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Original Article

Anaesthesia Section

Airway Management in Maxillofacial Trauma: Do We Really Need Tracheostomy/Submental Intubation

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ABSTRACT

Background: There are various techniques available for airway management in patients with maxillofacial trauma. Patients with panfacial injuries may need surgical airway access like submental intubation or tracheostomy, which have their associated problems. We have been managing these types of cases by a novel technique, i.e, intraoperative change of nasotracheal to orotracheal intubation.

Aim: To review our experience about various techniques for the airway management in patient with maxillofacial trauma. To analyse the possibility of using nasotracheal intubation and intraoperative change of nasotracheal to orotracheal intubation in panfacial fractures.

Materials and Methods: In a tertiary care centre four hundred eighty seven patients of maxillofacial injuries, operated over a period of 2 years were reviewed in relation to age, sex, mode of injury, type of facial fractures, methods of airway management and their associated complications.

Results: Young patients with male predominance is the most common affected population. Panfacial fracture is the most common type of injury (39.83%) among facial fractures. Airway was managed with intraoperative change of nasotracheal to orotracheal intubation in 33.05% of the patients whereas submental intubation or tracheostomy was done in 8.62% of the patients.

Conclusion: Nasal route for endotracheal intubation is not a contraindication in the presence of nasal fractures, base of skull fractures and CSF leak. By changing the nasotracheal intubation to orotracheal intubation intraoperatively in cases panfacial fractures, most of the tracheostomies and submental intubations can be avoided.

Keywords: Maxillofacial trauma, Airway management, Naso-tracheal intubation, Oro-tracheal intubation

INTRODUCTION

Trauma is a major health problem of modern society. Maxillofacial trauma needs special attention as it is potentially life-threatening and has long morbidity for the patient [1]. Maxillofacial injuries are the result of high-velocity trauma arising from road traffic accidents, sports injuries, falls and gunshot wounds. The first priority in these patients is airway maintenance with cervical spine stabilisation and control of bleeding. Airway management in maxillofacial injuries presents with a unique set of problems [2]. Single universal technique of intubation may not be favourable in all cases of maxillofacial trauma [3]. Different types of injuries, time of surgery, type of surgery need different methods of intubation. Alternative techniques and appliances for airway management as per the requirement of surgery need to be considered. The knowledge of facial skeletal anatomy and common types of fractures is important for the management of these patients

Various techniques of airway management in these patients have been described including oral intubation, nasal intubation under direct vision, blind nasal intubation, fibreoptic guided nasal intubation, submental intubation and tracheostomy [4]. Each technique has its own merits and demerits.

In cases of panfacial trauma intermaxillary fixation in normal dental occlusion is surgical necessity to do accurate plating of various mandibular and maxillary fractures, so nasal intubation is preferred over oral intubation [5]. If nasal bone reduction is also to be done along with maxillary and mandibular plating then submental intubation or tracheostomy remain the possible methods of airway management. In our institution we have managed these type of patients with nasal intubation (with or without fiberoptic assistance) for zygomatico-maxillary and mandibular plating. After plating, intermaxillary fixation is opened and nasal tube is changed to oral for the purpose of nasal bone reduction. In this way we have been able to avoid tracheostomy and submental intubation and their possible complications.

The aim of the study was to see the frequency of various intubation techniques in maxillofacial trauma. To analyse the possibility of using nasotracheal intubation and intraoperative change of nasotracheal to orotracheal intubation in panfacial fractures.

MATERIALS AND METHODS

In a retrospective study, four hundred eighty seven patients of either sex, operated for maxillofacial trauma, during January 2011 to December 2012 as emergency and elective basis were studied in a tertiary care centre. Inclusion criteria were all facio-maxillary trauma and exclusion criteria were all facial soft tissue injuries treated on OPD basis.

In pre anesthetic checkup, a detailed history was taken regarding time and mode of trauma, any pre-existing medical problem. Vital parameters including pulse rate, blood pressure, respiratory rate, temperature and SpO_2 were noted. Detailed note was made of the various injuries including head injury, cervical spine injury, abdominal trauma, chest trauma and orthopaedic trauma. Detailed examination of the maxillofacial injuries was noted. Patients having fractures of two or more than two facial bones were labelled as panfacial fractures. Airway was assessed by mouth opening (Mallampati classification), thyromental distance and neck movements. Nasal patency was checked for all the patients with the help of nasal speculum. CT scan of the face with 3-D reconstruction was seen

for assessment of the facial fractures and for nasal patency. All patients were operated upon under general anesthesia. Techniques of intubation were noted under following categories:

- Oral
- Nasal (under direct vision)
- Nasal (Fibreoptic guided)
- Nasal (under direct vision) followed by Oral
- Nasal (Fibreoptic guided) followed by Oral
- Tracheostomy
- Submental Intubation

Decision for selection of intubation technique was taken on the basis of airway examination, type of fracture, type of procedure and surgeons' requirement. Nasal intubation was done in patients who required intraoperative intermaxillary fixation. Fiberoptic intubation technique was selected for patients with difficult airway and patients having cervical spine injury. Informed consent was obtained from all patients after detailed explanation of procedure and alternative technique.

Intubation related complications like tooth injury, nasal bleed, meningitis, inadvertent entry into cranial cavity, oro–cutaneous fistula were noted.

RESULTS

Out of the 487 patients operated for maxillofacial trauma 69.6% were male and 30.3% female. Young patients in the age group of 11-40 years accounted for 81.5 % of the total patients [Table/Fig-1].

Overall the major etiology of maxillofacial trauma was road traffic accidents, i.e, 404 patients (82.95%). Among 40 patients with history of fall, majority were construction workers and children [Table/Fig-2].

Isolated fractures were less common as compared to multiple facial bone fractures [Table/Fig-3].

Technique of intubation was decided after discussion among the chief anaesthesiologist and chief surgeon. In 161 (33%) patients nasal intubation was changed to oral intubation for the purpose of nasal bone reduction after the fixation of maxilla and mandible. Fibreoptic guidance for nasal intubation was required in 52 (11%) patients either because of cervical spine injury or difficult airway [Table/Fig-4].

Nasal bleed was the most common complication among patients in whom nasal cavity was used for negotiating the endotracheal tube either directly or with fibreoptic assistance [Table/Fig-5].

DISCUSSION

Trauma has been labelled as the neglected disease of modern society. It accounts for thousands of deaths both in developed and developing countries. The productive age group of the society is the main sufferer of this disease and universally there is male predominance [5]. Maxillofacial trauma requires special attention as it involves both vital and non-vital organs and a skilful team approach of medical professionals can save the life of the patient from these life threatening injuries.

Management of airway is a major concern in patients with maxillofacial trauma because a compromised airway can lead to death. Gruen et al found that, failure to intubate, secure or protect the airway was the most common factor related to patient mortality, responsible for 16% of inpatient deaths [6]. There are various methods available for airway management in patients with maxillofacial trauma, but choice of a particular technique depends upon many factors like extent of facial injury, the composition and the anatomy of the injury, the choice of surgery, associated injuries (head injury, cervical spine injury), hemorrhage and expertise of anaesthesiologist [7]. It also depends upon whether patient is being intubated in emergency room or in the operation theatre for surgery when the patient is in relatively controlled conditions.

In maxillofacial trauma anaesthesiologist has to share the upper airway field with the surgeon. In these injuries, apart from anaesthetic consideration, surgeon's requirement is major factor in deciding the technique of intubation. The changing trends of surgery for maxillofacial trauma has also affected the choice of technique of

Age (years)	No. of Patients (n=487)	
	Male	Female
1-10	6 (1.23%)	5 (1.02%)
11-20	64 (13.14%)	30 (6.16%)
21-30	135 (27.72%)	50 (10.27%)
31-40	80 (16.42%)	38 (7.80%)
41-50	34 (6.98%)	9 (1.84%)
>50	20 (4.10%)	16 (3.28%)

[Table/Fig-1]: Age and Sex distribution of maxillofacial trauma patients
Data is expressed as number and percentage of patients, % is percentage. Percentage has been calculated from total number of patients, i.e, 487

Aetiology of trauma	No. of patients (n=487)
Road traffic accidents	404 (82.95%)
Fall	40 (8.21%)
Assault	21 (4.40%)
Gun shot	12 (2.40%)
Sports injury	10 (2.00%)

[Table/Fig-2]: Aetiology of trauma
Data is presented as number and percentage. *n* is number of patients, % is percentage

Type of maxillofacial trauma	No. of patients (n=487)
Panfacial fracture	194 (39.83%)
Fracture mandible	116 (24.00%)
Fracture maxilla	72 (14.8%)
Fracture zygoma	65 (13.34%)
Fracture nasal bone	40 (8.21%)

[Table/Fig-3]: Type of maxillofacial trauma
Data is presented as number and percentage. n is number of patients, % is percentage

Technique of intubation	No. of patients (n=487)
Oral	112 (22.99%)
Nasal (under direct vision)	147 (30.18%)
Nasal (Fibreoptic guided)	25 (5.13%)
Nasal (under direct vision) followed by Oral	134 (27.51%)
Nasal (Fibreoptic guided) followed by Oral	27 (5.54%)
Tracheostomy	30 (6.16%)
Submental Intubation	12 (2.46%)

[Table/Fig-4]: Technique of Intubation
Data is presented as number and percentage. n is number of patients, % is percentage

Technique of intubation	Complication	Number of patients
Direct laryngoscopy (Nasal+Oral) n=393	Injury to teeth	14
Nasotracheal and nasal to oral (Direct+Fibreoptic assisted) n=333	Nasal bleed	20
	Intubation related Meningitis	Nil
	Intracranial passage of endotracheal tube	Nil
Submental/Submandibular n=12	Sub mental scarring	3
	Oro-cutaneous fistula	1
	Wharton duct injury	Nil

[Table/Fig-5]: Intubation related complications
Data is expressed as number of patients. n is number of patients

intubation. With the available new techniques and technology almost all the facial fractures are treated with open reduction and internal fixation using microplating. So intraoperative dental occlusion by intermaxillary fixation is required for the proper alignment of the fracture fragments and their rigid fixation. So, surgeons prefer to have nasotracheal intubation as it gives them freedom to operate and accuracy of dental occlusion [8]. In our study, oral intubation was done only in cases of fracture zygoma and fracture nasal bone.

Cases where intra operative intermaxillary fixation was required, the airway was managed with naso-tracheal intubation technique either under direct vision or with fibreoptic guidance. whenever nasotracheal intubation is planned evaluation of nasal cavity with anterior rhinoscopy is recommended [9,10]. A close look at the CT Scan of the mid face gives information about any septal deviation, turbinate hypertrophy and foreign bodies, the adequacy of nasal passage and nasopharyngeal space. Fibreoptic guidance was used in cases of cervical spine injury and difficult airway (Mallampati class IV) or depending upon the anaesthetist's preference.

Although most of the anaesthesia text books include basilar fractures and nasoethomoidal fractures in the list of contraindications of nasotracheal intubation. But there is now enough data to suggest that nasotracheal intubation is not an absolute contraindication in the presence of nasal bone fractures, base of skull fractures and CSF leak [11-13]. Rhee K J et al., have shown that complications associated with skull base fractures are not increased when nasotracheal intubations are performed in the field [14]. In our study also there is no evidence of intracranial passage of nasotracheal tube in the skull base fractures. There is no case of nasotracheal tube related meningitis. As per our institution protocol all the patients were given prophylactic antibiotics. The only complication noted was nasal bleed in 20 cases which either stopped by itself or by nasal packing which was otherwise also required in cases of nasal bone correction.

In 33% patients, nasal bone reduction was also required along with other facial fractures. This could not be done in the presence of nasal tube. In our institution we managed these cases with a novel technique. First, nasal intubation was done either under direct vision or with fibreoptic guidance. fixation of mandible, zygomatico-maxillary complex and repair of soft tissue was completed. After this, surgeon opened the intermaxillary fixation and naso-tracheal tube was changed to oro-tracheal tube for nasal bone reduction. Closed reduction of nasal bone and packing is done after changing the tube. Due precautions were taken to maintain sterility and thorough suctioning was done to prevent aspiration before changing the tube. This avoided the need of tracheostomy and submental intubation and their associated complications. Tracheostomy is associated with complications such as haemorrhage, pneumomediastinum, pneumothorax, tracheal stenosis etc., and submental intubation can cause haemorrhage, oro-cutaneous fistula, injury to sublingual gland, wharton's duct,and lingual nerve [15,16].

Submental intubation was done in 12 patients (2.46%) where nasal intubation was not possible due to severe soft tissue trauma of nose or cases in which pre-existing nasal pack could not be removed as these cases were taken for surgery immediately after emergency nasal packing. Out of these, 3 patients had significant submental scarring and one developed oro-cutaneous fistula. Tracheostomy was already there in 30 (6.16%) patients when taken up for maxillofacial surgery. These patients were on long term ventilatory support for either head injury or poor chest condition. The complications related to tracheostomy were not noted in the study as tracheostomy was not performed as part of intraoperative airway management.

CONCLUSION

Decision of airway management in maxillofacial trauma has to be taken after mutual discussion of the surgeon and anaesthesiologist keeping in view the patient's condition and demands of surgery. Nasotracheal tube is safe even in the presence of nasal fractures, base of skull fractures and CSF leak. Technique of intraoperatively changing the nasotracheal tube to orotracheal tube in cases of panfacial fractures is a simple and logical method without any complication. In the era of rigid fixation of fractures and the possibility of leaving the patient with an open mouth, an alternative technique of airway management, i.e, nasotracheal to orotacheal intubation may replace the need for tracheostomy or submental intubation, thus avoiding their associated complications.

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