Various Intubations in Oral and Maxillofacial Surgery: A Prospective Study

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Abstract

Aim The aim of this study was to determine various routes of intubations in patients, based on the type of facio-maxillary procedures planned.

Materials and Methods A prospective study in patients undergoing various oral and maxillofacial procedures between March 2021 and December 2021, who were included in the study based on the inclusion and exclusion criteria.

Statistical Analysis Used Descriptive statistical analysis with SPSS 26 software.

Results Total 33 cases were considered for the study among which it is seen that nasal intubation is the most commonly used route of intubation ($n = 23$; 69.7%) followed by oral ($n = 5$; 15.2%), fiberoptic ($n = 3$; 9.1%), submental ($n = 1$; 3%), and tracheostomy ($n = 1$; 3%). Most cases operated were of trauma ($n = 19$; 57.6%).

Conclusion For better surgical access and visibility, proper selection of route of intubation is necessary given its proximity to the site of surgery. Although nasal route is the most commonly used route in the field of oral and maxillofacial surgery, oral, submental, fiberoptic, and tracheostomy are some of the routes whose application needs to be further researched.

Keywords
- nasal
- oral
- submental
- tracheostomy

Introduction

In the field of maxillofacial surgery, the success of any surgical procedure is largely dependent on the combination of good exposure of the site and the dexterity of the surgeon given the proximity of the site to the upper airway.[1]

The incidence of difficult airway is up to 15.4 to 16.9%, attributing to certain temporo-mandibular joint (TMJ) disorders, trauma, and certain other conditions resulting in limitations in mouth opening or altered normal anatomy caused by penetrating or blunt trauma to the structures of the upper airway like the larynx, trachea, or the hyoid bone along with the facial bone fractures that can result in a complex, difficult-to-manage airway.[2]

The orotracheal intubation is thought to be the standard way in airway management of various surgeries, except those involving the maxillofacial region, especially in patients with maxillofacial trauma who are in need of intraoperative maxillo-mandibular fixations (MMFs). Hence, nasotracheal intubations are used to secure airways in maxillofacial trauma patients without interfering with either the surgical site or the MMFs. Alternatively, submental intubation, fiberoptic-guided nasotracheal intubation, retromolar/retrotuberosity–orotracheal intubations, missing central incisors, or emergency surgical airways like tracheostomy can be used.[2]

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Fiberoptic nasotracheal intubation is the most preferred route in patients with predictable difficult airways as a result of severe malocclusion or patients presenting for orthognathic surgery or with severe TMJ pathology.[3,4]

This study aims to document and analyze the various routes of intubations used on patients undergoing maxillofacial surgeries as a result of trauma, pathologies, orthognathic surgeries, or rehabilitative surgeries, so as to ease the decision-making between the surgeon and the anesthesiologist and to build a better rapport.

Materials and Methods

A study was performed as a prospective study on patients undergoing various surgeries in the region of face and oral cavity under General Anesthesia operated between March 2021 and December 2021 in our institute.

All the patients included in the study were categorized based on the type of surgery—into trauma, pathology, cancer, orthognathic, and implant surgery. The route of intubation was decided based on the site of surgery so as to have least interference from the endotracheal tube (ET). The inclusion criteria were: (1) patients having maxillofacial morbidities requiring surgery under general anesthesia; and (2) patients of any age group. The exclusion criteria were: (1) subjects with major systemic illness contraindicating general anesthesia; and (2) patients with severe neurological deficits.

Once the patient was indicated to be taken up for surgery, under general anesthesia, the patient underwent a thorough clinical evaluation, routine investigations, and preanesthetic consultation. Intraoperatively, the route and type of intubation used was recorded along with the time taken and any associated complications. Also, the postoperative complications were recorded, if present.

The data gathered were statistically analyzed.

Results

The study comprised of 33 patients who underwent surgery of the oral and maxillofacial region. The demographics show that male was the predominant gender. It included 22 male patients (66.7%) and 11 female patients (33.3%), with most patients in the age group of 15 to 30 years ($n = 19$; 57.6%), as shown in ►**Table 1**. A total of 23 patients underwent nasotracheal intubation (69.7%), 5 patients underwent orotracheal intubation (15.2%), 1 patient underwent submental intubation (3%), 3 patients underwent fiberoptic nasotracheal intubation (9.1%), and 1 patient underwent tracheostomy (3%), as shown in ►**Table 2**, ►**Fig. 1**. Nineteen patients (57.6%) were trauma patients with various fractures of the facial skeleton, followed by patients with oral and maxillofacial pathology, patients undergoing implant placement (rehabilitative surgeries), and patients undergoing orthognathic and cancer surgeries, as shown in ►**Table 3**, ►**Fig. 2**. The time taken for the intubation is represented in ►**Table 4**, with most cases needing less than 5 min ($n = 23$; 69.7%). All patients were successfully intubated. Only one complication of tube blockage was noted in a tracheostomy patient (►**Table 5**). Brief summary of all the surgical procedures performed is listed in ►**Table 6**. Observations made during the study are described in the following subtitles.

Nasal intubation: A total of 23/33 patients underwent nasal intubation (males 17, females 6), with mean age of

Table 1 Age and gender distribution of study participants

Age groups (years)	Males: *n* (%)	Females: *n* (%)	Total: *n* (%)
≥15	0	1 (3)	1 (3)
15–30	13 (39.4)	6 (18.2)	19 (57.6)
31–50	6 (18.2)	2 (6.1)	8 (24.2)
51–70	3 (9.1)	2 (6.1)	5 (15.2)
Total	22 (66.7)	11 (33.3)	33 (100)

Table 2 Distribution of cases based on intubation route

Intubation technique	Frequency (*n*)	Percent (%)
Fiberoptic nasal	3	9.1
Nasal	23	69.7
Oral	5	15.2
Submental	1	3.0
Tracheostomy	1	3.0
Total	33	100.0

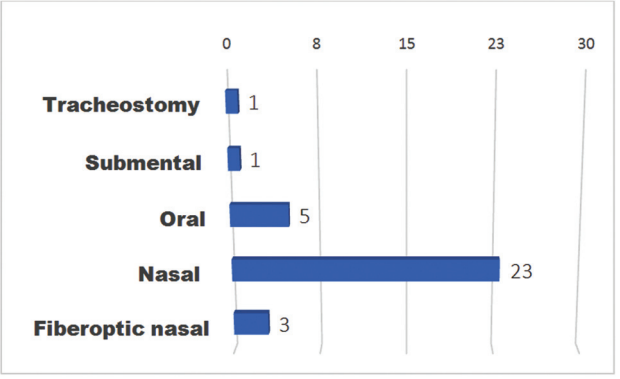

Fig. 1 Frequency distribution of cases based on different techniques of intubation.

Table 3 Case distribution based on diagnosis

Diagnosis	Frequency (*n*)	Percent (%)
Trauma	19	57.6
Pathology	7	21.2
Orthognathic	2	6.1
Implant	3	9.1
Cancer	2	6.1
Total	33	100.0

Fig. 2 Percentage distribution of cases based on the diagnosis.

31.34 years. Nasal intubation was the preferred route for patients undergoing surgery for trauma, especially in the patients with mandibular fractures in need of intermaxillary fixation ($n = 15/19$; 78.94%), followed by patients undergoing cancer surgery ($n = 2/2$; 100%), orthognathic surgery ($n = 2/2$; 100%), implant rehabilitation patients ($n = 2/3$; 66.66%), and pathology patients ($n = 2/7$; 28.57%). Of the north and south pole ET types, north pole type of ETs were most commonly used, given its advantage of least interference in the site of surgery. Most of the intubations required <5 min ($n = 18/23$), and no intraoperative or postoperative complications were noted.

Oral intubations: A total of 5/33 patients underwent oral intubation (males 2, females 3), with mean age of 28.4 years. Oral intubation was the preferred route of intubation in trauma patients with zygomatico-maxillary complex fractures or nasal bone fractures ($n = 3/19$; 15.78%), followed by patients with pathologies undergoing surgery for sinus or nasal cavity-related pathologies ($n = 2/7$; 28.57%). Average time taken was <5 min ($n = 5/5$). No intraoperative or postoperative complications were noted.

Table 4 Distribution of cases based on time taken for intubation

Time	Frequency (*n*)	Percent (%)
<5 min	23	69.7
5–10 min	7	21.2
>10 min	3	9.1
Total	33	100.0

Table 5 Distribution of cases based on complication in airway management

Complication	Frequency (*n*)	Percent (%)
None	32	97.0
Tube blockage	1	3.0
Total	33	100.0

Fiberoptic: A total of 3/33 patients underwent fiberoptic intubation (males 2, females 1), with a mean age of 58.33 years. Fiberoptic intubation was done in patients with predictable difficult intubations, like in patients with limitations in mouth opening or altered anatomy of the region. Average time taken was 5 to 10 min, with no intraoperative or postoperative complications.

Submental: With one patient (male, 48 years) undergoing submental route of intubation, the time taken for the procedure was >10 min. It involved placement of a paramedial transmylohyoid incision and tube passed extraorally through the incision. Although no intraoperative or

Table 6 Distribution of study participants based on surgical treatment performed

Treatment done	Frequency (*n*)	Percent (%)
BSSO with genioplasty	1	3.0
Buccal pad of fat + buccal advancement flap closure	1	3.0
Excision biopsy	1	3.0
Excision of ankylotic mass and total joint replacement	1	3.0
Excision of the lesion and reconstruction with radial free forearm flap	1	3.0
FESS	1	3.0
Incision and drainage	1	3.0
Mandibular recon plate fixation	1	3.0
Mandibular setback and reduction genioplasty	1	3.0
Open reduction and internal fixation (ORIF)	**19**	**57.6**
Partial maxillectomy	1	3.0
Quad zygomatic implant	1	3.0
Rehabilitation with implant placement	1	3.0
Resection of primary tumor + MRND	1	3.0
Zygomatic implant placement	1	3.0
Total	33	100.0

Abbreviations: BSSO: Bilateral Sagittal Split Osteotomy; FESS: Functional Endoscopic Sinus Surgery; MRND: Modified Radical Neck Dissection.

postoperative complications were noted, minimally visible scar is one of the disadvantages of this route of intubation despite its excellent use in cases with pan-facial trauma.

Tracheostomy: One patient underwent tracheostomy as the route of placement of ET, who was a 45-year-old female with Ludwig's angina with respiratory distress as a result of elevation of the floor of the mouth. The patient had a postoperative complication of tube blockage that had to be immediately replaced. The resultant unsightly scar is one of the drawbacks.

Discussion

The decision of the airway management in the field of oral and maxillofacial surgery is one of the critical decisions given the proximity of the surgical site. A proper understanding is a prerequisite to ensure an ease of procedure between an anesthesiologist and an oral and maxillofacial surgeon.

Endotracheal intubation was first described in 1543 by Andreas Versalius. Mac Ewan, Kuhn, Rosenberg, Meltzer and Auer, and Elsberg are known to be the pioneers in the early days of endotracheal intubation use. The description of the nasotracheal intubation was first given by Kuhn in 1902 who felt that it was a more physiological approach to tracheal intubation. The use of nasotracheal intubation was popularized by Magill in the 1920s for its application in intraoral surgery.[1]

This study compiled the use of commonly used intubations in various maxillofacial surgeries. The most number of surgeries done in our institute was that of trauma with majority of the cases involving the mandible. In comparison to a retrospective study by Mittal et al[5] on 487 trauma patients, oral intubation was reported in 22.99% as compared to 15.78% of our cases, nasal intubation in 30.18% as compared to our 78.94% of cases, and submental intubations in 2.46% and tracheostomy in 6.16% as compared to our 5.26% and 0%, respectively. The nasal route of intubation was the most commonly used route in both the studies.

Nasotracheal intubation has the advantage of not interfering with the MMF or the surgical approach but is contraindicated in cases with the fracture involving the nasal pyramid, or in cases with severe craniofacial trauma, which involves the risk of tracheal tube passage into the skull, which might lead to subsequent brain damage.[2] Submental intubation is the preferred route when both nasal and oral intubations are deemed unsuitable,[6] as they might hinder the surgical access or techniques, and in cases where MMF is required.[1]

Nagarkar et al's[3] retrospective study on 500 patients undergoing head and neck cancer surgeries showed 92.4% of nasal intubations, 7.6% oral intubations, 1.4% tracheostomy after surgery, and 0.6% before, as compared to 100% nasal intubations in our study. A proper preoperative assessment is important in head and neck cancer patients in order to make an informed decision regarding the selection of route of airway management. Some of the physical features that can be used in the assessment of airway difficulty are Mallampati score,[7] mouth opening, size of mandibular space, and range of neck motions.[3,8,9]

Another study by Yunus et al[10] studied airway management in 36 TMJ ankylosis patients and found 61.1% fiberoptic, 22.2% tracheostomy, 11.11% blind nasal, and 5.6% oral intubations as compared to 100% fiberoptic nasal intubation in our study. Intubation has the potential to be very difficult in patients presenting with severe malocclusion, or in patients for revision orthognathic surgery, or in patients presenting with severe TMJ pathology, and other cases where patients present with very limited mouth opening. In such cases, the mouth opening does not improve following induction of anesthesia, as compared to cases with mandibular trauma. Hence, consideration should be given to awake fiberoptic intubation if there are concerns.[4,11–13]

Fiberoptic and video-assisted devices are some of the modalities that can be used, especially in children with limited mouth opening, like in patients with Pierre Robin syndrome.[14]

This study also compared the time taken by various routes to assess the ease of the intubation. It was found that oral route was the easiest and required the least amount of time followed by nasal route of intubation.

Certain other routes of significance include retromolar intubation, as it provides least interference with the occlusion and thus it has clear advantage in oral and maxillofacial surgery procedures.[15,16]

The choice of intubation should be done weighing the contraindications and complications with each specific route of intubation—nasal, oral, submental, and other techniques of airway control—by the maxillofacial surgeon and the anesthetist, so as to have a safe airway control and proficient surgery. Thus, good assessment and communication between the surgeon and the anesthetist is required for proper choice of the route of intubation.[1,17]

Conclusion

In conclusion, route of intubation undeniably plays an important role in maxillofacial surgery. It should be established in such a way that it does not sway oral and maxillofacial surgical maneuvers. Although nasal route of intubation is the most commonly used route, other lesser used routes like submental and fiberoptic intubations are critical in certain surgeries and their application needs to be further researched.

Conflict of Interest
None declared.

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