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Case Report

Anesthesia Section

Novel Use of the MADgic Atomiser for Emergency Airway Management in Complex Neck Trauma: A Case Report

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ABSTRACT

Penetrating neck injuries present as a formidable challenge to anaesthesiologists and the trauma care team due to the risk of rapid airway compromise, exsanguination and involvement of multiple vital structures. Securing the airway remains the top priority, especially in patients presenting with neck injuries, active bleeding, tissue disruption, and altered sensorium. Safest methods to secure the airway is in an awake and spontaneously breathing patient. We report a case of a 55-year-old male who presented with a deep anterior neck laceration in hypovolaemic shock in an emergency, in whom a conventional airway was deemed impossible. Then, as a game-changer, the MADgic Atomiser, a mucosal atomiser, was used to facilitate topical anaesthesia in airway management. The traumatic airway being complex, airway management in such a scenario is extremely difficult. Multidisciplinary teamwork remains the gold standard. Here, in this case, oxygenation was utmost important, looking at the blood loss and Glagow Coma Scale (GCS) of the patient. Hence, direct placement of a tracheostomy tube through the exposed tracheal lumen was initiated, followed by definitive oral endotracheal intubation using a C-MAC for further management. This case highlights the novel use of MADgic Atomiser, an innovative airway adjunct, C-MAC, and the critical role of adaptability, along with multidisciplinary teamwork in managing life-threatening neck injuries.

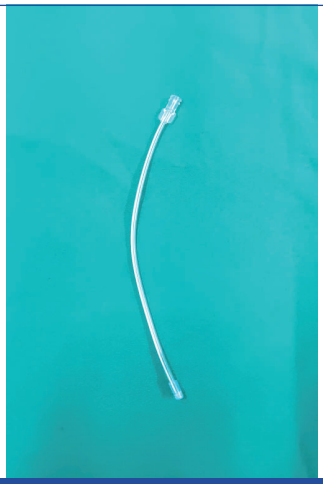
Keywords: Mucosal atomisation device, Tracheostomy, Traumatic airway

CASE REPORT

A 55-year-old male with a height of 5'10, weighing 70 kg, was brought to the emergency department at midnight with a deep transverse laceration over the anterior neck, sustained during a slit throat assault. On arrival, approximately 40 to 60 minutes after the assault, he was irritable, confused, with a GCS of 12/15 and in hypovolaemic shock. His vital signs were Heart Rate (HR) of 160 bpm, Non-invasive Blood Pressure (NIBP) of 70/40 mmHg and SpO_2 of 84% on room air with ASA IV. Aggressive fluid resuscitation with crystalloids, colloids, and norepinephrine infusion for blood pressure support was started. Baseline laboratory investigation (Hb of 8.5 gm%, 150,000 platelets per microlitre and INR of 1.4) was sent along with cross-matching for packed cells and fresh frozen plasma was requested urgently.

On inspection, the laceration was situated just above the thyroid cartilage, exposing the airway lumen and strap muscles, making the posterior tracheal wall clearly visible [Table/Fig-1]. There was active bleeding and significant contamination with blood and secretions. Continuous oxygen insufflation was given at the level of the cut end. Immediate airway intervention was performed due to the poor oxygenation and compromised airway. Conventional intubation seemed difficult due to distorted anatomy; hence, the decision was made for immediate airway access through the open wound. With the help of MADgic Atomiser [Table/Fig-2], 3 mL (63.9 mg) of 2% Lignocaine with Adrenaline [1] was sprayed onto the exposed airway mucosa to provide topical anaesthesia, considering the risk of systemic toxicity due to open blood vessels. A tip was introduced and a local anaesthetic spray was sprayed into the trachea. Oxygen insufflation was continued. After a latency of two minutes, under direct vision, a seven-no. tracheostomy tube was inserted through the visible lacerated airway lumen. Blood and secretions were suctioned thoroughly, placement was confirmed with an end-tidal CO_2 waveform, and equal B/L air entry. The tracheostomy tube was secured with a sterile gauze roll for stability. This immediate airway placement secured oxygenation and allowed further stabilisation. CT angiography and endoscopy were not performed due to the emergency.

[Table/Fig-1]: Clinical photograph showing penetrating neck injuries with exposed trachea.



[Table/Fig-2]: Showing MADgic atomiser.

The patient was then shifted to the operating theatre. Monitoring was done with Electrocardiography (ECG), Non invasive blood pressure (NIBP), Peripheral Capillary Oxygen Saturation SpO_2 and Heart Rate (HR). Premedication was given with Inj. Glycopyrrolate 0.2 mg, Inj. Midazolam 2 mg Inj. Fentanyl 100 mcg. Intravenous anaesthesia induction was done with Ketamine 50 mg and Inj. Propofol 50 mg. Anaesthetic maintenance was done with Sevoflurane: Oxygen and muscle relaxation with i.v. Atracurium. Analgesia was achieved with Inj. Paracetamol 1 g. Patient received two packed cells, four fresh frozen plasma intraoperatively, along with crystalloids.

On surgical exploration, haemostasis was achieved with ligation of multiple bleeding vessels. However, the tracheostomy tube in situ was partially obstructing the surgical field and limiting visualisation. After primary suturing and haemostasis, we planned to transition from the emergency tracheostomy tube to an oral endotracheal tube. With the help of C-MAC, internal injuries were assessed, once glottic was visualised bougie was passed and a tracheostomy tube was carefully removed, then 7-no flexo metallic endotracheal tube was guided into the trachea. Placement was confirmed using end-tidal CO_2 and bilateral air entry. With the airway secured orally, surgeons were able to achieve haemostasis and complete wound repair.

Postoperatively, the patient was shifted to the ICU and electively ventilated for airway protection and wound healing for 24 hours, then maintained on sedation. Reassessment was planned after 48-72 hours. On day 3, the patient was taken up for elective tracheostomy as planned to avoid aspiration of blood, secretion and better wound healing. Patient was then kept in SICU for three days on oxygen support, then shifted to the ward. Patient was successfully decannulated three weeks post-procedure.

DISCUSSION

Penetrating neck trauma accounts for approximately 5-10% of all trauma cases in India, but carries disproportionately high morbidity and mortality due to the density of vital structures in a small anatomical region. The "neck zones" classification underscores the risk of involvement of the trachea, oesophagus, carotid and vertebral vessels, thyroid gland, larynx, and cervical spine [2]. Zone 1 is the most caudal zone and extends from the level of the sternal notch/clavicles to the cricoid cartilage. Zone II continues from the cricoid cartilage to the angle of the mandible. Zone III includes the angle of the mandible to the base of the skull [3]. Securing the airway remains the top priority, especially in patients presenting with active bleeding, tissue disruption, and hypoxia. Traumatised airway management requires high level of suspicion of airway disruption, compression and a clinical decision based on the patient's clinical condition [4]. Early intervention and a multidisciplinary approach are lifesaving in penetrating neck injuries [5]. Safest methods to secure the airway is in an awake and spontaneously breathing patient [6].

MADgic atomiser, which is a laryngotracheal mucosal atomisation device for spraying topical anaesthetics in the laryngotracheal region, which provides atomised topical solution directly to the mucosa of the airway [7]. It can deliver local anaesthetic with precision and rapid absorption, and could play an important role in providing topical anaesthesia in emergency airway interventions [5]. A preliminary study was conducted by Xu FS et al., on 18 patients, and suggests that a combination of Trachlight™ and MADgic® atomiser can provide excellent topical anaesthesia of the airway for awake orotracheal intubation. The technique is easy to perform, well tolerated by the awake patient, and useful in difficult intubation [7]. The amount of drug sprayed with each actuation is determined by the clinician, as the device is not prefilled. The device is engineered to create a fine, consistent mist, ensuring reliable and targeted delivery of the medication to the targeted mucosal surfaces. It has a versatile application as administering medications to the upper airway and beyond the vocal cords, including the nasal and oropharyngeal regions [8]. In this case, the airway was directly visualised through the wound, allowing for an uncommon but lifesaving approach using the MADgic atomiser. The atomiser was used at the slit surface on the thyroid cartilage and onto the tracheal mucosa before the tracheostomy tube was inserted. This rapid intervention restored oxygenation and provided analgesia also time for resuscitation in a full-stomach patient. A comparative study conducted by Yadav U et al., stated that analgesia was better with nerve block than the atomiser [6], but in this case, nerve block was impossible due to the distorted anatomy; awake fibreoptic intubation was never an option.

Challenges faced, due to distorted anatomy, were disrupted landmarks, compromised surgical access and an impossible clinical scenario for conventional intubation. The initial tracheostomy tube, while lifesaving, obstructed surgical visualisation. Hence, dual airway strategy-a staged approach, initial surgical airway followed by definitive oral intubation, demonstrated the flexibility required in trauma anaesthesia. C-MAC video laryngeal scope provided better laryngeal view, fewer intubation attempts and shorter intubation time required [9]. The atomiser provided effective anaesthesia to the laryngeal and tracheal mucosa, ensuring patient comfort and successful Intubation [10]. Successful management was possible only through close collaboration between anaesthesiologists and surgeons. While anaesthesiologists ensured oxygenation and haemodynamic stability, surgeons foccused on haemorrhage control and tissue repair.

CONCLUSION(S)

This case highlights the effective use of the MADgic atomiser in facilitating emergency tracheostomy tube placement in a patient with severe hypovolemic shock. It is a valuable adjunct in emergency airway management, providing rapid and safe mucosal anaesthesia. Airway strategies must remain flexible, with readiness to transition from temporary to definitive methods. The outcome underscores the importance of innovation, adaptability and team coordination in the management of complex airway trauma.

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