The modified ventilating tube changer to facilitate tracheal intubation using the GlideScope® in patients with a limited mouth opening

Editor—Airway management of patients with limited mouth opening remains one of the major challenges in anaesthesia. The fiberoptic intubation is the technique most commonly chosen in such cases, but requires experience to achieve proficiency and is often affected by secretions or blood. It is reported that the failure rate of emergency fiberoptic intubation may be as high as 13%.1 Thus, anaesthetists faced with a difficult intubation may require alternative approaches to fiberoptic or direct laryngoscopy. The GlideScope® (GS) (Saturn Biomedical System Inc., Burnaby, BC, Canada) video laryngoscope may provide a better laryngoscopic view than direct laryngoscopy and is potentially useful for tracheal intubation in patients with a difficult airway.2 3 However, in a previous study of patients with a difficult airway due to limited mouth opening, we found that even if the GS was inserted into the mouth and the glottis was clearly exposed, introducing the endotracheal tube (ETT) tip into the glottis was difficult due to the wide and square design of GS blade.4 To solve this problem, we have successfully used the modified ventilating tube changer (MVTC) (Tuoren Medical Instruments Inc., Xinxiang, Henan, China) to facilitate tracheal intubation using the GS in such patients.

The MVTC, which is designed for exchange of ETTs, is a hollow PVC tube with an inner diameter of 3.5 mm and a length of 60 cm (Fig. 1A).5 Before the use, the removable 15 mm standard adapter of the MVTC is removed and a stiff metal stylet with a diameter of 2 mm and a length of 65 cm is inserted into the MVTC. The distal end of the MVTC with a metal stylet is bent anteriorly to an angle of 60°, which corresponds to the specially designed GS blade of 60° curvature (Fig. 1B). After the local ethics committee approval, 21 patients, aged 18–63 yr, undergoing elective plastic surgery under general anaesthesia requiring the oro-tracheal intubation were observed. All the patients had moderately limited mouth opening with an interincisor distance of 20.9 (2.1) mm (18–25 mm), which was attributed to face scar contracture in 17 patients and to temporomandibular ankylosis in four patients. Three patients also had micrognathia, with the thyromental distances of 4.2, 4.7, and 5.1 cm. After discussing with each patient the potential risks and benefits, they all gave written informed consent to receive awake tracheal intubation using the GS.

In the holding area, the patient’s airway was typically anaesthetized with 5 ml of nebulized lidocaine 4% for 20 min, after which five intra-oral lidocaine sprays (10 mg per spray) were administered. In the operating theatre, fentanyl 1.5 µg kg⁻¹ and a variable dose of midazolam (range 1–7 mg) were carefully titrated in small bolus doses i.v. When the desired level of sedation was achieved, cricothyroid membrane puncture was performed and 3 ml of lidocaine 2% was injected into the airway. After 5 min, the precurved styletted MVTC was introduced into the mouth from the right angle of mouth with the proximal end oriented towards the right. Then, the GS blade was carefully inserted into the mouth along the midline. After visualization of the glottis, the styletted MVTC was rotated counterclockwise 90° in a horizontal plane bringing it parallel to the GS blade and inserted into the glottis under direct vision. When the tip of the MVTC passed the glottis, the metal style was withdrawn and the

![Fig 1](https://example.com/image1.png)

Fig 1 (a) The modified ventilating tube changer. Its proximal end is equipped with a removable 15 mm standard adapter. There is one blunt opening with a diameter of 1.5 mm on its anterior tip and six side ports with a diameter of 1 mm on the distal 5 cm long wall. These ports are designed to provide intratracheal oxygen administration or perform jet ventilation during the tube exchange if necessary. (b) The modified ventilating tube changer with a stiff metal style. Note: the removable 15 mm standard adapter had been removed.
MVTC was advanced downward into the trachea. The GS blade was withdrawn from the mouth and the MVTC was firmly held in place. The ETT was threaded over the MVTC and advanced into the trachea, before removal of the MVTC. All the procedures were performed by anaesthetists experienced in using the GS.

All patients tolerated insertion of the styletted MVTC, the GS, and the ETT. In 10 patients with an interincisor distance of 18–20 mm, the GS was able to be introduced into the mouth, but the laryngoscopy was difficult. In the remaining cases, the GS procedures were easy. The laryngeal views obtained by a GS were Cormack–Lehane grades 1 and 2 in 17 and four patients, respectively. Although the MVTC was successfully inserted into the trachea in all patients, four required two attempts to get an appropriate angle for the MVTC. In all patients, the ETT was successfully advanced over the MVTC into the trachea at first attempt. Difficulty in advancing the ETT over the MVTC occurred in three patients. This was overcome by a 90° clockwise rotation of the ETT. The mean intubation time, from the styletted MVTC insertion to ventilation through the ETT, was 74 (15) s. After the ETT was inserted into the trachea, slight cough was observed in two patients.

Postoperative follow-up showed that 19 patients had no recall of the airway procedures. Slight recall was described by one patient. A clear but not unpleasant memory of the GS and ETT insertion was described by the remaining one patient. No patient recalled pain.

Our preliminary experience suggests that under adequate sedation and airway local anaesthesia, patients with moderately limited mouth opening can be intubated successfully using a combination of the MVTC and the GS. This technique is well tolerated by the sedated patient and they are comfortable during the procedure. This may be due to less stimulation of the oropharyngolaryngeal structures during the laryngeal exposure using the GS as it does not require a ‘line of sight’ to visualize the airway anatomy. With the view of larynx provided by the GS, the styletted MVTC can often be placed more easily than the styletted ETT because of its smaller diameter. This is similar to the experiences reported by others using an introducer, Eschmann guide and modified Eschmann guide to facilitate tracheal intubation using the GS. The MVTC with a stiff metal style has more strength to maintain its desired shape during the airway manipulation than an introducer and the Eschmann guide. The method is less affected by secretions or blood when compared with fibroptic intubation. However, this technique cannot be used in patients with an interincisor distance of <18 mm.

F. S. Xue*
Q. Y. Yang
N. He
Y. C. Xu
Beijing, China
*E-mail: fruitxue@yahoo.com.cn

Acute withdrawal syndrome in a butorphanol-treated patient: an adverse combination of opioids

Editor—We recently experienced withdrawal syndrome in a patient which was probably elicited by administration of remifentanil and butorphanol. The patient was a 58-yr-old man (169 cm, 53 kg) with bronchiectasis who had tracheal intubation because of pneumonia and a tracheotomy was planned. The patient was known to have had episodes of CO2 narcosis previously. Therefore, tracheotomy under local anaesthesia was planned to avoid any residual effects from anaesthetics, narcotics, or both on the patient’s respiration after operation. During the previous 2 weeks, the patient had been routinely treated for insomnia with nocturnal (8:00 p.m. to 8:00 a.m.) administration of midazolam and butorphanol 1.2 and 0.12 mg h−1, respectively. The patient presented for surgery 7 h after the last administration. He was conscious and could communicate with gestures and lip movements. The vital signs were stable (arterial pressure 150/80 mm Hg, heart rate 90 beats min−1, SPO2 95%, and end-tidal CO2 4.8 kPa). To minimize the patient’s pain and agitation during the operation, administration of remifentanil 0.25 μg kg−1 min−1 was started, and after local infiltration with lidocaine 1% with epinephrine (1:300 000), a skin incision was made. Oxygen 2 litre min−1 mixed with air 4 litre min−1 was supplied and ventilation was manually supported when ventilatory frequency decreased. SPO2 was kept above 94% and end-tidal CO2 was maintained at 4.8–6.4 kPa. Approximately 30 min after initiation of the remifentanil administration, severe sweating and facial twitching were noted along with


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