

# Study of tracheal intubation practices and adverse events in trauma victims on arrival at trauma center at a tertiary hospital

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## Abstract

**Background:** Airway management in the trauma patient presents numerous unique challenges beyond placement of an endotracheal tube (ETT), with outcomes dependent on the provider's ability to predict and anticipate difficulty and have a safe and executable plan. Present study was aimed to study tracheal intubation practices and adverse events in trauma victims on arrival at trauma center at a tertiary hospital. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in trauma victims, age > 18 years, of either gender, requiring definitive airway control with endotracheal intubation in patients of life-threatening injury requiring immediate emergency care. **Results:** 256 intubations done in trauma center were studied. Mean age of patients was  $35.56 \pm 12.68$  years, majority were male (69.53 %), had history of RTA (77.73 %), penetrating injury (14.06 %) and burns (8.2 %). Common injuries observed were head injury (51.56 %), blunt trauma chest (26.17 %), penetrating injury (14.06 %), blunt trauma abdomen (8.98 %), burns (8.20 %), cervical spine injury (4.69 %) and faciomaxillary injury (4.30 %). Successful intubations were majority in 1<sup>st</sup> attempt (77.73 %), followed by 2<sup>nd</sup> attempt (14.45 %) and 11 cases were difficult intubations (3 attempts) (4.30 %). Failed intubation were 9 (3.52 %). In majority of cases, no complications were observed (83.20 %). Common complications in present study were hypotension (9.38 %), followed by desaturation (6.64 %), airway injuries (6.25 %), oesophageal intubation (2.34 %), aspiration of blood (1.95 %) and aspiration of gastric contents (0.78 %). **Conclusion:** Primary goal of tracheal intubation, especially in trauma patients, is to achieve first pass success without adverse events. We had majority successful intubations, that too in first attempt, with few complications as a result of extensive training and monitoring. **Keywords:** Trauma, difficult intubation, trauma center, Intubation

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## INTRODUCTION

Traumatic injury is the leading cause of death and disability among young people and early, appropriate

airway management is a vital lifesaving measure in severely injured patients.<sup>1</sup> In spontaneously breathing patients basic airway manoeuvre can establish airway patency and restore adequate respiration. Intubation is reserved for those patients who continue to show signs of inadequate respiration after basic interventions or patients in whom these interventions alone are not likely to sustain adequate respiration.<sup>2,3</sup> Urgency and reduced physiological reserve contribute dramatically to increased risks of profound periintubation hypoxaemia, hypotension, arrhythmia, cardiac arrest, and death.<sup>4,5,6</sup> Delays during tracheal intubation and multiple attempts at laryngoscopy are associated with increased complications, again including cardiac arrest and death.<sup>7</sup> Airway management in the trauma patient presents numerous unique challenges

beyond placement of an endotracheal tube (ETT), with outcomes dependent on the provider’s ability to predict and anticipate difficulty and have a safe and executable plan. Present study was aimed to study tracheal intubation practices and adverse events in trauma victims on arrival at trauma center at a tertiary hospital.

### MATERIAL AND METHODS

Present study was single-center, prospective, observational study, conducted in trauma center of MGM Medical College and Hospital, Navi Mumbai, India. Study was conducted under department of Anaesthesiology, from January 2022 to June 2022(Six months). Study approval was obtained from institutional ethical committee.

**Inclusion criteria:** Trauma victims, age > 18 years, of either gender, requiring definitive airway control with endotracheal intubation in patients of life-threatening injury requiring immediate emergency care were considered for present study.

**Exclusion criteria:** Patients do not have life threatening injury/do not require immediate emergency care. Patients who were intubated before arrival in trauma triage, Patients with incomplete data/documentation of intubation events

Study was explained to patients in local language and written consent was taken from immediate legal relatives of eligible patients for participation and study. Patient related information such as demographic details, mode of injury, presence of any head injury, diagnosis, indication for intubation, drugs and equipment used for intubation, personnel performing intubation, number of attempts, and complications during intubation were noted in a pre-designed proforma. In trauma center, at the end of each shift, data was collected by independent observer. Use of rapid sequence intubation (RSI) or manual in-line stabilisation whenever performed were recorded. Variables such as airway injuries (lip, oropharyngeal, dental, and vocal cord trauma), aspiration (visualisation of newly regurgitated contents or the bleed due to trauma during suction via endotracheal tube), urgent intubations (immediate requirement of intubation), difficult intubations (requiring ≥ 3 attempts of intubation, attempts taking >10 minutes, or need for an airway adjunct or another airway manager), failed intubation (failure to place an endotracheal tube after ≥3 attempts). Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

### RESULTS

256 intubations done in trauma center were studied. Mean age of patients was 35.56 ± 12.68 years, majority were male (69.53 %), had history of RTA (77.73 %), penetrating injury (14.06 %) and burns (8.2 %). Common injuries observed were head injury (51.56 %), blunt trauma chest (26.17 %), penetrating injury (14.06 %), blunt trauma abdomen (8.98 %), burns (8.20 %), cervical spine injury (4.69 %) and faciomaxillary injury (4.30 %).

**Table 1: General Characteristics**

Characteristic	No. of cases (n=256)	Percentage
Age (years, mean ± SD)	35.56 ± 12.68	
Gender		
Male	178	69.53%
Female	78	30.47%
Etiology of trauma		
Road traffic accident	199	77.73%
Penetrating injury	36	14.06%
Burn	21	8.20%
Type of injury		
Head injury	132	51.56%
Blunt trauma chest	67	26.17%
Penetrating injury	36	14.06%
Blunt trauma abdomen	23	8.98%
Burn	21	8.20%
Cervical spine injury	12	4.69%
Faciomaxillary injury	11	4.30%

Among 256 intubations, successful intubations were majority in 1<sup>st</sup> attempt (77.73 %), followed by in 2<sup>nd</sup> attempt (14.45 %) and 11 cases were difficult intubations (3 attempts) (4.30 %). Failed intubation were 9 (3.52 %).

**Table 2: Intubation**

Characteristic	No. of cases (n=256)	Percentage
Successful intubation		
• In 1 <sup>st</sup> attempt	199	77.73%
• In 2 <sup>nd</sup> attempt	37	14.45%
• Difficult intubations (3 attempts)	11	4.30%
Failed intubation	9	3.52%

In majority of cases, no complications were observed (83.20 %). Common complications in present study were hypotension (9.38 %), followed by desaturation (6.64 %), airway injuries (6.25 %), oesophageal intubation (2.34 %), aspiration of blood (1.95 %) and aspiration of gastric contents (0.78 %).

**Table 3: Complications**

Complications	No. of cases (n=256)	Percentage
No complications	213	83.20%
Hypotension	24	9.38%
Desaturation	17	6.64%
Airway injuries	16	6.25%
Oesophageal intubation	6	2.34%
Aspiration of blood	5	1.95%
Aspiration of gastric contents	2	0.78%

## DISCUSSION

Emergency intubations may be required in patients with severe head injury, severe maxillofacial fractures, risk of aspiration of blood or vomitus, neck haematoma, laryngeal injury, tracheal injury, stridor, hypoxia, hypercarbia, tachypnea, cyanosis.<sup>2</sup> Airway management in trauma begins as soon as patient contact is made and rarely starts with placement of an ETT. Providing advanced airway management is part of the A and B and C parallel resuscitative priorities of trauma care. Hypoxaemia and hypotension are both influenced by intubation; tracheal intubation in patients who are not deeply comatose requires induction of anaesthesia and neuromuscular block.<sup>4,5</sup> However, injudicious use of anaesthetics and positive pressure ventilation can cause hypotension, particularly in hypovolaemic trauma patients.<sup>6</sup> Securing the airway following trauma is presumed to be a relatively safe procedure and it is often performed early in group of patients arriving with GCS  $\leq$  8 to mitigate the risk of hypoxia, ventilatory failure and aspiration. But, the procedure is technically challenging in the acute trauma settings and if not performed correctly may lead to worse outcomes.<sup>3</sup> Two devices are commonly used to facilitate tracheal intubation: a stylet or a tracheal tube introducer (bougie).<sup>8</sup> Driver BE *et al.*,<sup>9</sup> noted that successful intubation on the first attempt occurred in 447 patients (80.4%) in the bougie group and 453 patients (83.0%) in the stylet group (P = 0.27). A total of 58 patients (11.0%) in the bougie group experienced severe hypoxemia, compared with 46 patients (8.8%) in the stylet group. Among critically ill adults undergoing tracheal intubation,

use of a bougie did not significantly increase the incidence of successful intubation on the first attempt compared with use of an endotracheal tube with stylet. In study by Jafra A *et al.*,<sup>10</sup> airway in trauma patients was primarily managed by non-anaesthesia speciality residents (426 patients); anaesthesia residents were primarily called for deferred or difficult intubations. The first attempt success rate of intubation by anaesthesia residents was significantly higher than speciality residents (P = 0.0001). Non-anaesthesia residents used midazolam in varying doses (3-12 mg) for intubation, whereas, rapid sequence intubation was the most common technique used by anaesthesia residents. Airway injuries were the most frequent complication observed in 32.8% of patients intubated by specialty residents compared to 5.9% of patients intubated by anaesthesia residents. Fathil SM *et al.*,<sup>11</sup> studied 228 intubations, cardiopulmonary arrest was the main indication for intubation (35.5%). The other indications were head injury (18.4%), respiratory failure (15.4%), polytrauma (9.6%) and cerebrovascular accident (7.0%). All of the 228 patients were successfully intubated. Rapid sequence intubation (RSI) was the most frequent method (49.6%) of intubation. A total of 223 (97.8%) intubations were done by ED personnel. In 79.8% of the cases, intubations were successfully performed on the first attempt. Midazolam was the most common induction agent used (97 patients), while suxamethonium was the muscle relaxant of choice (109 patients). There were 34 patients (14.9%) with 38 reported immediate complications. The most common complication was oesophageal intubation. A strategy for difficult airway management is necessary

when facemask ventilation, supraglottic airway device (SAD) placement or ventilation, tracheal intubation or insertion of a front-of-neck airway (FONA) is predicted to be challenging. The incidence of difficult facemask ventilation is 0.66–2.5%, difficult SAD placement or ventilation 0.5–4.7%, difficult tracheal intubation 1.9–10% and combined difficulty in both facemask and tracheal intubation 0.3–0.4%.<sup>12,13,14,15</sup> Because of proven advantages of a fast-learning curve, an improved laryngeal visualization and an increased success rate, VL has been widely used for tracheal intubation in emergency and critical situations.<sup>16,17</sup> Understanding when and why trauma patients may encounter difficulty in airway management can help guide the logistical and mental exercise of developing specific mitigating strategies and contingency planning. A call for help should always be viewed as a patient-focused measure, not a sign of provider weakness.

## CONCLUSION

Primary goal of tracheal intubation, especially in trauma patients, is to achieve first pass success without adverse events. We had majority successful intubations, that too in first attempt, with few complications due to rigorous training and monitoring,

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