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Tube-within-Tube Technique during Emergency Intubation for the Unanticipated Difficult Airway in Low-resource Settings: A Case Report

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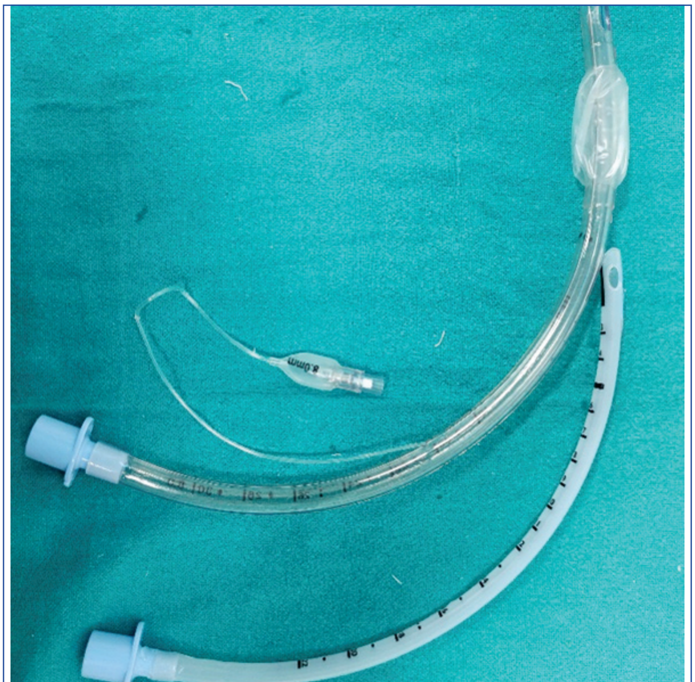
ABSTRACT

Emergency intubation can pose numerous difficulties for an anaesthesiologist, especially in unpredictable situations. A crucial aspect in trauma cases with a low Glasgow Coma Scale (GCS) is to promptly and safely secure the airway. Patient and environmental factors further complicate the intubation process. The survival rate of patients is closely linked to successfully establishing a patent airway. Factors that hinder intubation include limited ability to assess the airway, inadequate equipment and positioning, lack of backup, challenging or insufficient preoxygenation, presence of other life-threatening conditions, and the risk of aspiration. Familiarity with alternative techniques and utilisation of all available aids can significantly reduce morbidity and mortality in settings with limited resources. The author presents a case report of a 26-year-old male patient with polytrauma and a head injury, presenting with a low GCS score, who required emergency intubation. This situation occurred unexpectedly in the triage area of the hospital. The 'tube within tube' intubation technique was effectively employed to achieve early and successful airway control in this resource-limited setting.

Keywords: Endotracheal tube, Intubation, Stylet

INTRODUCTION

A 26-year-old male patient, who is 185 cm tall and weighs 70 kg, was brought to the triage area following a roadside accident. The emergency team assessed the patient and found multiple injuries and burns on the face and chest. The GCS, which evaluates eye response (E), verbal response (V), and motor response (M), was recorded as E1V1M3. The patient's pupils couldn't be assessed due to periorbital oedema. Two wide-bore cannulas were used to secure a peripheral intravenous line, and fluids were administered. Vital signs were checked and indicated a Blood Pressure (BP) of 90/70 mmHg, a Pulse Rate (PR) of 110 bpm, a Respiratory Rate (RR) of 27 cycles per minute, and an oxygen saturation (SpO_2) of 96% on a simple face mask with oxygen flow at 15 L/minute. The decision was made to intubate the patient. The necessary equipment and emergency drugs were prepared for intubation. Oxygenation was initiated using an Artificial Manual Breathing Unit (AMBU) mask with oxygen at 15 L/min. The patient received 3 mg of intravenous midazolam. The patient's neck was maintained in a neutral position due to suspected cervical spine injury. Laryngoscopy was attempted but unsuccessful due to blood and excessive secretions, which were cleared using suction. Blind nasotracheal intubation was not attempted due to potential head injury and nasal bone fractures. Orotracheal intubation was preferred over supraglottic devices to secure the airway, considering the high-risk of aspiration and laryngeal oedema from burns. However, McCoy blades, fibreoptic intubation, and Intubating Laryngeal Mask Airway (ILMA) were not available in the triage area. Another attempt at laryngoscopy was made using a size 4 MacIntosh blade, but visualisation of the glottic opening was poor, with the patient having a Modified Cormack Lahane grade of 3b [1]. Unfortunately, the stylet in the intubation trolley broke during insertion into the Endotracheal Tube (ETT), and there was no time to obtain a replacement from the store due to the high-risk of aspiration. To act quickly given the circumstances, alternative options to replace the stylet were evaluated. It was decided to use a "tube within tube" technique to maintain the curvature of the tube. An uncuffed ETT with a size of 5 mm was inserted into a cuffed ETT with a size of 8 mm. The universal connectors of both tubes were securely fixed using micropore tape, and a generous amount of water-based jelly was applied to the smaller tube to facilitate easier insertion and removal. The airway was successfully secured using the tube within tube technique under direct laryngoscopy [Table/Fig-1]. Once intubation was confirmed, the inner tube was removed, and oxygenation continued with AMBU ventilation. The patient's vital signs remained stable throughout the intubation process. Subsequently, the patient was transferred to the ICU for further management and was discharged after several days with a tracheostomy tube in place, as a case of diffuse axonal injury.



[Table/Fig-1]: Different sizes of endotracheal tubes used for "tube within tube" technique.

DISCUSSION

Securing the airway is the primary requirement for appropriate therapy in emergency patients [2]. Inability to secure the airway can increase morbidity and mortality within seconds [3,4]. The time margin to effectively secure an emergency airway without intermittent oxygenation is limited to 30 to 40 seconds [5,6]. Endotracheal intubation is often referred to as the 'gold standard' for airway management in emergencies, but multiple failed intubation attempts can risk patients' lives due to poor oxygenation and trauma to the airway [4,7]. Therefore, knowledge and availability of alternative procedures are also essential in every emergency, especially in resource-limited settings. Knowing how to use every available aid in a time of crisis can prove to be lifesaving.

In the present case, other methods of securing the airway were not used due to various reasons. In a case report by Tiwari T et al., retrograde intubation was used as a rescue procedure in an unanticipated difficult airway [8], but it could not be used in this case due to a lack of experience. Blind nasotracheal intubation was not attempted because of a probable head injury and nasal bone fractures. In a case report by Wasim MH, a supraglottic airway device was used in managing a difficult airway in a resource-constrained environment [9], but supraglottic devices were not used for rescue ventilation in this case due to the high-risk of aspiration and possible laryngeal oedema caused by burns. McCoy blades, fiber optic intubation, combi-tube, ILMA, and videolaryngoscopes are some alternatives, but they are not available in the triage area of the hospital [10].

The principle behind the technique used is similar to the use of a stylet in an endotracheal tube for securing difficult airways, but it is specifically designed for use in resource-limited areas [11]. The tube within a tube provides the strength and angulation to the endotracheal tube, similar to the stylet, for easier insertion in difficult airway management in a resource-limited setting [12-14]. In cases where the glottic opening is difficult to visualise, every effort should be made to guide the endotracheal tube through the glottic opening using available aids while minimising time and injury to the airway [15]. However, there were certain issues, including poor adhesion of the universal connector to the endotracheal tube, which can cause detachment of the connector from the tube and make it difficult to remove the smaller tube. The connector was fixed using micropore tape. The non-application of any water-based jelly can also make it difficult to remove the smaller tube due to friction, resulting in high resistance and poor oxygenation. Therefore, this method is not an ideal way to secure the airway but serves as a valuable rescue aid in resource-limited settings.

CONCLUSION(S)

The trauma triage area frequently encounters emergency intubations under unanticipated circumstances. Early and improved utilisation of available airway adjuvants can be lifesaving in such situations. Since endotracheal tubes are cost-effective and widely accessible in hospitals, it is believed that anaesthesia teams in developing countries could employ this rescue technique if faced with similar scenarios. The intelligible and readily available "tube within tube technique" for intubation may prove to be very useful in resource-limited settings for managing difficult airways. As most of the steps involved are routinely practiced by anaesthesiologists, this procedure can be easily learned and implemented.

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