J.E. Pollard, Department of Anesthesiology, University of Utah, SOM,
30 N. 1900 E. 3C444 SOM, Salt Lake City, UT 84132, USA

Two Case Reports of a Rescue Intubation Technique using a Total Control Introducer™ with a Hyperangulated Video Laryngoscope.

J. E. Pollard,[1] A. Dziuba,[2] D. Ferranti[3]

1 Associate Professor of Anesthesiology, Department of Anesthesiology, University of Utah, SOM, Salt Lake City, UT, USA
2 M.D. Resident in training PGY 3, Department of Anesthesiology, University of Utah, SOM, Salt Lake City, UT, USA.
3 M.D. Candidate, University of Utah, SOM, Salt Lake City, UT, USA

Correspondence to: Dr J.E. Pollard, Jacob.Pollard@hsc.utah.edu

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TCI Articulating introducer rescue after failed video laryngoscopy

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Rescue intubation with RSI/TCI Articulating Introducer

Summary
This case report demonstrates two rescue intubations that utilize an articulating Total Control Introducer ™ after failure to intubate with a video laryngoscope and a rigid stylet. One patient was under cervical spine precautions, and the other was an unanticipated difficult airway. The outcome in both cases was successful tracheal intubation using the rescue device Total Control Introducer ™. We suggest utilizing a Total Control Introducer ™ as a rescue device after failed video laryngoscopy during the COVID-19 pandemic. This device could displace techniques such as direct laryngoscopy or an intubating Laryngeal Mask Airway, which may have a higher risk of provider contamination.

Introduction
A "rescue device" is often required during the intubation of a difficult airway. Common rescue devices include a bougie, intubating Laryngeal Mask Airway (LMA), video laryngoscope (VLS), or fiberoptic bronchoscope. The use of a rescue device presents two problems likely encountered during the COVID-19 pandemic. First, these rescue devices can introduce more contaminated equipment spreading the infection to surrounding personnel. Second, rescue devices may become scarce as resources deplete, and more patients require intubation and mechanical ventilation [1].

To lower the risk of provider exposure, many society guidelines recommend utilizing a VLS for the first intubation attempt in COVID-19 patients [2–4]. VLS manufacturers often supply stylets that complement the angle of the blade to facilitate tracheal intubation. These rigid stylets offer limited maneuverability; thus, one limitation to this technique is the potential difficulty directing an endotracheal tube towards the glottis despite favorable Cormack and Lehane view resulting in a failed intubation attempt.

It is not uncommon for a laryngoscopist to achieve a grade I or II view using a hyperangulated VLS, but be unable to intubate with a rigid stylet. One solution to this problem is the combined technique, where a fiberoptic bronchoscope is used to maneuver through the upper airway and into the trachea. A pre-loaded endotracheal tube is then passed over the fiber-optic bronchoscope [5]. The Total Control Introducer ™ (TCI ™, TTCmed.com, Salt Lake City, UT) possesses an articulating tip, which offers a potential solution to this problem and maybe a useful tool for rescue for VLS failure due to endotracheal tube delivery despite an adequate view.

We report the successful use of the novel articulating TCI ™ as a rescue tool during video laryngoscopy. We believe that the TCI ™ could act as a low-risk rescue device after a failed VLS attempt during this COVID-19 pandemic.

Case Report 1
A 48-year-old male presented open reduction internal fixation of a pelvic fracture without significant past medical history. Examination showed a Mallampati IV, limited mouth opening, a thyromental distance greater than 3 cm, and a thick neck. BMI was 32.

The plan was to manage the airway asleep with a VLS. Induction consisted of 200 mcg fentanyl, 150 mg Propofol, and 50 mg rocuronium. Relaxation was confirmed. A Cormack and Lehane grade IIa view was obtained using a Glidescope with a GLV 4 blade. We were unable to intubate with a Gliderite stylet loaded with an 8.0 endotracheal tube due to the inability to direct the ETT anteriorly enough to reach the glottis. The attempt was discontinued, and bag-mask ventilation (BMV) started.
A second attempt used a TCI ™ pre-loaded with an 8.0 endotracheal tube. A Cormack-Lehane Grade IIa view was obtained using the same VLS and Blade. The TCI ™ was advanced alongside the blade until the tip appeared in the VLS field of view. The tip was articulated anteriorly and seated between the vocal

folds. The tip was then articulated posteriorly and passed through the glottis into the trachea until the green zone was adjacent to the vocal cords. Maintaining visualization with the VLS, the handle of the TCI ™ was removed. The endotracheal tube was advanced over the introducer into the trachea. The TCI ™ and VLS were removed, leaving the endotracheal tube in place.

Case Report 2

A 48-year-old male presented for lithotripsy. Past medical history included OSA and obesity BMI 36. Airway examination revealed Mallampati III, normal mouth opening, a thyromental distance greater than 3 cm, and a thick neck.

Induction consisted of 150 mcg fentanyl, 200 mg Propofol, and 100 mg succinylcholine. Once relaxed, direct laryngoscopy was then performed using a Mac 3 blade resulting in esophageal intubation. The endotracheal tube was promptly removed, BMV was initiated, and a VLS was requested.

A Cormack-Lehane Grade IIa view was obtained using a Glidescope with a GLV3 blade. Intubation using a 7.5 cm endotracheal tube loaded onto a Gliderite rigid stylet was attempted. It was quickly determined that the glottic opening was too anterior. An attempt with a standard bougie using the same VLS view failed due to inadequate anterior reach of the bougie. BMV again easily performed. The patient was given 50 mg of rocuronium.

A TCI ™ was pre-loaded with a 7.5 endotracheal tube. The same VLS and blade were used to obtain the same view. The TCI ™ was advanced alongside the VLS blade until the tip appeared in the VLS field of view. The tip was articulated anteriorly and seated between the vocal folds. The tip was then articulated posteriorly, passed through the glottis into the trachea until the green zone was adjacent to the vocal cords. The handle of the TCI ™ was removed. The endotracheal tube was advanced over the introducer into the trachea. The TCI ™ and VLS were removed, leaving the endotracheal tube in place.

Discussion

We present two examples in which the TCI ™ was used as a rescue intubation tool after traditional attempts with VLS failed.

The COVID-19 pandemic has resulted in an unprecedented need for intubation and mechanical respiratory support. Estimates indicate that millions of COVID-19 patients across the world will require intubation for both respiratory failure and surgical procedures [6]. Advanced airway management in an infected patient presents a unique challenge, as it is known to cause aerosolization of respiratory secretions, which poses a risk of infection to the proceduralist and surrounding personnel [7]. During this pandemic, our medical system cannot afford to lose physicians, nurses, or respiratory therapists due to quarantine and/or illness. The need to reduce the risk of contamination of providers cannot be overstated.

In the setting of a difficult airway, bag-mask ventilation (BMV) and multiple intubation attempts can increase the risk of provider exposure to contagious respiratory droplets and aerosolized virus [8]. Ideally, the intubation of an infected patient is accomplished rapidly, without the need for BMV or multiple airway instrumentations.

Rapid and efficient intubation of COVID-19 patients will be essential to protect the provider from unnecessary exposure. As multiple society guidelines recommend that the first attempt at laryngoscopy in the COVID-19 patient should be via VLS, it is probable that over the course of millions of COVID-19

intubations, practitioners will find themselves in scenarios similar to those we describe above. The TCI™ offers an option similar to the combined technique, with the advantage of preserving fiberoptic bronchoscopes for diagnostic and therapeutic purposes.

TCI™ has several unique features. First, the device has a removable pistol grip that permits single-handed anterior and posterior articulation of the introduce tip, allowing the operator to dynamically control the tip of the introducer as it passes through the upper airway and into the trachea. Second, the shaft of TCI™ is flexible enough to conform to the curvature of the upper airway, yet is stiff enough to allow pass over of an endotracheal tube. Finally, color depth bands are printed on the distal shaft of the TCI™, providing operator control of tracheal depth at the level of the glottis (see Figure 1).

Figure 1: The total control introducer. The introducer has an articulating tip that can be controlled with a removable pistol-grip handle. On the distal shaft, color depth bands are printed, allowing the user to know the depth of tracheal penetration.

The TCI™ rescue technique is as follows. Visualization of the glottis is acquired using a standard VLS. Under direct visualization, the TCI™ tip is inserted alongside the VLS blade into the visual field of the VLS. The tip is then dynamically maneuvered through the glottis and into the trachea until the green zone of the depth bands is adjacent to the vocal cords. At this point, the handle is removed, and an endotracheal tube is passed over the introducer into the trachea. Finally, the introducer is removed, leaving the endotracheal tube in place.

In closing, consider a hypothetical example of a COVID-19 patient being intubated in the ICU. A VLS is used to achieve a view of the glottic opening; however, the provider quickly realizes that intubation with a standard rigid stylet is not possible due to the anterior position of the glottis. The provider then removes the rigid stylet, and while maintaining their current VLS view of the glottis, introduces a TCI™ and facilitates intubation. This example illustrates the potential benefit a TCI™ can offer during the intubation of a COVID-19 patient. First, the provider was only required to instrument the airway a single time. Second, assuming that it was quickly recognized that intubation with a rigid stylet wasn't possible, the patient did not require BMV. Both of these points reduce exposure to the provider and surrounding personnel. Finally, additional equipment (e.g., fiber optic bronchoscope) was not required, allowing the preservation of critical resources.

In conclusion, we describe two cases in which the TCI™ was used as a rescue device during intubation. We suggest that the TCI™ could be a valuable rescue tool for providers intubating COVID-19 patients during this pandemic.

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Conflict of Interest
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