

# CORRESPONDENCE

# Prophylactic insertion of a transtracheal catheter for anticipated difficult airway management

A retrospective analysis

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## Editor,

Difficult airway management remains a challenge for anaesthesiologists. In specific cases, anaesthesiologists deal with patients presenting difficult airway criteria and who are scheduled for procedures in which traditional intubation and intra-operative ventilation techniques are not suitable. The prophylactic use of a percutaneous transtracheal catheter, initially described by Ravussin, can overcome these problems.<sup>1,2</sup> Little is known about the feasibility of this technique in large series and the advantages and pitfalls to be considered with its use.

The current retrospective review included patients older than 18 years of age with known or suspected difficult airways who underwent a planned procedure. Anticipated difficult airway was defined as a known history of a difficult airway or presence of difficult airway criteria. Patients in whom the cricoid membrane could not be identified were not considered.

All procedures were performed in a tertiary centre, between April 2010 and March 2016. The institutional ethics committee (2016/11OCT/443, Chairperson J.M. Maloteaux) approved the study on 3 November 2016. Patient consent was waived.

The insertion technique of the transtracheal catheter is similar to what has been described previously and was performed with a 13-gauge Jet-Ventilation catheter (VBM, Medizintechnik, Germany) by an experienced staff anaesthesiologist or a resident familiar with the technique.<sup>3</sup> If necessary, 1 to 2 mg of midazolam was administered intravenously. To avoid kinking of the transtracheal catheter, which might be the main technical problem encountered, the needle was advanced during catheter insertion.

No pressure was applied on the catheter or lateral flanges. As it is at the junction of the Teflon catheter and the plastic flanges that the kinks are described, the lateral flanges must be in close contact with the skin. Lateral flanges were taped to the skin rather than using the neck strap that is delivered with the kit. To ensure the correct positioning of the transtracheal catheter and its permeability, we aspirated and insufflated air with the syringe connected to the catheter. A capnograph was then directly connected to the transtracheal catheter to confirm proper positioning (http://links.lww.com/EJA/A218, http://links.lww.com/EJA/A219).

After pre-oxygenation, anaesthesia was induced and maintained with a target controlled propofol infusion and a continuous infusion of  $0.5 \,\mu g \, kg^{-1} \, min^{-1}$  of remifertanil or boluses of 5 to 10 µg of sufentanil. When needed, and only after confirming that ventilation was possible either with a mask, a supraglottic device or a jet ventilator through the transtracheal catheter, a neuromuscular blocking agent was administered. High frequency jet ventilation was performed only when ventilation through the face mask or supraglottic device failed, or for surgical needs. To effectively achieve high-frequency jet ventilation, the patency of the expiratory pathway must be ensured. In fact, whenever the limit of end-expiratory pressure is reached, the jet ventilator stops. This is important to prevent air trapping and possible barotrauma. Depending on the type of surgery and feasibility, an oro/nasotracheal tube was inserted. The transtracheal catheter was removed in the post anaesthesia care unit once the patient had recovered from anaesthesia.

Twenty-five patients were analysed for a total of 41 procedures (Supplemental Digital File Table 1, http://links.lww.com/EJA/A220). All patients presented difficult intubation criteria. Of the 41 procedures, a transtracheal catheter was successfully inserted forty times. In one case, the insertion failed because of the impossibility to localise the trachea. When insertion is difficult, ultrasonography must be considered. Ultrasonography was shown to be accurate and superior to palpation to identify the cricothyroid membrane.<sup>4</sup>

Of the 40 successfully inserted catheters, high frequency jet ventilation was attempted in 31 cases either for difficult ventilation with a face mask or through the supraglottic device, or for surgical needs. Highfrequency jet ventilation was successful 29 times. In two procedures, high-frequency jet ventilation could not be performed due to kinking. In nine procedures, high-frequency jet ventilation was not tested because face mask ventilation and/or ventilation through the

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supraglottic device was easy. Mean insertion time was 5 min (range, 3 to 15).

We observed one episode of oxygen desaturation (SpO<sub>2</sub> 80%) during a period during a period that required a low FiO<sub>2</sub> (25%) for laser surgery and due to airway obstruction stopping the high frequency jet ventilator. We addressed this issue by performing a suspension laryngoscopy and by gently pushing apart the oedematous vocal cords.

We proceeded to six flexible fibreoptic intubations (one due to impossibility to localise the trachea and five due to insufficient mouth opening). The remaining tracheal intubations were performed with an optical or a video laryngoscopy device. Transtracheal catheters ensured oxygenation during intubation attempts regardless of the intubation technique used. This is an advantage for clinicians as they offer more time to proceed to intubation in a stress-free environment. Moreover, transtracheal catheters may decrease the risk of losing airway patency in case of oversedation. In our series, no emergency cricothyroidotomy was needed.

One patient presented a small-sized cervical subcutaneous haematoma with no haemodynamic or respiratory consequences. Complications such as haematoma, haemorrhage, puncture of the posterior wall of the trachea and oesophageal fistula should, however, be considered. Confirmation by capnography of the appropriate placement of the catheter is essential. Misplacement precludes oxygenation and may cause pneumothorax or cervicomediastinal emphysema.<sup>5</sup> In conclusion, in this case series, we observed a high rate of successful placement and use of transtracheal catheters in patients with anticipated difficult airway. Moreover, transtracheal catheters provided the opportunity to oxygenate the patients with high-frequency jet ventilation during the critical phases of induction and intubation. The transtracheal catheter can also be used if the intubation would not be possible otherwise or not suitable for the procedure. The prophylactic insertion of a transtracheal catheter may be considered as an additional option of airway management in well selected patients.

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