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Techniques and Procedures

THE HENNEPIN DOUBLE-TUBE TECHNIQUE: A MORE EFFICIENT METHOD OF TRACHEAL INTUBATION THROUGH THE LMA FASTRACH

Daniel H. Lee,* Glenn Paetow,* Matthew E. Prekker,*,† and Brian E. Driver*

*Department of Emergency Medicine, Hennepin County Medical Center, Minneapolis, Minnesota, and †Division of Pulmonary/Critical Care, Department of Medicine, Hennepin County Medical Center, Minneapolis, Minnesota

Reprint Address: Daniel H. Lee, Department of Emergency Medicine, Hennepin County Medical Center, 701 Park Avenue, Mail Code 825, Minneapolis MN, 55415

□ **Abstract—Background: The LMA Fastrach (LMA North America, Inc; hereafter termed the *intubating laryngeal mask airway* [ILMA]) is an extraglottic device designed to facilitate endotracheal intubation. After the endotracheal tube is placed through the lumen of the ILMA into the trachea, the ILMA is removed, using a proprietary stabilizer rod to hold the tube in place. Discussion: The traditional method of ILMA removal is not optimized for the critically ill patient. It requires the use of unfamiliar equipment, exposes the patient to a significant period without ventilation, and risks tube dislodgement. We designed a simple technique with a double-endotracheal tube setup that addresses these problems using common equipment, allowing for continuous ventilation, and minimizing the risk of tube dislodgement. Conclusions: The traditional method of ILMA removal around an endotracheal tube is not designed for critically ill patients or the physicians taking care of them. This novel technique is designed to improve the usability of the ILMA for physicians and improve airway outcomes for patients. © 2022 Published by Elsevier Inc.**

□ **Keywords—airway management; LMA Fastrach; ILMA removal; stabilizer rod**

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INTRODUCTION

The LMA® Fastrach™ (LMA North America, Inc; hereafter termed the *intubating laryngeal mask airway* [ILMA]) is an extraglottic airway device widely used by emergency physicians, prehospital providers, and anesthesiologists as either a backup in cases of failed airway management or as a primary airway management device (1–3). The ILMA was designed specifically to facilitate endotracheal intubation through the lumen of the device (4). After initial placement, inflation, and successful oxygenation through the ILMA with a manual ventilation bag, the process of intubation through the device occurs in two steps (5). First, the manual ventilation bag is disconnected and either a proprietary wire-reinforced silicone or a standard polyvinyl chloride (PVC) endotracheal tube is fed through the rigid ILMA conduit. Our practice is to use a standard PVC tube in a reverse curve (6). The manual ventilation bag can then be reconnected to the endotracheal tube for ventilation. The second step is to remove the ILMA by slowly retracting the device without dislodging the endotracheal tube. This requires the clinician to remove both the manual ventilation bag and standard 15-mm endotracheal tube adapter, deflate the ILMA, and remove the ILMA while attempting to keep the endotracheal tube in place using a proprietary semi-rigid stabilizer rod. Once the ILMA is removed, the tube adapter and manual ventilation bag can be reconnected to

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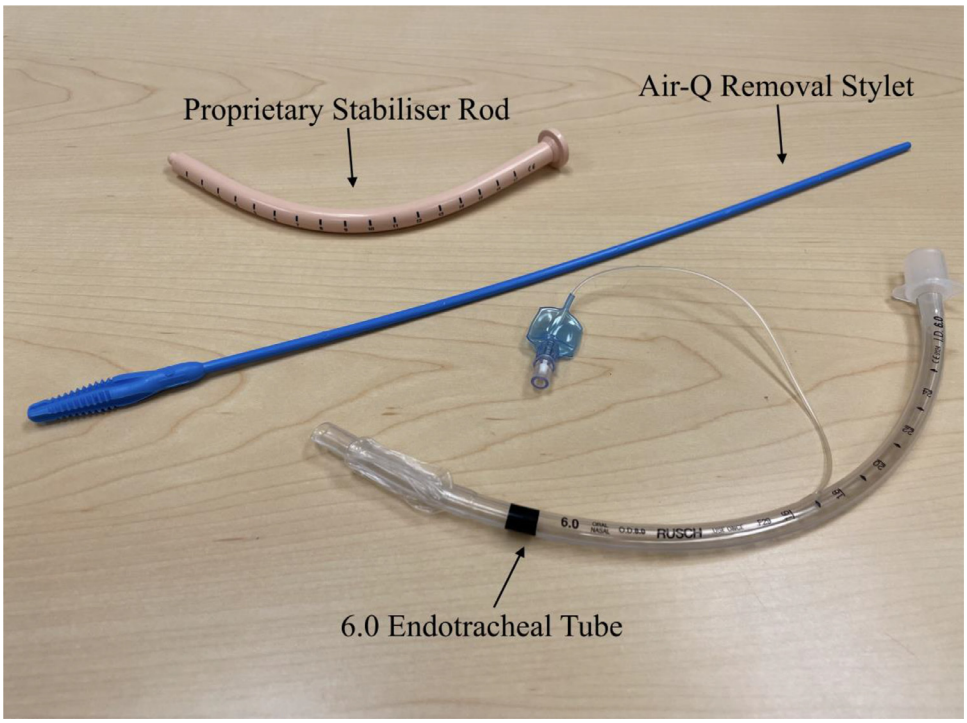

Figure 1. Three different stabilizer rods for the intubating laryngeal mask airway including the proprietary stabilizer rod, the Air-Q removal stylet, and a size 6.0 endotracheal tube.

the endotracheal tube for ventilation. This technique is often successful, but in our experience can be cumbersome and has resulted in inadvertent extubation.

DISCUSSION

In our experience, removal of the ILMA around the endotracheal tube, as currently taught, is suboptimal even in experienced hands. The proprietary stabilizer rod is not rigid enough and does not adequately hold the endotracheal tube in place, causing potential for dislodgement of the tube, which is dangerous in patients with severe hypoxia or a difficult airway (3). At our institution, we have switched to a longer and stiffer stabilizer rod (Air-Q removal stylet; Cookgas), but have found that it still can be difficult to remove the ILMA device successfully in some patients (Figure 1).

The ILMA removal technique was developed by anesthesiologists for use in the operating room, where conditions are controlled and short periods of apnea in optimally preoxygenated patients are not dangerous. In the emergency department and critical care setting, some patients with severe hypoxic respiratory failure cannot be preoxygenated adequately and cannot tolerate the 10–20 s of apnea that is required for ILMA removal with the standard technique. Furthermore, use of the stabilizer rod is not a frequent procedure for most emergency physicians. The unfamiliarity with the process or equipment may discourage providers from using the ILMA, a proven primary airway device and a valuable backup to standard laryngoscopy and endotracheal intubation (7–9).

We sought to develop a new process for ILMA removal to address these problems. After several iterations, we developed a novel technique using tools that all emergency and critical care physicians are familiar with, while minimizing interruptions in ventilation during the procedure. The technique begins after the ILMA has been placed into the patient's hypopharynx and oxygenation and ventilation are established. An attached video demonstrates the procedure in detail (Video 1).

First, in preparation for tracheal intubation, the bevel tip of a size 6.0 endotracheal tube is firmly seated into the end of a size 7.0 endotracheal tube after the tube adapter has been removed and set aside for later use (Figure 2). This procedure has been performed with both size 7.0 and size 7.5 endotracheal tubes as the larger tube. Once this double-endotracheal tube setup is prepared and lubricated, it is fed in a standard reverse curve fashion into the lumen of the ILMA and advanced so that the size 7.0 tube is through the ILMA and into the trachea, and the size 6.0 tube is entirely outside of the ILMA and held by the operator. After blind intubation, the patient can receive continuous manual bag ventilation (Figure 3).

After the endotracheal tube is confirmed to be in appropriate position using waveform capnography, the ILMA

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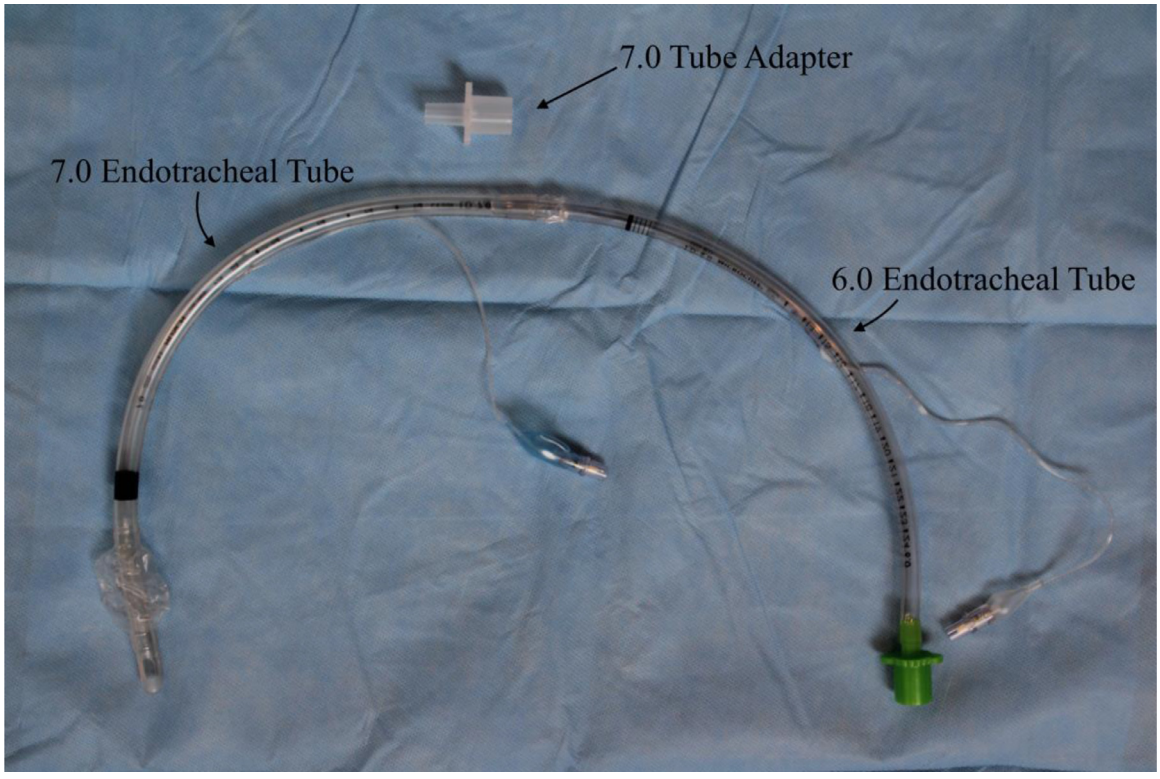

Figure 2. The double-endotracheal tube setup with a size 6.0 endotracheal tube inserted in the end of a size 7.0 tube. The tube adapter of the size 7.0 tube is removed and stored for reconnection at the end of the procedure.

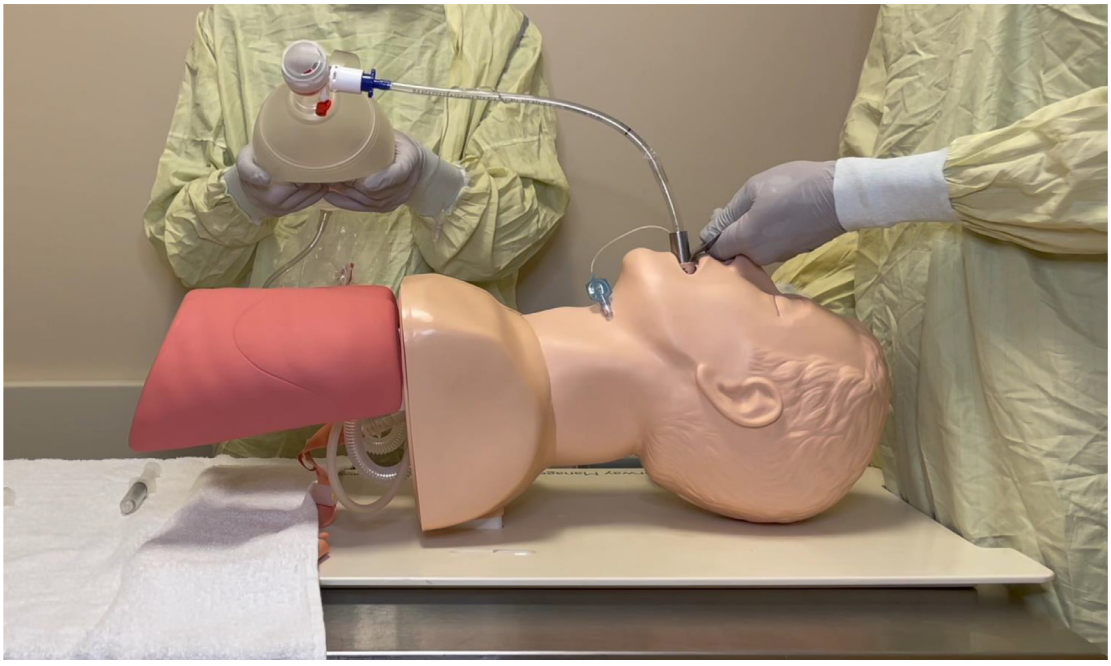

Figure 3. The double-endotracheal tube setup is fed into the intubating laryngeal mask airway (ILMA) in a reverse curve until the size 7.0 tube is through the ILMA and into the trachea.

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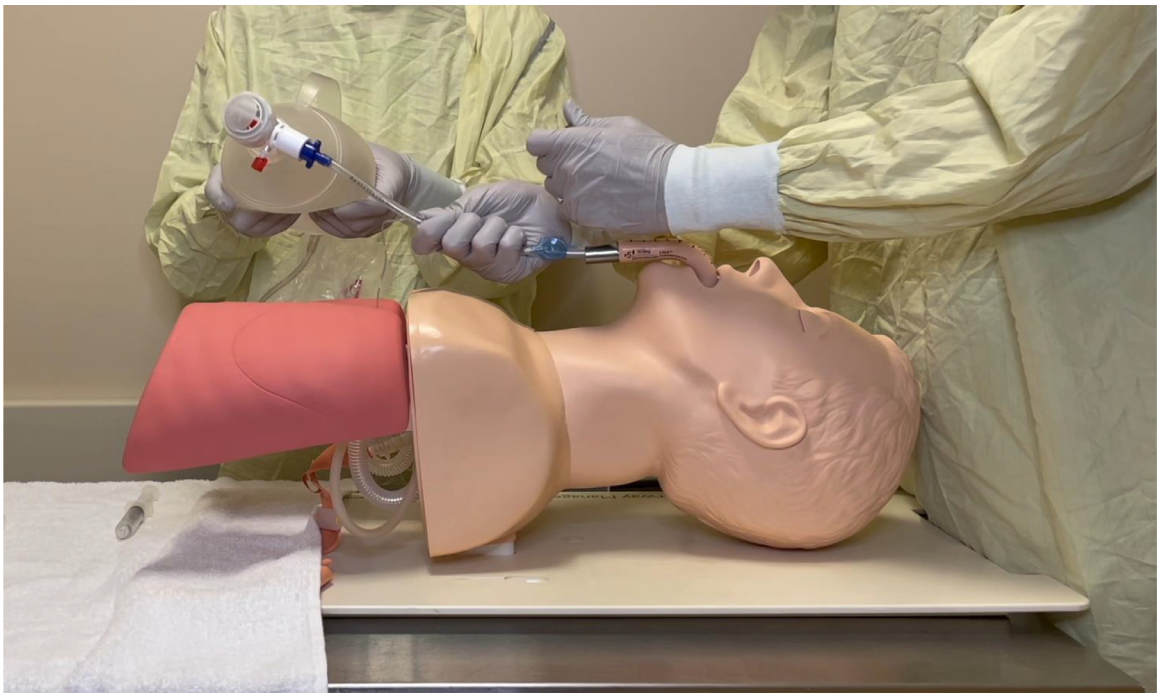

Figure 4. Holding the double-endotracheal tube as a single unit with one hand as an assistant delivers manual ventilation, the operator uses the other hand to slowly remove the intubating laryngeal mask airway over the tube.

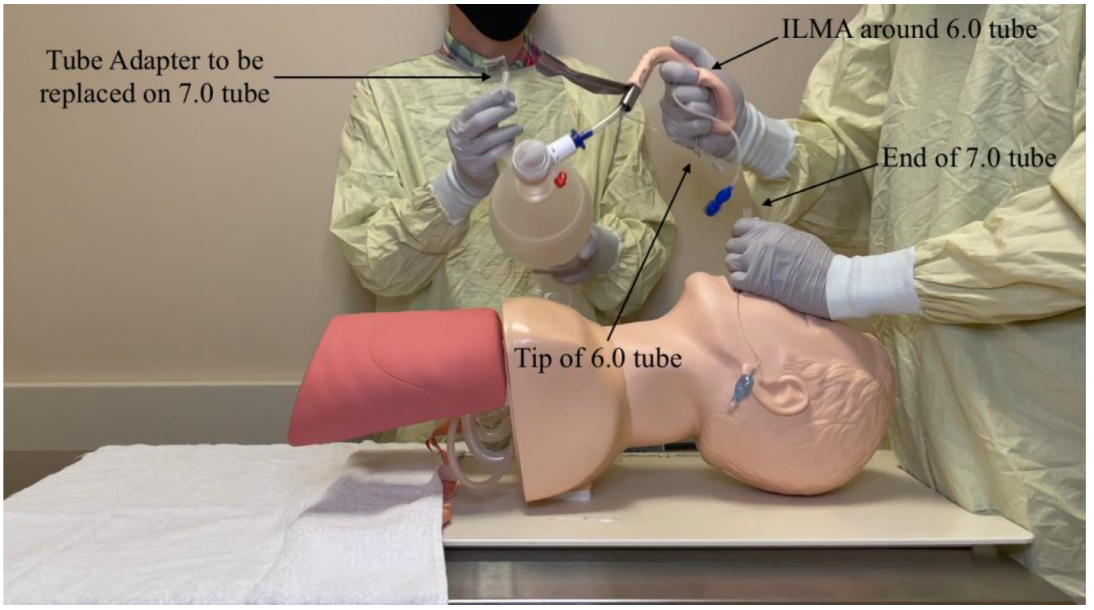

Figure 5. Once the intubating laryngeal mask airway is completely surrounding the size 6.0 endotracheal tube, the two tubes are disconnected manually and the tube adapter is replaced back on the end of the size 7.0 tube to resume ventilation. The patient is now intubated.

cuff can be deflated and the device can be slowly removed over the modified endotracheal tube. The operator can ensure that the endotracheal tube does not dislodge by simply holding the tube setup in a firm grip, as the modified tube functions as a single unit (Figure 4). During this time, the patient continues to receive ventilation through the use of a manual ventilation bag. The operator responsible for the ILMA can slowly and methodically remove the ILMA without risk of hypoxemia or hypoventilation, which is often present when ventilation is interrupted with

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use of a traditional stabilizer rod. Once the ILMA is fully separated from the larger endotracheal tube and is only surrounding the smaller tube, the two tubes can be disconnected easily (Figure 5) and ventilation can resume after replacing the tube adapter on the size 7.0 tube. This final exchange is brief; in our experience, the patient is without ventilation for several seconds, which is generally well tolerated.

Potential limitations of this technique relate to the physical properties of the additional size 6.0 endotracheal tube used in place of a solid stabilizer rod during ILMA removal. The size 6.0 tube adds anatomic dead space to the circuit, making ventilation less efficient. Moreover, compared with the size 7.0 tube, the smaller diameter of the size 6.0 tube increases resistance to airflow so higher pressure is required to deliver the desired tidal volume (10). Both drawbacks, in our opinion, are much preferable to not ventilating the patient at all during the conventional technique for ILMA removal. Although we have used this technique successfully numerous times in real clinical care, no comparison studies have been performed and the efficacy of this technique is not currently backed by quantitative data.

CONCLUSIONS

Compared with the conventional method, we believe this is a safer and more intuitive technique for emergency and critical care clinicians, as it uses familiar equipment, removes the need for haste, and minimizes interruption in ventilation for the critically ill patient.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jemermed.2022.04.003.

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