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Original Article

A Randomized Controlled Trial Comparing the Utility of Lighted Stylet and GlideScope for Double-Lumen Endobronchial Intubation

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Objective: To compare GlideScope and lighted stylet for double-lumen endobronchial tube (DLT) intubation in terms of intubation time, success rate of first attempt at intubation, difficulty in DLT advancement toward the glottis, and postoperative sore throat and hoarseness.

Design: A prospective, randomized study.

Setting: Medical center governed by a university hostpial.

Participants: Sixty-two adult patients undergoing thoracic surgery using DLT intubation.

Intervention: After the induction of anesthesia, DLT intubation was performed using GlideScope (n = 32) or lighted stylet (n = 32).

Measurements and Main Results: Number of intubation attempts, difficulty of DLT advancement toward the glottis, time taken for DLT intubation, and the incidence and severity of postoperative sore throat and hoarseness at 1 and 24 hours after surgery were evaluated. Time taken for DLT intubation was shorter in the lighted stylet group compared with the GlideScope group (30 [28−32] s *v* 45 [38−53] s, median [interquartile range], respectively; $p < 0.001$). DLT advancement toward the glottis was easier in the lighted stylet group than in the GlideScope group ($p = 0.016$). The success rate of DLT intubation in the first attempt (96.9% *v* 90.6% for lighted stylet and GlideScope, respectively), and the incidence and severity of postoperative sore throat and hoarseness were not different between the two groups.

Conclusions: The use of lighted stylet allowed easier advancement of the DLT toward the glottis in the oropharyngeal space and reduced time for achieving DLT intubation compared with GlideScope.

Key Words: double-lumen endobronchial tube; lighted stylet; GlideScope; intubation

A DOUBLE-LUMEN endobronchial tube (DLT) allows fast and reliable lung isolation as well as an effective application of continuous positive airway pressure and suction.[1,2] However, compared with single-lumen endotracheal tubes, DLTs are larger, longer, and less compliant, thus making insertion and manipulation of DLT more difficult and complicated during direct laryngoscopy.

The GlideScope videolaryngoscope has a 60° angulated blade with a video camera at its tip, and it can closely show the vocal cords and the surrounding structures. The GlideScope has been reported to facilitate endotracheal intubation compared with direct laryngoscope.[3–5] The lighted stylet is also a useful device for endotracheal intubation. These devices may

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facilitate DLT intubation, but the benefits of using the GlideScope or lighted stylet for DLT intubation have not been clearly determined yet. In the present study, the authors evaluated the GlideScope and lighted stylet for DLT intubation in terms of the intubation time, number of intubation attempts, difficulty in DLT advancement toward the glottis, postoperative sore throat and hoarseness, and hemodynamic responses during intubation.

Methods

This study was approved by the Institutional Review Board of the authors' hospital on March 21, 2016 (no. 20160302/16-2016-17/041), and registered at the Clinical Research Information Service on 26 May 2016 (KCT0001933).

After obtaining written informed consents from patients, the authors enrolled adult patients undergoing thoracic surgery requiring DLT intubation for one-lung ventilation between May 30, 2016 and January 30, 2017. The authors excluded patients with known or predicted difficult airway, sore throat, hoarseness, requirements for postoperative mechanical ventilation, or risk of aspiration.

Patients were randomly allocated to the GlideScope or lighted stylet groups, using a computer-generated block randomization (block size of 4) in a 1:1 ratio. An investigator blinded to the group assignment opened sequentially numbered and sealed opaque envelopes containing the randomization sequence and determined the group allocation. Patients were unaware of the group allocations.

Electrocardiogram, peripheral capillary oxygen saturation, and noninvasive and invasive arterial pressure were monitored during surgery. Anesthesia was induced with propofol, 1.5 mg/kg, and fentanyl, 1.5 to 2.0 μg/kg. Rocuronium, 0.6 mg/kg, was given to facilitate tracheal intubation. Endotracheal intubation was performed with a DLT (Broncho-Cath; Mallinckrodt Medical Inc, Athlone, Ireland; 37 Fr for men and 35 Fr for women) using GlideScope (Verathon Medical, Burnaby, BC, Canada) or lighted stylet (Light Way, Ace Medical, Seoul, Korea) by two board-certified staff anesthesiologists (J-EC and J-YH) with experience of more than 300 single-lumen endotracheal tube intubations and 50 DLT intubations using each device.

In the GlideScope group, DLT was shaped with its own stylet within the tube to fit along the curve of the GlideScope (Fig 1). After the bronchial tip was inserted through the vocal cords, directed anteriorly Using the GlideScope, the stylet was withdrawn and the DLT was rotated 90° counterclockwise, directing the bronchial tip to the left side, and then advanced. In the lighted stylet group, 1.5 cm of the bifurcated ends of the DLT was cut to align a lighted stylet at the tip of the endobronchial lumen because the length of the lighted stylet was relatively short compared with that of the DLT. A lighted stylet was lubricated with water-soluble jelly, inserted into the endobronchial lumen, and bent at 6.5 cm from the distal end at a 90° angle (Fig. 2). Then, the DLT with the lighted stylet was inserted into the oropharynx, directed anteriorly through the midline using the right hand after lifting the mandible with the left hand. When a central and bright transillumination was seen on the cricothyroid membrane, the lighted stylet was removed. Under anterior jaw lift, the DLT was rotated 90° counterclockwise, and then advanced. Success of tracheal intubation was confirmed by the presence of end-tidal carbon dioxide waveform. DLT placement was confirmed after intubation and the patient's position change using a fiberoptic bronchoscope. Intracuff pressure was monitored every 30 minutes using a handheld aneroid manometer (VBM, Sulz, Germany), and maintained at 25 cmH_2O. Anesthesia was maintained with sevoflurane in oxygen and air. Fentanyl and rocuronium were intermittently administered.

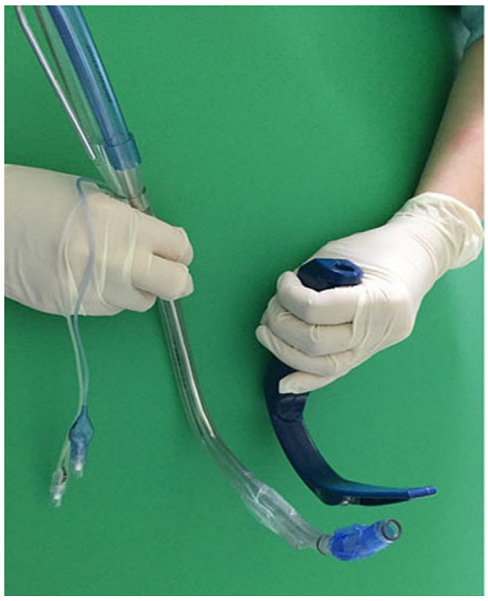

Fig 1. DLT with the GlideScope. A pre-curved DLT with its own stylet within the tube for fitting along the curve of GlideScope.

During tracheal intubation, difficulty of DLT advancement toward the glottis in the oropharyngeal space (categorized as very easy, easy, difficult, and very difficult), resistance to DLT insertion through the glottis (categorized as none, mild, and moderate), number of intubation attempts, and intubation time were recorded. Intubation time was defined as the time elapsed from picking up GlideScope or lighted stylet to confirmation of successful intubation by capnometry. If tracheal intubation was not performed within 90 seconds, a second attempt was made after manual ventilation. Intubation time was calculated by adding the time taken for each attempt. If tracheal intubation failed after two attempts using each device, it was recorded as a failure, the anesthesiologist performed tracheal intubation with other devices, and the patient was excluded from the analysis of subsequent outcomes. The time taken for positioning the DLT, number of repositioning attempts, duration of one-lung ventilation and tracheal intubation, and fentanyl requirements were recorded during the procedure. Mean arterial pressure (MAP) and heart rate (HR) were recorded before induction of the anesthesia, immediately before tracheal intubation, and every 30 seconds for 5 minutes after tracheal intubation.

An intravenous patient-controlled analgesia (PCA) machine consisting of fentanyl 10 to 20 μg/mL and ketorolac

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