Is it safe to use frova airway intubating device during tracheal intubation in difficult airway patient with multiple and chest trauma?

ABSTRACT
Traumatic chest injury is one of the leading causes of death in motor vehicle accident (MVA). A complete tracheobronchial injury occurred in 1% of trauma cases and most of these cases died before arrival to the hospital,[1‑3] and these injuries need immediate diagnosis and management. However, tracheal intubation is difficult in 1–4% and impossible in about 0.05–0.35% of patients who have apparently normal airways,[4] and definitely in trauma cases these figures are much higher, which needs in these circumstances a skillful technique to deal with and also using a different safe devises to achieve successful intubation.

Key words: Chest trauma; frova airway intubating introducer; tracheobronchial rupture

Introduction
Traumatic chest injury is one of the leading causes of death in motor vehicle accident (MVA). A complete tracheobronchial injury occurred in 1% of such trauma cases and most of these cases died before arrival to the hospital,[1‑3] and these injuries need immediate diagnosis and management. However, tracheal intubation is difficult in 1–4% and impossible in about 0.05–0.35% of patients who have apparently normal airways,[4] and definitely in trauma cases these figures are much higher, which needs in these circumstances a skillful technique to deal with and also using a different safe devises to achieve successful intubation.

Case Report
A 37-year-old female involved in motor vehicle accident (MVA). On arrival to the emergency room (ER), her vital signs were normal including O₂ saturation 100% on facemask of full flow of O₂; 10 min later, her level of consciousness started to deteriorate and O₂ saturation dropped, which required securing the airway and ventilation, and intubation trial was attempted twice but failed. On the 3rd time, frova airway intubating introducer (FAII) (COOK) with its metallic stiffening cannula [Figure 1] was used and inserted into...
the airway and then tracheal tube slid over FAII, which was reported as successful intubation. Immediately after intubation, the patient started to have extensive bilateral subcutaneous emphysema and severe hypoxia. Chest X-ray showed extensive surgical emphysema and right side tension pneumothorax, which was not relieved by bilateral chest tube insertion. Further, there was massive air leak from the right chest tube which required the second chest tube to be inserted [Figure 2], after which the patient O₂ saturation improved temporarily; which allowed to proceed for computed tomography scan chest, which showed near complete tear of the origin of the right main bronchus. There was also a significant amount of surgical emphysema dispersing into the mediastinum and the pleural spaces causing pneumothorax and soft-tissue emphysema [Figure 3a and b].

Fiberoptic bronchoscopy (FOB) performed in ER which showed a complete transection of the right main bronchus at the origin from the carina, and also, there was a laceration 4 cm in length on the right side of the lower trachea.

Immediately, the patient transferred to the operating room (OR); the tracheal tube was directed to the left main bronchus guided by FOB for lung isolation, ventilation, and better visualization. Right thoracotomy performed, and exploration showed that the mediastinal pleura was intact and not injured but there was underneath it complete transaction or avulsion of the right main bronchus from the carinal origin, which extends 4 cm upward to the lower trachea. Complete and direct repair of both the right main bronchus and the tracheal laceration were performed. During the procedure check, FOB repeated few times which was satisfactory. The patient kept ventilated in the Intensive Care Unit (ICU) for ten days, and after extubation, she remained in stable condition where she was discharged home on the 20th postoperative day in good and stable condition.

Routine follow-up in the clinic and check FOB were repeated in 3rd, 6th, and 12th month postoperative, without any abnormality.

**Discussion**

Traumatic chest injury is one of leading causes of death in MVA. A complete tracheobronchial injury occurs in 1% of trauma cases and most of the victims in such cases died before arrival to the emergency department. The immediate diagnosis and timely identification of such injuries are lifesaving.

Tracheal intubation in the ER is a more hazardous procedure than that performed in OR. The incidences of difficult intubation are 3–5.3% in the ER. Failed intubation in the OR is seen in 0.05–0.35% of patients, whereas the rate of failed
tracheal intubation leading to cricothyroidotomy is 0.5–1.1% in the ER.[4]

FAII has been used since 1998. The success rate for frova introducer is 97% with fewer esophageal intubations.[5,6] Airway trauma is a cause of major concern and should be minimized by the use of optimal equipment and smooth technique. The airway trauma caused by tracheal tube introducers can be quite a serious complication resulting in ICU admission or even death.[7] The metallic stiffening cannula and the curved hard tip of the FAII can cause significant trauma. It is well-documented in the literature that the peak forces that could be applied to the tissues by the FAII are 3–6 times greater, at all distances held from the tip, than the peak force exerted by the Eschmann introducer.[5,6,8]

A number of anesthetists have reported difficulties in advancing the tip of the FAII. This may have been a result of the FAII tip hitting the anterior tracheal wall at almost a right angle.[6,8] This problem might be resolved by flexing the head and neck, thus allowing the FAII to be advanced further into the upper airway and trachea. However, this method is not applicable in trauma patients.

Literature also shows that complications can arise with the use of the FAII.[1] It can be broken under force leading to fragment spillage.[2] Tracheal injury as a result of force insertion can cause hemorrhage.[3] Airway trauma can also occur due to high pressure to the trachea during insertion.[7,8]

In our case, we assume that the patient came with partial or minimal traumatic injury to the right main bronchus due to the MVA, but this injury progressed to complete avulsion and transection after using FAII with the metallic stiffening cannula, and forced sliding of the tracheal tube over it. Further, the lower tracheal laceration most likely induced by this curved end of the frova introducer with the stiffening cannula as the patient initially was stable and all these manifestations of instability from the severe hypoxia, expanding surgical emphysema, and tension pneumothorax, started immediately after the use of this hard, stiff, curved tip of FAII.

We do not recommend using FAII in multiple trauma patients or difficult airway intubation in the ER as the consequences or the complications could be catastrophic.

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Conflicts of interest
There are no conflicts of interest.

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