tip protruding from the leading end (Figure 1)—was advanced easily into the oropharynx and around the base of the tongue. The DuCanto suction catheter delivered the tip of the bougie directly between the vocal cords, and the bougie was advanced through vocal cords and down the trachea under direct visualization (Figure 2). The typical tracheal ring clicks and "stop sign" were felt as the bougie advanced down the trachea to a depth of approximately 35 cm. The DuCanto suction catheter was removed over the bougie, and a size 8.0 ETT was delivered over the bougie

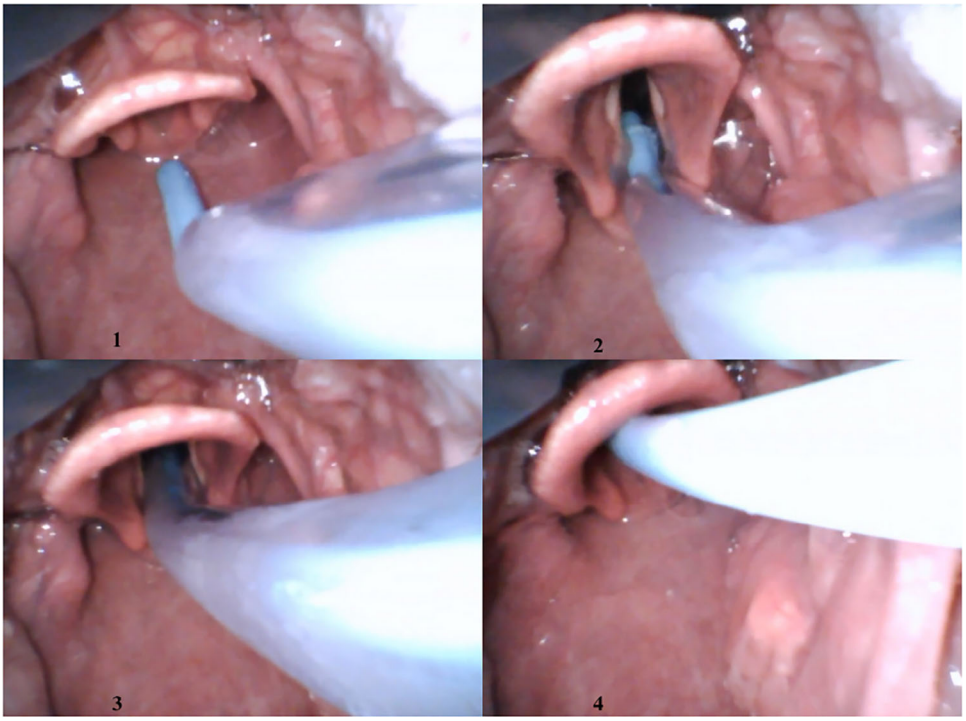

FIGURE 2 Delivery of the bougie through the DuCanto suction catheter (Video S1).

(Video S1). The bougie was then removed from inside the ETT and mechanical ventilation was initiated with ETT placement confirmed with continuous end-tidal carbon dioxide capnography. Chest x-ray verified mid-tracheal ETT placement. There were no peri-intubation complications. The patient was started on a propofol infusion and admitted to the neurocritical care service. They left the hospital 3 days later, back at their baseline mentation and neurologic status.

3 | DISCUSSION

This approach to HAVL intubation is important to help overcome common problems with HA blade intubations. Although HAVL is known for excellent visualization of the larynx, without pairing it with a matching rigid HA stylet, successful ETT delivery can be challenging or impossible. Rigid HA stylets are not as commonly available as their HAVL blade counterparts often due to cost and stock issues, making safe and effective intubation practices more difficult to achieve. HA blades conform well to the primary (oropharyngeal) curve of the airway but do not align with the secondary (pharyngo-glotto-tracheal) curve of the airway, so even if the ETT can reach the larynx, advancement of the ETT down the trachea can be difficult.

The substantial angulation of the DuCanto suction catheter, coupled with the coudé tip of the bougie, creates an angle of approach that is comparable to the curve of an HA blade to allow for easy passage of the bougie around the primary curve of the airway. The flexibility of the bougie then allows it to conform to the secondary curve of the airway and advance down the trachea. If the coudé tip hangs up on tracheal rings, the bougie can be rotated to dislodge the tip off the rings.

FIGURE 3 A visual comparison of the DuCanto and Yankauer suction catheters.

There is emerging evidence and expert consensus that wide-bore suction catheters like the DuCanto should replace the more narrow, less angulated Yankauer catheter (Figure 3) for use during intubation because of increased ability and speed of clearing airway debris.[7] DuCanto suction catheters are approximately $3 each on many purchasing sites, compared with $1–2 each for Yankauer suction catheters. The DuCanto-bougie HAVL intubation method provides

a low-cost and effective procedure to facilitate ETT delivery. Moreover, as the bougie has been shown to improve intubation first-pass success[8] and is becoming widely adopted and increasingly available, the two components of this ETT delivery procedure should be available in virtually every ED. Finally, using a preloaded DuCanto-bougie combination (rather than placing the DuCanto through the vocal cords and subsequently advancing the bougie into and through the DuCanto) can save precious seconds during the intubation, which can be crucial in a physiologically non-optimized patient. Of note, in difficult airways with significant debris (bleeding or copious emesis), there may be a DuCanto suction catheter in the oropharynx already (i.e., suction-assisted laryngoscopy and airway decontamination [SALAD] technique),[9] and SALAD can be used in situ with this method.

This method has potential limitations. First, if copious suctioning is required, then a second suction device would have to be present to provide suctioning while the DuCanto that has been preloaded with the bougie is used to pass the bougie through the vocal cords. A possible solution would be to employ the technique published by Cochran-Caggiano et al.,[5] which uses one suction catheter to remove debris, find the vocal cords, disconnect wall suction, and then pass the bougie through the suction catheter. Additionally, the increased cost of the DuCanto suction catheter compared to the Yankauer may be a potential limitation in resource-limited environments.

Although not yet extensively studied, this technique is likely widely applicable across various patient presentations. We strongly recommend that clinicians simulate this technique on a mannequin before employing it in direct patient care.

4 | CONCLUSIONS

HAVL is a common approach for intubation in the ED. If a rigid HA stylet is not available, ETT delivery can be very challenging. In classic teaching, the bougie cannot reliably be used with HAVL. However, this case report describes a promising HAVL technique using a bougie-preloaded through a DuCanto suction catheter for simple bougie delivery down the trachea, followed by the ETT intubation.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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