

## **Overview of airways management (intubation) in facial trauma patients**

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### **Abstract:**

Management of the airway is a major problem in patients with maxillofacial trauma because a compromised airway could lead to death. The approach of intubation to use in these patients remains a debatable topic and we review the management and intubation strategies. We conducted computerized search among electronic databases; EMBASE, COCHRANE and MEDLINE for literature available in the databases to December, 2017 using the following search term including variants: “facial trauma”, “intubation”, “Management”. When one is managing maxillofacial trauma, the first concern to consider is airway concession. Depending on the nature of the trauma, there are many available options for intubation. Each possesses its own set of advantages and disadvantages. In general, endotracheal intubation is usually not an alternative; however, nasotracheal intubation and tracheotomies could be performed. Yet, these two procedures could possibly create additional difficulties; thus, submental and submandibular intubations provide an interesting alternative to consider when managing these situations. Various forms of trauma such as GSWs, facial fractures, cervical spine injuries, and laryngotracheal injuries are potentially life-threatening. At times, patients sustaining these sorts of traumatic injury may need an artificial airway.

### **Introduction:**

In patients who have sustained traumatic maxillofacial injuries, airway management is a primary concern. A compromised airway either in the very early or later phases could cause hypoxia or obstruction, which are both life-threatening conditions [1]. Taking care of the airway could be really tough. There are several options offered relying on the situation. Nevertheless, the method of intubation to use remains questionable. Level I suggestions state that emergency tracheal intubation need to be done when there is airway blockage or cognitive problems. In these instances, patients might additionally have hematomas or linked cervical spine injuries. This might better make complex control of the airway [2]. In the management of these situations, preserving the airway is one of the most essential concern in the beginning, whereas surgical repair service with anesthesia can be managed in the later phases.

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### **Methodology:**

We conducted computerized search among electronic databases; EMBASE, COCHRANE and MEDLINE for literature available in the databases to December, 2017 using the following search term including variants: “facial trauma”, “intubation”, “Management”. Restriction to only

English language with human subjects were applied. Reference lists from all articles were scrutinized to identify any additional studies of interest.

## Discussion:

### • INITIAL MANAGEMENT

A quick, initial evaluation of the patient should involve the Advanced Trauma Life Support procedure adhering to the "ABCDE" sequence (A-airway maintenance with cervical spinal column protection; B-breathing and ventilation; C-circulation with hemorrhage control; D-neurological standing; E-exposure/environmental control). To perform emergent surgery, patients need to be maintained promptly by regulating hemorrhage, unwinding the body tooth cavities, and maintaining access to respiratory tracts and vessels [3]. Nasal and airway flows are examined to analyze any compromise as a result of fractured bones, blood loss, loose teeth, foreign bodies, or laryngeal injuries [4]. Bleeding can be managed utilizing nasal packaging or a recklessness catheter. If it is severe, embolization or ligation of the significant vessels may be needed [2]. If the patient is aware and alert, with a breathing rate of greater than 20 breaths/min and no secretions present, after that the patient is regarded to have an appropriate airway.

In various other cases, the indications for intubation are as complies with: absolute indications-unrelieved airway obstruction, apnea, respiratory distress, extreme neurological shortages, and depressed consciousness; urgent indications-penetrating neck injuries, consistent or refractory hypotension, chest wall injuries with breathing dysfunction, and transformed mentation; loved one indications-oromaxillary injury, impending respiratory system failure, threat of putting at risk deterioration with analysis treatments, and danger of breathing failing after management of

sedation or analgesics. Problems with intubation are usually noted in patients with oropharyngeal masses, weight problems, and trauma [5].

### • METHODS OF INTUBATION

One of the most usual method of intubation is endotracheal intubation, however this technique is thought about to be a contraindication in a lot of cases with maxillofacial trauma. Additionally, it may disrupt using maxillomandibular fixation (MMF). Nasotracheal intubation is a different approach that can be utilized when orotracheal intubation is not possible or contraindicated, that is, injury to the mandible or oropharyngeal region. It could additionally be used in patients that are subconscious or have linked cervical spinal column injuries. Dangers in using this method in patients with maxillofacial trauma are intracranial injury, blood loss, and infection [6]. With the arrival of fiberoptic endoscopy, nasotracheal intubation is still a viable option in maxillofacial trauma cases. It was suggested to be made use of in midface fractures [7]. Case records have revealed that nasotracheal intubation achieved success in patients with thought skull base cracks; nonetheless, this factor should be explored additional [4], [8]. A survey located nasal fiberoptic intubation to be the preferred approach for facial fractures such as Le Fort III [9].

When endotracheal and nasotracheal intubation are not possible, a tracheotomy can be carried out. It is one of the earliest modes created to establish a rising airway, and it is implied for patients with a loss of consciousness or panfacial fractures [7]. It is claimed to have been utilized given that the 2nd and 3rd centuries by Galen and Aretaeus. Lorenz Keister created the term tracheotomy in 1718. In 1714, Detharding advised the procedure for individuals that had actually drowned. In 1766, Caron performed the very first pediatric tracheotomy. Some general signs for tracheotomy consist of prolonged intubation, numerous facial fractures, acute airway blockage, and destruction of the nasal region [2]. Its benefits include promoting the positioning of MMF and

removing the nasal and oral flows of any tubes. In a study of anesthesiologists and doctors, the results showed that the participants used tracheotomies to intubate 11.6% of patients with mandibular, panfacial, and Le Fort fractures [7]. Yet, the adverse effects of tracheotomies prevail and were noted in a possible research study of 150 seriously unwell patients. Complications included stomal infection (36%), stomal hemorrhage (36%), and subcutaneous emphysema (13%) [10]. Various other observed difficulties include hypotension, bronchorrhea, injury to the persistent laryngeal nerve, atelectasis, tracheoesophageal fistula, aerophagia, dislocation of tracheotomy tube, persistent airway blockage, subglottic edema, tracheal stenosis, pneumonia, dysphagia, keloid formation, and trouble with decannulation. In a more recent research, the level I trauma solution experienced no major complications in carrying out tracheotomies ( $n = 125$ ) on patients with maxillofacial trauma [11]. A percutaneous tracheostomy can be executed rather since it is a safer and cost-efficient approach calling for much less operating time [12].

A cricothyroidotomy could be carried out as opposed to a tracheotomy when endotracheal intubation and nasotracheal intubation are not possible. A few other signs include difficult intubation due to entrapment and extreme burns [13]. An incision is made with the skin and cricothyroid membrane to permit the placement of a tube. This particular life-saving approach is quicker compared to a tracheotomy and can be executed in the prehospital setup; nevertheless, it is just a short-term option [13]. Cricothyroidotomy could also be done when the vocal cords could not be seen throughout laryngoscopy or the pharynx is obscured by hemorrhage. Some potential difficulties are subglottic blockage and stomal stenosis [14]. In the pediatric airway, it is more challenging to establish the degree of injury, so a first analysis with a computed tomographic scan or endoscope is needed. The primary choice is endotracheal intubation with an endoscope. A cricothyroidotomy must never ever be performed [15].

Two alternate techniques of intubation for situations with midfacial and panfacial cracks are submental and submandibular intubation. Use of these 2 techniques would certainly anticipate using a tracheotomy. Adhering to the standards of orotracheal intubation, Caron et al [16] succeeded in performing submental intubation on 25 patients with only 1 minor issue. They developed a flow with the mylohyoid with blunt breakdown making use of a hemostat. The orotracheal tube is pulled extraorally with the opening and connected to the anesthetic system to intubate the patient. The procedure could be performed in regarding 5 minutes [17]. When long-term respiratory system assistance is not required, the submandibular method could be utilized. An incision is made in the submandibular region 1 inch below and half an inch anterior to the angle of the mandible. Blunt dissection was done with the fat, platysma, deep cervical fascia, and mylohyoid. Just like the submental technique, the patient is intubated with the submandibular opening [18], [19]. Both techniques call for mindful dissection to stop damages to the adjacent frameworks. These 2 approaches are useful in maxillofacial trauma due to the fact that they prevent the issues observed with various other intubation methods and allow the usage of MMF. Intraoperatively, one does not need to utilize both nasotracheal and orotracheal intubation to fix and reduce fractures if these 2 alternate methods are chosen [16].

## • **CONSIDERATIONS FOR DIFFERENT TYPES OF TRAUMA**

### **Gunshot Wounds**

Gunshot wounds (GSWs) can typically be handled nonoperatively. A significant concern is airway compromise. Emergent airways are needed in GSWs that got in the mandible (53%) or midface (25%) [20]. When the symphysis of the jaw is fractured, the tongue could obstruct the airway. A retrospective research of 55 patients with GSW showed that half of the patients needed

orotracheal intubation and 2 had a cricothyroidotomy due to hemorrhage and blockage [21]. A computed tomographic scan is the very best imaging technique to analyze the fractures. Any type of facial bleeding ought to be managed with angiography and embolization [22].

## **Facial Fractures**

Facial fractures are the significant sort of maxillofacial injury and that cause airway compromise. One mechanism is the posterior variation of midface structures right into the oropharynx. Obstruction could likewise be due to serious hemorrhage. One third of patients (64 overall) with midface cracks needed intubation as a result of these problems in the research study by Ng et al. [23]. In enhancement, bilateral airway fractures triggered airway obstruction due to a loss of support for the oral structures; 43.5% of patients with Le Fort III fractures needed tracheotomy compared to 9.1% in patients with Le Fort I and II fractures [24]. A research by Thompson et alia [25] verified the searching for that patients with Le Fort III fractures are at a higher risk for airway concession, in which 26.5% of patients with Le Fort fractures had airway compromise and 33.3% needed a tracheotomy. Patients needing tracheotomy had a greater incidence of mandibular cracks and Le Fort III fractures in a retrospective research done at a level I trauma center [11]. Facial cracks with malocclusion could be handled with MMF. Maxillomandibular fixation inhibits making use of endotracheal intubation unless the patient has missing teeth in the molar area. Patients with MMF must have cable cutters at their bedside in situation of airway concession. In 1 certain research study, surgeons took 35.3 secs on standard to dissemble the MMF, whereas the health center team requires 2 minutes 9 seconds [26]. With these times, the patient can perhaps experience mind damage. Rigid interior addiction could be done rather than MMF to prevent such difficulties [18]. Fixation is suggested even if submandibular or submental

intubation is made use of [19]. Airway concession could be avoided by preserving stability of the mandible and tongue in addition to putting the patient in a prone or sitting setting. When there is airway compromise in these cases, nasotracheal intubation is the primary option.

### **Cervical Spine Injury**

When a patient with maxillofacial trauma presents with cervical spinal column injury, the airway must be taken care of effectively without using a cricothyroidotomy. In the beginning, imaging researches ought to be carried out to analyze the extent of injury. Cervical traction can support the injury before intubating [27]. In a survey that was carried out, the favored techniques for patients with cervical spine injuries were as adheres to: elective-nasotracheal intubation; urgent-nasotracheal and orotracheal intubation; and emergent-orotracheal intubation. In the very same study, a retrospective review located that the 3 primary methods made use of were orotracheal intubation (43%), nasotracheal intubation (22%), and fiberoptic bronchoscope (27%) [6]. Orotracheal intubation have to be carried out carefully since it can aggravate the cervical spine injury, and blind intubation is not recommended [13], [27].

### **Laryngotracheal Injuries**

Laryngotracheal injuries are rare, with an incidence of 1:1000 in trauma patients. Nonetheless, they are life-threatening. They generally present with subcutaneous emphysema and need very early monitoring with a laryngoscope or endoscope [28] In 1 retrospective study, 74% of patients required intubation (tracheostomy, n = 14; endotracheal intubation, n = 5; cricothyrotomy, n = 1). The writers primarily favor tracheostomy. Nevertheless, they do rule out endotracheal intubation



to be contraindicated, although there are potential threats with respect to damaging bordering internal structures.

### **The Conventional Direct Laryngoscopy**

Straight laryngoscopy utilizing a standard laryngoscope is a basic and straightforward method for protecting the airway of a patient and may achieve success when done by a skilled operator. However, the threat of losing the airway is high, and hemodynamic negative effects occasionally take place [33]. Considering the danger of a failed endotracheal intubation, straight laryngoscopy must be booked for selected slim patients with excellent surface area composition of the neck, where immediate cricothyroidotomy or tracheotomy is feasible when necessary, and an ear, nose, and throat specialist prepares to perform the surgical airway.

### **Conclusion:**

When one is managing maxillofacial trauma, the first concern to consider is airway concession. Depending on the nature of the trauma, there are many available options for intubation. Each possesses its own set of advantages and disadvantages. In general, endotracheal intubation is usually not an alternative; however, nasotracheal intubation and tracheotomies could be performed. Yet, these two procedures could possibly create additional difficulties; thus, submental and submandibular intubations provide an interesting alternative to consider when managing these situations. Various forms of trauma such as GSWs, facial fractures, cervical spine injuries, and laryngotracheal injuries are potentially life-threatening. At times, patients sustaining these sorts of traumatic injury may need an artificial airway. The method of intubation chosen will depend upon each patient's circumstance and the experience of the trauma team. The

medical airway is thought about to be the last choice in airway management; however, in patient with facial trauma in some cases it is the ideal solution.

### Reference:

1. Thaller SR, Beal SL. Maxillofacial trauma: a potentially fatal injury. *Ann Plast Surg* 1991;27:281Y283
2. Ardekian L, Rosen D, Klein Y, et al. Life-threatening complications and irreversible damage following maxillofacial trauma. *Injury* 1998;29:253Y256
3. Broos PL, Janzing HM, Vandermeeren LA, et al. Life saving surgery in polytrauma patients. *Przegl Lek* 2000;57:118Y119
4. Huang JJ, Wu J, Brandt K. Airway management of a patient with facial trauma. *J Clin Anesth* 2002;14:302Y304
5. Combes X, Jabre P, Jbeili C, et al. Prehospital standardization of medical airway management: incidence and risk factors of difficult airway. *Acad Emerg Med* 2006;13:828Y834
6. Lord SA, Boswell WC, Williams JS, et al. Airway control in trauma patients with cervical spine fractures. *Prehosp Disaster Med* 1994;9:44Y49
7. Smoot EC 3rd, Jernigan JR, Kinsley E, et al. A survey of operative airway management practices for midface fractures. *J Craniofac Surg* 1997;8:201Y207
8. Arrowsmith JE, Robertshaw HJ, Boyd JD. Nasotracheal intubation in the presence of frontobasal skull fracture. *Can J Anaesth* 1998;45:71Y75
9. Ezri T, Szmuk P, Warters RD, et al. Difficult airway management practice patterns among anesthesiologists practicing in the United States: have we made any progress? *J Clin Anesth* 2003;15:418Y422
10. Stauffer JL, Olson DE, Petty TL. Complications and consequences of endotracheal intubation and tracheotomy. A prospective study of 150 critically ill adult patients. *Am J Med* 1981;70:65Y76
11. Holmgren EP, Bagheri S, Bell RB, et al. Utilization of tracheostomy in craniomaxillofacial trauma at a level-1 trauma center. *J Oral Maxillofac Surg* 2007;65:2005Y2010
12. McHenry CR, Raeburn CD, Lange RL, et al. Percutaneous tracheostomy: a cost-effective alternative to standard open tracheostomy. *Am Surg* 1997;63:646Y651

13. Xeropotamos NS, Coats TJ, Wilson AW. Prehospital surgical airway management: 1 year's experience from the Helicopter Emergency Medical Service. *Injury* 1993;24:222Y224
14. DeLaurier GA, Hawkins ML, Treat RC, et al. Acute airway management. Role of cricothyroidotomy. *Am Surg* 1990;56:12Y15
15. Granholm T, Farmer DL. The surgical airway. *Respir Care Clin N Am* 2001;7:13Y23
16. Caron G, Paquin R, Lessard MR, et al. Submental endotracheal intubation: an alternative to tracheotomy in patients with midfacial and panfacial fractures. *J Trauma* 2000;48:235Y240
17. Biglioli F, Mortini P, Goisis M, et al. Submental orotracheal intubation: an alternative to tracheotomy in transfacial cranial base surgery. *Skull Base* 2003;13:189Y195
18. Adamo AK, Katsnelson T, Rodriguez ED, et al. Intraoperative airway management with pan-facial fractures: alternative approaches. *J Craniomaxillofac Trauma* 1996;2:30Y35
19. Anwer HM, Zeitoun IM, Shehata EA. Submandibular approach for tracheal intubation in patients with panfacial fractures. *Br J Anaesth* 2007;98:835Y840
20. Chen AY, Stewart MG, Raup G. Penetrating injuries of the face. *Otolaryngol Head Neck Surg* 1996;115:464Y470.
21. Glapa M, Kourie JF, Doll D, et al. Early management of gunshot injuries to the face in civilian practice. *World J Surg* 2007;31:2104Y2110.
22. McLean JN, Moore CE, Yellin SA. Gunshot wounds to the face: acute management. *Facial Plast Surg* 2005;21:191Y198.
23. Ng M, Saadat D, Sinha UK. Managing the emergency airway in Le Fort fractures. *J Craniomaxillofac Trauma* 1998;4:38Y43.
24. Bagheri SC, Holmgren E, Kademani D, et al. Comparison of the severity of bilateral Le Fort injuries in isolated midface trauma. *J Oral Maxillofac Surg* 2005;63:1123Y1129.
25. Thompson JN, Gibson B, Kohut RI. Airway obstruction in LeFort fractures. *Laryngoscope* 1987;97:275Y279.
26. Goss AN, Chau KK, Mayne LH. Intermaxillary fixation: how practicable is emergency jaw release? *Anaesth Intensive Care* 1979;7:253Y257.
27. Rathlev NK, Medzon R, Bracken ME. Evaluation and management of neck trauma. *Emerg Med Clin North Am* 2007;25:679Y694.
28. Hamaekers A. E., Henderson J. J. Equipment and strategies for emergency tracheal access in the adult patient. *Anaesthesia*. 2011;66(2):65–80. doi: 10.1111/j.1365-2044.2011.06936.x.
29. Kearney P. A., Griffen M. M., Ochoa J. B., Boulanger B. R., Tseui B. J., Mentzer R. M., Jr. A single-center 8-year experience with percutaneous dilational tracheostomy. *Annals of Surgery*. 2000;231(5):701–709.
30. Yuen H.-W., Loy A. H.-C., Johari S. Urgent awake tracheotomy for impending airway obstruction. *Otolaryngology—Head and Neck Surgery*. 2007;136(5):838–842. doi: 10.1016/j.otohns.2006.12.012.
31. Dillon J. K., Christensen B., Fairbanks T., Jurkovich G., Moe K. S. The emergent surgical airway: cricothyrotomy vs tracheotomy. *International Journal of Oral and Maxillofacial Surgery*. 2013;42(2):204–208. doi: 10.1016/j.ijom.2012.10.021.

32. Mabry R. L. An analysis of battlefield cricothyrotomy in Iraq and Afghanistan. *Journal of Special Operations Medicine*. 2012;12(1):17–23.
33. Srivastava V. K., Agrawal S., Kumar R., Misra P. P. Bradycardia and hypotension during laryngoscopy for intubation in maxillofacial trauma. *Saudi Journal of Anaesthesia*. 2012;6(4):436–437. doi: 10.4103/1658-354x.105906.

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