Airway trauma during difficult intubation… from the frying pan into the fire?

INTRODUCTION

Endotracheal tube (ETT) introducers (commonly known as bougies) help the anaesthesiologist in securing the airway during an unanticipated difficult intubation. Traumatic complications with bougies are rare but serious complications. We report a case of an unanticipated difficult intubation, where the bougie, used to secure the airway, led to bronchial injury.

CASE REPORT

A 46-year-old male, with no preexisting lung or heart ailments, diagnosed with severe cervical myelopathy, was posted for anterior cervical corpectomy and fusion. Apart from his echocardiogram, which showed mild pulmonary artery hypertension (right ventricular systolic pressure = 43 mmHg) associated with mild mitral stenosis (mitral valve area = 2 cm²) and mitral regurgitation, all other investigations were normal. His airway examination revealed modified Mallampati class III. Neck mobility was not assessed because of his disc prolapse.

Anaesthesia was induced with intravenous (I.V.) injection fentanyl (2 µg/kg) and injection propofol (2 mg/kg), and injection atracurium (0.5 mg/kg) was given after confirming mask ventilation. Laryngoscopy, with minimal neck extension, revealed Cormack-Lehane grade 3a view of the vocal cords with external laryngeal manipulation. Portex™ single use 15 Fr 700 mm coude tip bougie was first introduced up to 25 cm mark, without eliciting tracheal click or hold up signs. Portex™ ETT size 8 mm I.D. was railroaded over the bougie without much difficulty and the ETT cuff inflated. On removal of the bougie, the tip was blood stained. There was a gush of blood from the ETT. Suctioning was done through the ETT, and its position was checked. Ventilation was not achieved, and auscultation did not reveal bilateral air entry and end-tidal CO₂ could not be recorded, as there was blood in the sampling line. Repeat suctioning through the ETT was done and auscultation again did not reveal air entry. Since the oxygen saturation started dropping to 80% and
the position of ETT could not be confirmed, the ETT was removed and the patient was ventilated with a face-mask. Mask ventilation was difficult and a classic laryngeal mask airway size 4 was inserted. There was no chest rise, and auscultation revealed no air entry and SpO₂ dropped further to 60%. Repeat laryngoscopy was attempted, and airway was secured with Portex™ 8 mm I.D. ETT with the help of the Portex™ bougie again. No injury was visualised in the oral cavity and supraglottic area during laryngoscopy. There was still blood inside the ETT, but with repeat suctioning and lavage with dilute epinephrine (1:100,000) the bleeding was controlled. Injection tranexamic acid 1 g and injection dexamethasone 8 mg I.V. were administered. Auscultation revealed extensive wheeze and the peak airway pressure was 45 cm H₂O and SpO₂ increased to 95%.

An emergency bronchoscopy revealed bleeding from the right main bronchus. After instillation of topical tranexamic acid and repeated lavage, the bleeding was localised to be from the right middle bronchus [Figure 1]. The bleeding was controlled eventually. No definitive injuries could be visualised anywhere along the tracheobronchial tree while withdrawing the ETT till the vocal cords over the fibreoptic bronchoscope. Since the ventilator parameters were satisfactory after bronchoscopy, it was decided to proceed with posterior decompressive laminectomy in the prone position. The decision was taken considering the possibility of rebleed during surgery and better drainage of the blood through ETT in the prone position. The rest of the intraoperative course was uneventful. After surgery, the patient was turned supine, neuromuscular blockade was reversed and trachea extubated. Postoperatively, the SpO₂ maintained above 95% with 6 L/min oxygen flow through a facemask.

Computed tomogram of the chest done after 6 h showed patchy consolidation and centriacinar nodules in lateral segment of the right middle lobe and extensive centriacinar airspace opacities in both lungs – suggestive of aspiration changes [Figure 2]. The bronchial lavage fluid was normal. The patient had an uneventful recovery.

**DISCUSSION**

Traumatic complications during unanticipated difficult intubation range from 0.5% to 7%.⁹ Bougies are used to facilitate tracheal intubation for Cormack-Lehane grades of 2b or 3a during laryngoscopy. However, All India Difficult Airway Association does not recommend blind insertion of bougies in Grade 3b or 4 direct laryngoscopic view as it can lead to trauma.⁹ However, the reports of airway trauma due to bougies, are limited to only a few case reports, and the incidence of bronchial injury even fewer.⁴ Trauma was more often with single use bougies.⁵ The coude tip of the bougie was designed to facilitate easy passage into the laryngeal inlet, and to prevent it from going too far down the airway, thereby reducing traumatic complications.⁵ However, in our case, the coude tip did not prevent the bougie from causing injury.

Trauma related to ETT bougies is suspected when the bougie tip is stained with blood on withdrawal and a gush of blood is observed through ETT. The anaesthesiologist is presented with a triad of problems at this stage – haemorrhage below the vocal cords, inability to confirm ETT placement along with difficult

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**Figure 1:** Fibreoptic bronchoscopic view of the bronchial tree showing bleeding from the right middle bronchus

**Figure 2:** Computed tomogram of the chest showing patchy consolidation and centriacinar nodules in the right middle lobe of the lung

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intubation and inability to oxygenate. Infraglottic airway injury in a difficult intubation is a rare and life-threatening incident and has no definitive airway management guidelines in literature.

The placement of a bougie into the trachea has been traditionally confirmed by the “tracheal click” sign or the “distal hold up” sign. The “distal hold up” sign has been shown to have more incidence of trauma even with force as low as 0.9 N. In our case, even though we did not elicit “distal hold up” sign, the bronchial haemorrhage could have been due to the inadvertent advancement of the bougie during railroading. Railroading ETT under direct laryngoscopy guidance to minimise the force, withdrawing the bougie 2–3 cm before railroading the ETT, not advancing the bougie more than 25 cm in average-built adults can minimise trauma due to bougies. In stressful conditions like an unanticipated difficult intubation, the use of traffic-light bougie can prevent such dangerous practice of inserting bougies too far, by rapidly assessing the depth inserted with the help of the three colours on it.

In all reported cases of airway trauma due to bougies, conservative management with endotracheal suctioning is mentioned. Endobronchial instillation of tranexamic acid (500 mg in 20 ml) can be as efficient as epinephrine (1 mg in 20 ml) in controlling haemoptysis and requires less frequent use of the second medicine. Fibreoptic endobronchial epinephrine instillation is an effective, rapidly feasible and beneficial therapy for life-threatening haemoptysis in intubated and mechanically ventilated patients.

CONCLUSION

Until definitive recommendations are in place for an infraglottic airway bleed during difficult intubation, we believe that airway injury by a bougie can be prevented by avoiding hold up sign, gentle and careful insertion of the bougie. Railroading of ETT over the bougie under direct laryngoscope guidance, use of a traffic signal bougie, avoiding bougies with metal core and obtaining help from an assistant to stabilise the bougie to prevent it from moving inwards are other approaches.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.