ISSN 1220-8841 (Print)
ISSN 2344-4959 (Online)

ROMANIAN
NEUROSURGERY

Vol. XXXVI | No. 2 June 2022

Airway management in neurotrauma care. Basic considerations

Indubala Maurya,
Ved Prakash Maurya,
Rakesh Mishra,
Luis Rafael Moscote-Salazar,
Tariq Janjua,
Mohd Yunus,
Amit Agrawal

DOI: 10.33962/roneuro-2022-038

Romanian Neurosurgery (2022) XXXVI (2): pp. 216-219
DOI: 10.33962/roneuro-2022-038
www.journals.lapub.co.uk/index.php/roneurosurgery

Airway management in neurotrauma care. Basic considerations

Indubala Maurya[1], Ved Prakash Maurya[2], Rakesh Mishra[3], Luis Rafael Moscote-Salazar[4], Tariq Janjua[5], Mohd Yunus[6], Amit Agrawal[7]

[1] Department of Anaesthesiology, Kalyan Singh Super Specialty Cancer Institute, CG City, Lucknow, INDIA
[2] Department of Neurosurgery, SGPGIMS, Lucknow, INDIA
[3] Department of Neurosurgery, Institute of Medical Sciences, Banaras Hindu University, Varanasi, INDIA
[4] Latin-American Council of Neurocritical Care (CLaNi), COLOMBIA
[5] Department of Critical Care Medicine, Physician Regional Medical Center, Naples, FL, USA
[6] Department of Trauma and Emergency Medicine, All India Institute of Medical Sciences, Saket Nagar, Bhopal, INDIA
[7] Department of Neurosurgery, All India Institute of Medical Sciences, Saket Nagar, Bhopal, INDIA

Keywords
neurotrauma, neurocritical care, traumatic brain injury, airway management

Corresponding author:
Amit Agrawal

Department of Neurosurgery, All India Institute of Medical Sciences, Saket Nagar, Bhopal, India

dramitagrawal@gmail.com

ISSN online 2344-4959
© Romanian Society of Neurosurgery

First published
June 2022 by
London Academic Publishing
www.lapub.co.uk

ABSTRACT

The predictability of the airway compromise affects the decision for tracheal intubation. Associated specific injuries, clinical presentation, and expected deterioration are the deciding factors regarding the need for securing the airway. Emergent or semi-urgent intubations are straightforward in the majority of patients. Airway management in trauma patients aims to improve tissue oxygenation, ensure ventilatory exchange, stabilize other injuries and prevent aspiration. Airway management in the trauma and emergency room is challenging as the emergency team has limited time for full airway assessment unlike pre-anaesthesia check-up clinic/operative room. The airway cart must be checked routinely in the emergency room for the working condition of the equipment and its availability. All trauma patients must be considered to have cervical spine injuries unless ruled out. The airway management for trauma patients is best done using a team approach including emergency medicine physicians, anaesthesiologists, surgeons, and trained paramedical staff. Regardless of the emergency room setting, airway management of a trauma patient requires effective communication and efficient teamwork.

INTRODUCTION

Airway management in trauma patients aims to improve tissue oxygenation, ensure ventilatory exchange, stabilize other injury and prevent aspiration. Airway management in the trauma and emergency room is challenging as the emergency team has limited time for full

airway assessment unlike pre-anaesthesia check-up clinic/operative room. Trauma patients present a varied spectrum of injury from localized to multisystem involvement. The presence of hemodynamic instability, direct airway injury, thoracic injury, combative patient (Raised Intracranial pressure/intoxication/hypoxemia), etc. can lead to difficult airway situations. Availability of trained team, synchronized teamwork, and functional airway equipment are paramount for safe airway management. [1-3]

INDICATION FOR SECURING THE AIRWAY

Associated specific injuries, clinical presentation, and expected deterioration are the deciding factors regarding the need for securing the airway. Emergent or semi-urgent intubations are straightforward in the majority of patients. But in some patients, it may be less clear. The Eastern Association for the Surgery of Trauma (EAST) practice management guidelines and the Advanced Trauma Life Support (ATLS) program have given indications for intubation in trauma patients. [1, 4] In general, the indication for emergency tracheal intubation in trauma patients is the failure of oxygenation or ventilation, failure to maintain/protect the airway and anticipated deterioration of the airway. (**Table 1: Indication for tracheal intubation**). The trauma patients may have poor oxygenation and ventilation hypoxemia or hypoventilation due to multiple factors and may not respond to simple interventions e.g., oxygen supplementation. Adequacy of oxygenation and ventilation can be assessed clinically by pulse oximetry, respiratory effort, and associated injuries. Inability to protect the airway could be due to decreased level of consciousness secondary to traumatic brain injury or intoxication. In these cases, early intubation is typically indicated. Any patients with penetrating neck injury, inhalation injury (burns from closed space fire), hemorrhagic shock (due to complicated pelvic fracture, Liver laceration) may lose airway as natural clinical course, thus they will need intubation in anticipation. The predictability of the airway compromise affects the decision for tracheal intubation. [5, 6]

Table 1: Indication for tracheal intubation

Eastern Association for the Surgery of Trauma (EAST) • Hypoventilation • Persistent hypoxemia • Decreased level of consciousness (GCS≤ 8) • Cardiac arrest • Hemorrhagic shock • Airway obstruction • Inhalation injury • Facial injury
Advanced trauma life support (ATLS) • Poor Respiratory efforts • Hypoxia • Hypercarbia • Cyanosis • Neurological deterioration (GCS≤ 8) • Apnea • Severe facial injury • Direct airway injury • Inhalational injury • Unconscious patients

PREPAREDNESS

A preparedness and coordinated approach to airway management is the key step. [7, 8] The airway cart must be checked routinely in the emergency room for the working condition of equipment and its availability. The intuitional/local practice best determines the timing but checking after every shift is recommended. Standard airway equipment should be there in the airway cart. [9] The cart should have different sizes/types of facemasks, laryngoscopes, endotracheal tubes, oral airway, nasal airway, bougies, invasive airway equipment, etc. (**Table 2: Difficult airway cart**).

Table 2: Difficult airway cart

• Manual Resuscitator with oxygen reservoir • Oral and nasal airways (various sizes) • Rescue airways device: Combi tube, Laryngeal mask airway • Endotracheal tube introducer (Gum elastic bougie) • Semi-rigid stylet • Endotracheal tubes (Range of sizes) • Laryngoscope blades of shorted design and size • Laryngoscope handle with battery (check for functionality) • Syringes, Lubricant, Tube ties • Video laryngoscope • Cricothyrotomy kit

Always ensure that oxygen source and suction equipment are available in the functional stage. The emergency drug tray must have induction agents (e.g., etomidate, ketamine, propofol, etc.) and muscle relaxants (e.g., Succinylcholine, Rocuronium, etc.)

beside emergency drugs. [2, 3, 10] Regardless of the emergency room setting, airway management of a trauma patient requires effective communication and efficient teamwork. The airway management for trauma patients is best done using a team approach including emergency medicine physicians, anaesthesiologist's, surgeons, and trained paramedical staff. [11-13] Emergency intubation in the emergency room requires additional assistance to administer drugs, to ventilate the patient, to give cricoid pressure, and manual in-line stabilization (MILS) of the cervical spine if indicated. Even extra assistance is needed to control agitated patients due to head injury/intoxication.

Uncooperative/Agitated patients

The agitated patients can injure themselves. The trauma patients may be violent or agitated due to various reasons such as alcohol/drugs intoxication, hypoxia, hypercarbia, head injury, hypoglycemia, severe pain, etc. These factors should be addressed along with airway intervention. As per EAST guidelines, if the severity of agitation hinders assessment and resuscitation, intubation can be considered. [4]

Craniofacial trauma

A significant proportion of individuals with severe maxillofacial injury, more so with pan-facial involvement, have associated traumatic brain and spine injury; therefore, spine stabilization and preventing airway compromise are challenging in these patients. The mechanisms attributed to airway compromise in maxillo-facial trauma are primarily due to tongue fall secondary to bilateral mandible fracture, displacement of the fractured maxilla, hematoma, soft-tissue oedema, foreign body, or direct laryngeal trauma. The patient should be placed in a lateral position for mid-facial trauma with the potential risk of haemorrhage and the mandible pulled forward. This technique would help remove the blood and secretion, and the airway can be easily kept patient. Oropharyngeal airway and nasopharyngeal airway devices are used in these cases because traditional manoeuvres of jaw thrust, chin lift, and head tilt may not be possible due to associated oedema or C-spine injury. While intubating, a rigid high suction device may be kept alongside the laryngoscope to prevent soiling of the airway. [14] The available options are orotracheal intubation, nasotracheal intubation, cricothyroidotomy, and tracheostomy.

Direct airway trauma

In patients with direct trauma, the airway is a challenging situation for the emergency team. Direct trauma to the airway can be due to blunt or penetrating injury. Airway injury can occur at multiple levels and may be associated with a cervical spine injury, injury to the aerodigestive tract, etc. It can result in immediate or delayed airway obstruction. [5, 15, 16] General principles for the management of direct airway trauma include repeated clinical assessment because the airway can compromise due to tissue oedema or hematoma over time. Even if the patient appears clinically stable, airway management is required given anticipated deterioration. Swallowing of blood from a facial fracture can cause gastric distention and irritation thus it may increase the risk of regurgitation. The emergency team should assess the possibility of difficulty with bag-mask ventilation, endotracheal intubation, supraglottic device placement, and even with the surgical airway. A large-bore catheter suction should be used. If a difficult BMV is anticipated, an awake approach instead of RSII is safer. During bag-mask ventilation, airway obstruction can increase further due to pressure on the mandible and displacement of fractured segments. Airway disruption and bleeding make laryngoscopy and intubation challenging. Placement of supraglottic airways devices can be difficult due to distorted airway anatomy and limited mouth opening. If initial attempts to laryngoscopy fail, the surgical airway is indicated. In selected patients, the surgical airway may be the most appropriate initial approach to airway intervention.

Conclusion

All trauma patients must be considered to have cervical spine injury unless rules out. The selection of induction drugs should be based on the type/severity of the injury and the patient's hemodynamic status. A variety of effective rescue airway devices are available for use in trauma patients. Airway specialists should become familiar with and practice several of them to maximize the options available in case of a failed airway.

References

1 Trauma ACoSCo. Advanced Trauma Life Suport ATLS: Student Course Manual: American College of Surgeons, 2012.

2. Cranshaw J, Nolan J. Airway management after major trauma. Continuing Education in Anaesthesia, Critical Care & Pain 2006;6:124-127.

3. Louro J, Varon AJ. Airway management in trauma. International anesthesiology clinics 2021;59:10-16.

4. Mayglothling J, Duane TM, Gibbs M, et al. Emergency tracheal intubation immediately following traumatic injury: an Eastern Association for the Surgery of Trauma practice management guideline. The journal of trauma and acute care surgery 2012;73:S333-340.

5. Jain U, McCunn M, Smith CE, Pittet JF. Management of the Traumatized Airway. Anesthesiology 2016;124:199-206.

6. Rajandram RK, Syed Omar SN, Rashdi MF, Abdul Jabar MN. Maxillofacial injuries and traumatic brain injury--a pilot study. Dental traumatology : official publication of International Association for Dental Traumatology 2014;30:128-132.

7. Smith KA, High K, Collins SP, Self WH. A preprocedural checklist improves the safety of emergency department intubation of trauma patients. Academic emergency medicine : official journal of the Society for Academic Emergency Medicine 2015;22:989-992.

8. Tsai AC, Krisciunas GP, Brook C, et al. Comprehensive Emergency Airway Response Team (EART) Training and Education: Impact on Team Effectiveness, Personnel Confidence, and Protocol Knowledge. The Annals of otology, rhinology, and laryngology 2016;125:457-463.

9. Bjurström MF, Bodelsson M, Sturesson LW. The Difficult Airway Trolley: A Narrative Review and Practical Guide. Anesthesiology research and practice 2019;2019:6780254.

10. Khan RM, Sharma PK, Kaul N. Airway management in trauma. Indian journal of anaesthesia 2011;55:463-469.

11. Kovacs G, Law JA, Ross J, et al. Acute airway management in the emergency department by non-anesthesiologists. Canadian journal of anaesthesia = Journal canadien d'anesthesie 2004;51:174-180.

12. Levitan RM, Rosenblatt B, Meiner EM, Reilly PM, Hollander JE. Alternating day emergency medicine and anesthesia resident responsibility for management of the trauma airway: a study of laryngoscopy performance and intubation success. Annals of emergency medicine 2004;43:48-53.

13. Mackersie RC. Pitfalls in the evaluation and resuscitation of the trauma patient. Emergency medicine clinics of North America 2010;28:1-27, vii.

14. DuCanto J, Serrano KD, Thompson RJ. Novel Airway Training Tool that Simulates Vomiting: Suction-Assisted Laryngoscopy Assisted Decontamination (SALAD) System. The western journal of emergency medicine 2017;18:117-120.

15. Barak M, Bahouth H, Leiser Y, Abu El-Naaj I. Airway Management of the Patient with Maxillofacial Trauma: Review of the Literature and Suggested Clinical Approach. BioMed research international 2015;2015:724032.

16. Saini S, Singhal S, Prakash S. Airway management in maxillofacial trauma. Journal of anaesthesiology, clinical pharmacology 2021;37:319-327.