Original Article - Retrospective Study

Retrospective evaluation of airway management with blind awake intubation in temporomandibular joint ankylosis patients: A review of 48 cases

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ABSTRACT

Aim: The aim was to determine the morbidity or mortality associated with the blind awake intubation technique in temporomandibular ankylosis patients. **Settings and Design:** A total of 48 cases with radiographically and clinically confirmed cases of temporomandibular joint (TMJ) ankylosis were included in the study for evaluation of anesthetic management and its complications. **Materials and Methods:** Airway assessment was done with standard proforma including Look externally, evaluate 3-3-2 rule, Mallampati classification, Obstruction, Neck mobility (LEMON) score assessment in all TMJ ankylosis patients. The intubation was carried out with the standard departmental anesthetic protocol in all the patients. The preoperative difficulty assessment and postoperative outcome were recorded. **Results:** Blind awake intubation was done in 92% of cases, 6% of cases were intubated by fiberoptic awake intubation, and 2% patient required surgical airway. Ninety-eight percent of the patients were cooperative during the awake intubation. The frequent complications encountered during the blind awake intubation were epistaxis and sore throat. **Conclusion:** In an anesthetic setup, where fiberoptic intubation is not available, blind awake intubation could be considered in the anesthetic management algorithm.

Keywords: Ankylosis, blind awake intubation, fiberoptic intubation

INTRODUCTION

Securing the airway is fundamental to the practice of general anesthesia. Intubation by direct laryngoscopy is usually the norm. Surgery of temporomandibular joint (TMJ) ankylosis falls in the category of difficult intubation as direct vocal cord visualization is difficult due to an inability to open the mouth. The difficult intubation in TMJ ankylosis patient results from severe trismus, mandibular hypoplasia with unequal growth of two halves of mandible, reduced mandibular space with pseudomacroglossia in a confined space all of which narrow the pharyngeal passage. Many patients frequently suffer from obstructive sleep apnea.[1] All of these factors make intubation much more difficult. As mouth opening is restricted, some better options for airway management such as orotracheal intubation, laryngeal mask airway, intubating laryngeal mask airway, combitube, cuffed oropharyngeal airway[2] are not useful in these patients.

Hence, the intubating options in these patients are few and difficult: A blind nasal intubation, fiberoptic laryngoscope-assisted intubation, binasopharyngeal airway fluoroscope-aided retrograde placement of guide wire for tracheal intubation, retrograde endotracheal intubation using a pharyngeal loop, semi-blind

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technique of nasal intubation, and tracheostomy.[3-6] Though difficulty in intubating ankylosis patients is well accepted, there is no standardized protocol for the anesthetic management. In this study, we have discussed our experience of airway management in TMJ ankylosis patients with blind awake intubation.

MATERIALS AND METHODS

A retrospective study of airway management was conducted on patients who have undergone surgery for TMJ ankylosis. Patients included in the evaluation were unilateral or bilateral TMJ ankylosis cases observed by orthopantomography or coronal computed tomography with American Society of Anesthesiologist I classification. In this group of treatment, we evaluated the anesthetic plan, time to intubation, patient cooperativeness [Table 1], and complications encountered during intubation and postoperative airway complications. Ethical committee exemption was obtained from the Head of the Department of Oral and Maxillofacial Surgery due to the retrospective nature of the study.

All TMJ ankylosis patients were evaluated for the airway assessment with a standard proforma which included previous anesthetic problem, general appearance of face, neck, maxilla and mandible, jaw movement, head extension and movement, teeth and oropharynx, nasal obstruction or deviated nasal septum, soft tissues of the neck, thyroid enlargement, recent chest and cervical spine radiographs, and for any gross anatomical distortion. Patients were assessed for spontaneous ventilatory exchange and an intact cough reflex. The difficulty of intubation was evaluated based on LEMON assessment[7,8] and recorded. Patient's ability to follow simple verbal commands such as "open your mouth" and "take a deep breath" were confirmed. Patients with nasal obstruction, restricted neck movements, neck swelling, serious bleeding disorders, and uncooperative patients were deferred for blind awake intubation. Blind awake intubation procedure, possibility of tracheostomy, and requirement of postoperative ventilatory support were explained to the patient and guardian. Informed consent was taken from the patient and patient's guardian. Airway management was done according to our anesthesiology department protocol [Figure 1].

Difficult intubation trolley [Figure 2] which consisted of tracheal tubes of different sizes, retrograde intubation set, cricothyrotomy set, and tracheostomy standby were kept ready. Well-trained assistant and surgeon capable of managing difficult airway were present at the time of blind awake intubation. Facilities to deliver adequate preoxygen and supplemental oxygen throughout the difficult airway management were arranged.

Premedication comprised glycopyrrolate 0.2 mg and ranitidine 50 mg which were given as intramuscular injections 30 min prior to surgery. No sedatives were administered preoperatively. Patient was taken inside operation theater and monitors such as electrocardiogram, pulse oximetry attached. Two drops of xylometazoline nasal drops were put into the nares after checking patency of nares. Bilateral superior laryngeal nerve blocks (2% xylocaine with 1:80,000 adrenaline) and transtracheal block were given by injecting 1 cc of 2% plain xylocaine intratracheally. In pediatric patients, incremental doses of ketamine were given intravenously (IV) to keep the patient quiet without interfering airway reflexes. The patient was preoxygenated adequately, and blind awake nasotracheal intubation was done. Endotracheal intubation was confirmed with bilateral chest auscultation, pulse oximeter, and reservoir bag movement. Once intubation is achieved, it is secured properly to prevent its displacement.

Anesthesia was induced by IV thiopentone sodium and succinylcholine. Anesthesia was maintained with nitrous oxide and oxygen (60:40 ratio) and 0.5% halothane and incremental doses of muscle relaxant vecuronium bromide, midazolam, and fentanyl. Patients were given moderate hypotensive anesthesia with IV nitroglycerin (3–10 μg/kg/min) titrated to maintain mean arterial pressure around 70–75 mmHg till ankylotic mass resection. Ampicillin 1 g, metronidazole 500 mg, dexamethasone 8 mg were given through IV route intraoperatively. Intraoperative monitoring consisted of pulse oximetry, electrocardiogram, systolic, diastolic, and mean arterial pressure using noninvasive blood pressure monitoring.

Table 1: Cooperativeness of the patient

Category	Description
Good	Patient is fully cooperatlve
Fair	Minimum interference from the patient
Average	Difficult intubation due to patient movements
Poor	Patient movements grossly interfering with the procedure

RESULTS

We have operated 48 cases of TMJ ankylosis. Out of which, 31 patients had primary ankylosis surgery and 17 patients had recurrent ankylosis surgery. None of our patients had a prior history of any kind of surgical airway. All patients underwent gap arthroplasty with or without interpositional graft surgery. The age ranges from 5 to 50 years. About 23% of them were below 10 years old, 29% were between 10–20 years old, and 48% were above the age of 20 years. The mean mouth opening was 12 mm. Blind awake intubation was successful in 92% of the cases. The remaining patients required some other mode of airway management such as fiberoptic intubation (6%) and tracheostomy (2%). The most common complications that we encountered during blind awake intubation were a sore throat (42%), epistaxis (10%), and soft tissue injury (6%) to the upper airway. None of the patients developed complications either due to mask ventilation or during blind awake intubation

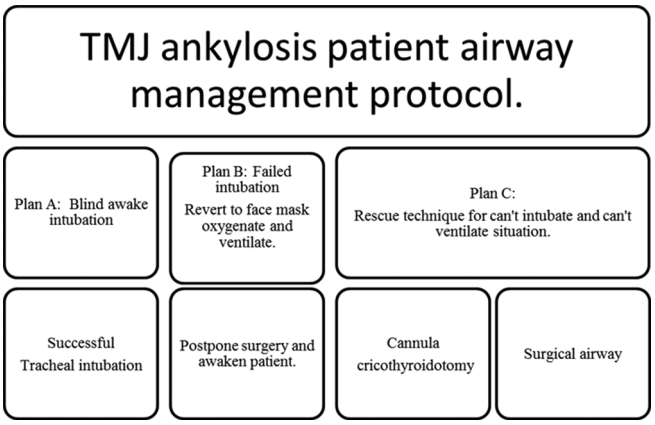

Figure 1: Difficult airway management protocol

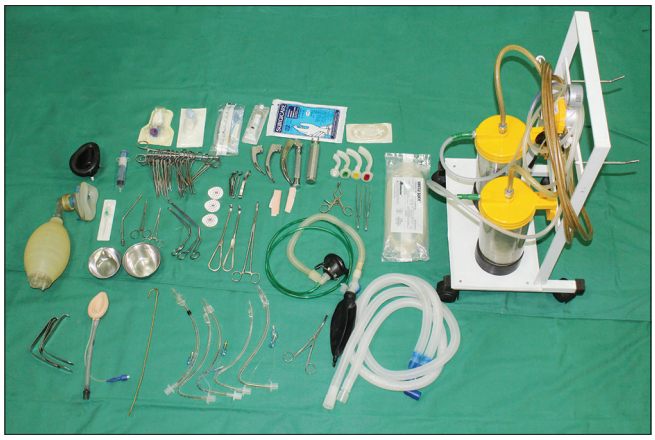

Figure 2: Difficult intubation trolley

such as marginal mandibular nerve damage, mental nerve damage, subluxation of TMJ, gastric distention, pharyngeal submucosal emphysema, trauma to the larynx, vocal cord, or tracheobronchial injury. The data are summarized in Table 2.

Table 2: Demographic classification of analyzed data

Characteristics	No.of cases
Age	
Less than 10 years	11
10-20 years	14
Above 20 years	23
Male : female	25:23
Type of ankylosis	
Primary ankylosis	31
Recurrent ankylosis	17
Mean mouth opening	
Less than 10 mm	29
10-20 mm	19
Average lemon score	5
Anesthetic technique	
Blind awake intubation	92%
Fibreoptic intubation	4%
Surgical airway	2%
Failed intubation	2%
Complications	
Epistaxis	10%
Sore throat	42%
Death	0
Others	0
Patient cooperativeness	
Good	20%
Fair	63%
Average	15%
Poor	2%

DISCUSSION

Endotracheal intubation in patients with altered airway anatomy always remains a challenge for the anesthesiologist. In developing countries, patients often present late for treatment. Due to the late presentation in patients having TMJ ankylosis, airway anatomy becomes so much altered that it becomes quite difficult or sometimes impossible to intubate with conventional methods. Airway obstruction due to the tongue falling back on the posterior pharyngeal wall may occur with deeper plane of anesthesia. Upward jaw thrust to perform a triple airway maneuver is near to impossible in children with bilateral TMJ ankylosis. Hence, awake intubation is the safest technique for anticipated difficult airway.[9,10]

Fiberoptic intubation is the gold standard for intubation in case of TMJ ankylosis but is quite expensive, and a variety of sizes are needed in pediatrics. Fiberoptic scopes from 2.2 mm outer diameter onward would be necessary for passing through the 3 ± 6 mm inner diameter tubes. With financial constraints, procuring scopes of various sizes (1.8–4.5 mm) is impossible. Nonavailability of suitable size of flexible fiberoptic scopes should not hamper the airway management. Although the use of the fiberoptic bronchoscope is simple conceptually, there is a significant learning curve that must be overcome before becoming proficient.[11] In addition, blood and secretions can obliterate the field of vision.

Methods such as retrograde intubation are more invasive and also retrieval of the catheter from oral cavity may not possible due to the limited mouth opening in the cases of TMJ ankylosis. Blind awake intubation is a best alternative for the management of difficult airway like in patients with marked ankylosis of TMJ and remains the technique of choice in places or conditions where expensive instruments such as fiberoptic bronchoscopes are not available. It is less traumatic, less expensive option, which has high success rate in the hands of expertise. However, adequate preparation, monitoring, positioning, and a coordinated team are mandatory for the success of the procedure.

Endotracheal intubation frequently induces intense autonomic responses such as tachycardia, hypertension, dysrhythmias, bronchospasm, and bronchorrhea. Occasionally, it may also produce hypotension and bradycardia. These reactions are exaggerated during awake intubation, and the patient may also become uncooperative. It can be minimized by anesthetizing the upper and lower airway by anesthetic nebulizer, topical local anesthetic application with cotton pledgets or by various nerve block techniques.[12] Superior laryngeal nerve block and transtracheal local anesthesia were given in all our cases prior to blind awake intubation. Analgesia produced by this technique not only contributed to the smoothness of intubation but also allowed the patient to be maintained in a lighter plane of general anesthesia without excessive use of muscle relaxants. In our study, we have administered transtracheal local anesthesia prior to intubation, which had reduced the incidence of vocal cord spasm and reflex cardiac arrhythmia. Reflex bradycardia resulting from intubation may be prevented by the IV administration of atropine or glycopyrrolate before intubation.[2] Glycopyrrolate was given in our study since it produces less stimulatory effects on the central nervous system and heart rate than does atropine.

During blind awake intubation, the tube may theoretically pass through any one of the following routes such as submucosal dissection into the mucous membrane of the nose, epiglottic vallecula, esophagus, right or left pyriform fossa or anterior wall of larynx and may complicate endotracheal intubation.[12] Hence, anesthesiologist should have a thorough knowledge of the upper airway, be cautious and suspicious about wrong passage of endotracheal tube whenever resistance is felt or if there is any absence of breath sound through the endotracheal tube. In such cases, successful endotracheal intubation can be achieved

by using any of the maneuvers such as passing the tube through other nostril, slight withdrawal and then advancement and mild rotation, altering neck extension, and external manipulation of vocal cord depending on the obstruction encountered. In our study, 92% of cases were successfully intubated with blind awake intubation technique which correlated with Kopman *et al*.'s study group.[6]

Maximal abduction of the vocal cords occurs during the latter phase of inspiration, and at this phase of the respiratory cycle, the tube is quickly passed through the glottis into the trachea, thereby minimizing vocal cord trauma. The technique of passing the tube at the moment of an explosive cough is also helpful because the laryngeal aperture is again at its greatest diameter during this time. Successful intubation may be verified by one or more of the following: Continued passage of air through the endotracheal tube as evidenced by excursions of the anesthesia bag; equal bilateral breath sounds, symmetric bilateral chest movement, observation of tube condensation, and pulse oximetry. However, the confirmatory test for successful intubation is fiberoptic bronchoscopy or capnography.[2]

There is a close relationship between difficult intubation and traumatic intubation. A difficult intubation may thus become a traumatic intubation. Complications vary widely in severity,[2,13] whereas some are dramatic and immediately life-threatening (unrecognized esophageal intubation), others can be severe and long-lasting (nerve injuries) or mild and short-lived (sore throat). Advancement of the nasotracheal tube can traumatize nasal passages causing bleeding, bacteremia, avulsion of a turbinate or even retropharyngeal dissection. Lubrication, use of vasoconstrictor, and prewarming of endotracheal tubes for softening have been recommended to reduce trauma during nasotracheal intubation. Performing a preliminary fiberoptic nasoendoscopy enables the diagnosis or exclusion of intranasal abnormalities and allows the selection of the most patent nostril for intubation resulting in fewer complications. In our study, the common complications following the blind awake intubation were sore throat, epistaxis, and less commonly soft tissue injury of upper airway. None of our patients developed severe or life-threatening complications. However, 35% of patients have reported unpleasant experience following blind awake intubation.

CONCLUSION

To minimize injury to the patient, the anesthesiologist should examine the patient's airway carefully, identify any potential problems, devise a plan that involves the least risk for injury and have a backup plan immediately available. In our study, we found that blind awake intubation is still a viable option in an unfortunate poor situation, where fiberoptic intubation facility is unavailable. However, each anesthesiology department should establish guidelines or algorithm specific to their institution depending on the expertise and the facility available.

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Conflicts of interest

There are no conflicts of interest.

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