CASE REPORT

Submandibular Intubation in Severe Maxillofacial Trauma using C-MAC Videolaryngoscope: A Case Report

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ABSTRACT **Introduction:** Anatomical distortion, intra-oral bleeding, and the requirement for unhindered surgical access make managing the airway in patients with severe maxillofacial trauma extremely difficult. When midface fractures or involvement of the skull base are present, orotracheal and nasotracheal intubation may not be safe nor practical. Although tracheostomy is a common substitute, there are risks associated with it, including bleeding, subcutaneous emphysema and chronic issues like loss of airway, recurrent laryngeal nerve damage etc.

Case Presentation: We describe the successful submandibular intubation of a patient with panfacial fractures using the C-MAC videolaryngoscope for maxillofacial reconstruction surgery. This method avoided the problems associated with tracheostomy while allowing unhindered surgical access.

Conclusion: By enhancing glottic visualization and minimizing airway trauma, the C-MAC videolaryngoscope has further improved the technique's ease and safety during the procedure.

Keywords: **S**ubmandibular intubation, Maxillofacial surgery, Panfacial fracture, C-MAC videolaryngoscope.

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INTRODUCTION

The anaesthetists and surgeons must be aware that airway management of patients with severe craniofacial injuries presents with substantial complications. Due to active bleeding, altered anatomy, or the requirement for intraoperative maxillomandibular stabilization, conventional orotracheal or nasotracheal intubation may be either contraindicated or impracticable. Tracheostomy has been the alternative in these complicated situations, but it has some drawbacks of its own, such as bleeding, infection, subglottic stenosis, and long-term morbidity. An alternative to tracheostomy, submental intubation was originally described by Francisco Hernandez Altemir in 1986[1] where after normal oral intubation, an incision of 2cm is given in the submental and paramedial space and through this incision, the oral endotracheal tube is pass with cuff deflated and the tube is fixed at the submental level. A modification of submental intubation is submandibular intubation, which is better in certain aspects like the incision is lower and away from major salivary ducts, less visible scar and avoids injury to lingual nerve and sublingual gland.[2] It also avoids possible tongue elevation and is a less invasive method that permits intraoperative access without obstructing surgical repair.[2,3] By improving glottic visibility and manoeuvrability, the C-MAC videolaryngoscope further improves the safety and effectiveness of airway management in these challenging circumstances, particularly in patients with deformed anatomy.[4] In order to demonstrate the C-MAC videolaryngoscope's effectiveness as dependable and less invasive, we report a successful submandibular intubation that was made possible by the device in a patient who had suffered severe maxillofacial damage.

CASE PRESENTATION

A 28-year-old male patient presented to the emergency room following a road traffic accident. On arrival, his Glasgow Coma Scale (GCS) score was 15, but he had serious facial abnormalities, such as left body of mandible fracture, Le Fort II fractures and bilateral zygomaticomaxillary complex fractures. There was active intra-oral bleeding, limited mouth opening and severe facial oedema. Nasal patency test was positive in each nostril indicating no obstructions. There was no history of loss of consciousness, vomiting or seizures. He has no comorbidities. The patient's complete blood counts (CBC), serum electrolytes, serum urea, serum creatinine and coagulation profile were all within normal limits. CT scan confirmed fracture of left body of mandible, fractures of the maxillary and nasal bones and the absence of basal skull fracture. His airway evaluation indicated a limited mouth opening of one finger's width due to pain. Mallampati scoring could not be assessed because of the restricted mouth opening. The mobility of the temporomandibular joint was also limited.

Elective open reduction and internal fixation (ORIF) was scheduled to take place 48 hours after the initial injury. Orotracheal intubation would impede surgical access and maxillomandibular fixation, and nasal intubation was contraindicated due to nasal bone fracture. The plan was to carry out a submandibular intubation following oral intubation while the patient was under general anaesthesia with the administration of a muscle relaxant. Informed written consent was obtained. In the Operation Theatre (OT), all standard multi-parameter monitors were attached like NIBP, ECG, pulse oximetry, temperature and respiration. Peripheral intravenous cannula was secured with 18G in left upper hand. Preoxygenation was performed using 100% FiO2 for a duration of 3 minutes. Intravenous induction was carried out with Fentanyl 100mcg, Propofol 100mg, and Rocuronium bromide 40mg, which served as the muscle relaxant as there was availability of Suggamadex and maintenance with isoflurane titrated according to MAC. The Rapid Sequence Induction (RSI) technique was employed, and on the first attempt using the C-MAC videolaryngoscope MAC #4 displaying a Cormack Lehane grade of 1, an 8.0mm I.D reinforced (flexometallic) endotracheal tube was orally inserted into the trachea and secured at the 22cm mark and correct placement confirmed with capnography and equal bilateral air entry.[4] Oropharyngeal packing was performed following intubation to reduce the risk of aspiration during surgery. Intraoperative medications given were Paracetamol 1gm IV, Fentanyl 50mcg IV, Ondansetron 4mg IV and Dexamethasone 4mg IV.

Figure 1: KARL STORZ C-MAC videolaryngoscope with MAC #4

The procedure was jointly done by the Anaesthetist and Surgeon. The right side of the floor of the mouth was chosen for access and identified using a C-MAC videolaryngoscope due to fracture of left body of mandible (Figure 1). About 1 inch below and 0.5 inches in front of the angle of the mandible, after local infiltration with 3ml LOX 2% (Lignocaine and Adrenaline 1:200000), a 1.5cm transverse skin incision was made in the right submandibular area. By keeping a safe distance from the inferior border of the mandible, this site was selected to avoid the facial nerve's marginal mandibular branch. A blunt dissection was made cephalad with a curved artery forceps, going through the mylohyoid muscle, platysma, deep cervical fascia, and subcutaneous tissue until the oral mucosa was tented. After ensuring ventilation with FiO2 100%, the endotracheal cuffs were deflated, and pilot balloon was first grasped with an artery forceps and pulled through the submandibular incision after the universal connector has been removed. Next, the proximal end of the endotracheal tube was carefully grasped and exteriorized through the submandibular tunnel. The tube was reconnected to the closed breathing anaesthesia circuit, sutured securely to the skin and fixed in place after confirming with capnography and bilateral air entry (Figure 2). The procedure was uneventful and completed in less than 15 minutes.

Figure 2: Position of the flexometallic endotracheal tube after submandibular intubation

Having achieved an airway that would not interrupt surgical access, the surgical team were able to do an open reduction and internal fixation of the panfacial fractures and get proper alignment. The procedure was well tolerated. At the end of the surgery, the Anaesthetist repositioned the endotracheal tube intraorally and submandibular incision closed prior to extubation. The patient was extubated in the operating room, which was uneventful, shifted to Post-Anaesthesia Care Unit (PACU) and then to ward on room air. After discharged from the hospital, he was follow-up in Oral and Maxillofacial surgery (OMFS) OPD 1-week and 1-month respectively. Post operatively, he was on nasogastric tube feeding for 2 weeks and later started on soft oral diet. The submandibular incision healed well, and recovery went smoothly.

DISCUSSION

Airway management of severe cases of maxillo-facial trauma will always require a carefully considered anaesthetic and surgical plan. Nasotracheal intubation, a preferred approach for many maxillofacial surgeries is contraindicated in cases of complex facial fractures because of the possibility of intracranial tube implantation. This is especially important where skull base fractures are suspected.[5,6] Despite being widely used, orotracheal intubation can obstruct the surgical field and make it more difficult to apply intermaxillary fixation, that is necessary to restore facial symmetry and occlusion.

Submental tracheal intubation on the other hand, circumvents the possible risks of tracheostomy and nasal intubation.[7] With the intention of avoiding tracheostomy and keeping away from the surgical field, Francisco Hernandez Altemir described the submental intubation technique in 1986.[1] This technique allows the endotracheal tube to be rerouted from the normal oral intubation through a submental incision, maintaining ventilation while granting unrestricted surgical access. The submental approach, as described by Altemir, has been subsequently modified by Green and Moore[8], who introduced the use of two tracheal tubes. Initially, the patient is intubated using the standard method with an orotracheal tube. Following this, a submental incision is created, and a second tube is pulled through the incision, with the cuff end first, and is inserted into the trachea after the first tube is removed. This method is regarded as safer than utilizing a single tube, which could become dislodged during the process of being pulled through the submental incision or if complications arise while reconnecting the connector.

In contrast to tracheostomy, submental intubation is an alternative and cost-effective technique for complex maxillofacial surgeries, and it avoids complications such as tracheal stenosis, fistula formation, bleeding, and infection.[9,10] Bhatia et al.[11] reported an unusual complication of submental intubation causing injury to submandibular duct and secondary fibrosis causing sialocele.

A modification of submental intubation is submandibular intubation,[2,3,12] where the incision is made in the submandibular region, further posteriorly. It is an easy and useful method of avoiding the potential hazards of the submental approach, including injury to the lingual nerve, sublingual gland and submaxillary ducts. This method is better in certain aspects like the incision is lower and away from major salivary ducts, less visible scar and avoids injury to lingual nerve and sublingual gland. It also avoids possible tongue elevation and is a

less invasive method that permits intraoperative access without obstructing surgical repair.

Figure 3: ROMSON' S re-inforced (flexometallic) endotracheal tube

Pulling the tube's end through the deep cervical fascia of the submandibular region might be easier than doing so in the constricted submental region. Preventing injury during submandibular intubation requires an understanding of anatomy. The incision was performed below the mandibular angle so as not to damage the marginal mandibular branch of the facial nerve. Careful incision through the soft tissues ensured an atraumatic tube passage. Although submandibular intubation is generally well tolerated, there are some risks involved. These include infection, haemorrhage, accidental extubation during tunnelling, and scarring after surgery.[12]

In our case, the procedure was well tolerated and there were no complications. In addition to the skill required to facilitate this procedure, the use of airway adjuncts improved the success of the procedure. In our patient, despite facial trauma and intra-oral bleeding, successful intubation was made possible using a C-MAC videolaryngoscope, which greatly improved airway visualization as compared to other videolaryngoscope like McGrath laryngoscope that may have been occluded by blood on the scope thereby making it more technically challenging. The C-MAC videolaryngoscope was therefore a superior tool in this situation. In contrast to conventional direct laryngoscopy, video laryngoscopy offers a better glottic view and lowers the risk of trauma, making it a useful adjunct in challenging airway situations.

Furthermore, the risk of kinking during manipulation and tunnelling was reduced by using a flexometallic endotracheal tube as compared to use of a polyvinyl chloride (PVC) endotracheal tube[12] (Figure 3). Submandibular endotracheal tube is transferred and usually replaced with oral endotracheal tube after surgery. Being very stable post operatively, our patient was transferred to the PACU after an uneventful extubation in the operating room and was shifted to ward on room air. In the intensive care unit, delayed oral extubation has also been reported due to related facial swelling and oral cavity oedema.[13] Stranc[14] reported a case of a 29-year-old man who developed a submandibular mucocoele 6 months after submandibular intubation for panfacial fractures. In our patient, the technique of airway management prevented post operative airway oedema, hence, the reason for no requirement for ICU post operatively.

CONCLUSION

In patients with complex maxillofacial trauma for whom airway management via conventional routes are contraindicated, submandibular intubation is a safe and efficient substitute for tracheostomy. In situations where intermaxillary fixation is necessary, it offers a safe airway without hindering the surgical field. In anatomically difficult situations, the use of videolaryngoscope, like the C-MAC, improves ease of intubation and safety. This procedure is cost-effective as it results in fewer complications, a shorter length of hospital stays, and lessens the requirement for a high dependency unit to manage the tracheostomy tube. Additionally, this method offers an aesthetic advantage; the scar resulting from the incision is significantly less as compared to that of a tracheostomy. Submandibular intubation can be carried out jointly by Anaesthesia and Surgical team with good results and low morbidity if the right knowledge of anatomy and surgical techniques are deployed.

Consent: Written informed consent was obtained from the patient.

Conflict of interest: None indicated.

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