

Airway Management of Temporomandibular Joint Ankylosis Patients based on Upper and Lower Pharyngeal Width in Lateral Cephalogram - A Retrospective Study

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Abstract: *The aim of this study was to evaluate the changes in the oro-pharyngeal airway and its correlation to the clinical outcome associated with two different airway management techniques in temporomandibular (TMJ) ankylosis patients after assessing upper and lower pharyngeal width in Lateral Cephalometric Analysis. This study included 25 patients aged between 5 years to 30 years diagnosed with TMJ ankylosis. The Awake Fibre-optic intubation attempts were carried out in 23 cases in cases who had upper pharyngeal width of more than 10 mm and lower pharyngeal width of more than 6 mm. Elective tracheostomy was done preoperatively in 2 patients with upper pharyngeal width less than 10 mm and lower pharyngeal width less than 6mm. Fibre-optic intubation can be performed with minimal complications in patients with normal upper and lower pharyngeal width while elective tracheostomy is recommended in patients with reduced pharyngeal width. The study highlights the diagnostic as well as prognostic role of cephalometry for clinical perception of geometry of pharyngeal airway in patients having Temporomandibular ankylosis*

Keywords: Airway Management, TMJ ankylosis, Temporomandibular joint ankylosis, Fibreoptic intubation, Tracheostomy, Anaesthesiology

1. Introduction

Ankylosis of the temporomandibular joint (TMJ) is an intracapsular union of the disc-condyle complex to the temporal articular surface that restricts mandibular movements, including the fibrous or bony fusion between condyle, disc, glenoid fossa, and eminence. Patients with TMJ ankylosis develop obstructed or reduced oropharyngeal (upper) and nasopharyngeal (lower) airways, severe maxillomandibular dysplasia, convex profile, reduced mandibulo-hyoid distance, decreased chin to neck angles. These factors make intubation much more difficult. Hence, the intubating options in these patients are few and difficult: A blind nasal intubation, fibreoptic bronchoscope-assisted intubation, retrograde endotracheal intubation using a pharyngeal loop, semi-blind technique of nasal intubation and tracheostomy.

Lateral cephalometric radiograph is a radiograph of the head taken with the x-ray beam perpendicular to the patient's sagittal plane. A Cephalometric tracing is an overlay drawing produced from a cephalometric radiograph by digital means and a computer program or by copying specific outlines from it with a lead pencil onto acetate paper, using an illuminated view-box. Tracings are used to facilitate cephalometric analysis, as well as in superimpositions, to evaluate treatment and growth changes. The cephalometric measurements include skeletal and dental measurements. Lateral Cephalometric view was taken for every patient to determine the following;

- Upper Pharyngeal width (Macnamara analysis): midway from soft palate to posterior pharyngeal wall=15-20mm
- Lower Pharyngeal width (Macnamara analysis): tangential point of inferior border of mandible and tongue to posterior pharyngeal wall= 11-14mm

2. Methods/Approach

A retrospective study of airway management was conducted on patients who have undergone surgery for TMJ ankylosis at our institute during the year March 2012 to March 2017 nearly 5 years. Patients included in the evaluation were unilateral or bilateral TMJ ankylosis cases diagnosed by orthopantomography or coronal computed tomography with American Society of Anaesthesiologist III classification.

All TMJ ankylosis patients were evaluated for the airway assessment with standard pro-forma which included: any previous anaesthetic 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. Patient's ability to follow simple verbal commands such as "open your mouth" and "take a deep breath" were confirmed. Possibility of elective tracheostomy, and requirement of postoperative ventilatory support were explained to the patient and the guardian.

Informed consent was taken from the patient and patient's guardian.

This study included 25 patients aged between 5 years to 30 years diagnosed with TMJ ankylosis. The Awake Fibre-optic intubation attempts were carried out in 23 cases in cases who had upper pharyngeal width of more than 10 mm and lower pharyngeal width of more than 6 mm. Elective tracheostomy was done preoperatively in 2 patients with upper pharyngeal width less than 10 mm and lower pharyngeal width less than 6mm.

We evaluated the anaesthetic management and pre-op upper and lower pharyngeal width in Lateral Cephalometric Analysis and complications encountered during intubation and postoperative airway complications.

The preoperative difficulty assessment and postoperative outcome were recorded.

3. Results and Discussion

The retrospective analysis of 25 TMJ ankylosis cases in terms of morbidity and mortality was done. Patients with upper laryngeal width more than 10 mm were intubated using awake fibre-optic technique. Out of 25 cases, 23 cases were intubated with Awake Fibre-Optic intubation out of which 21 patients didn't have any complications and were uneventful postoperatively. 2 patients required re-intubation following extubation who had upper pharyngeal width of 10cm. They were shifted to ICU on T-piece with O₂ flow 6 lt/min. they were extubated after 12 hrs without further complications. Those with upper pharyngeal width less than 10 mm and lower pharyngeal width less than 6mm were electively tracheostomised pre-operatively. There were no complications in post-operative period and were kept on-air. the patients were successfully weaned off tracheostomy within two days of surgery.

TMJ ankylosis, especially with mandibular hypoplasia presents a severe problem for airway management. The relatively difficult problem becomes even more grave in the paediatric age group because of their small mouth opening, near total trismus and uncooperativeness while securing the airway in the awake state. In children with longstanding bilateral TMJ ankylosis during the active growth phase, a hypoplastic and retrognathic mandible with severe bird face deformity is noted and hence (OSA) is obstructive sleep apnoea is relatively more common and a potentially fatal associated disorder. Patients with TMJ ankylosis develop obstructed or reduced oropharyngeal (upper) and nasopharyngeal (lower) airways, severe maxillomandibular dysplasia, convex profile, reduced mandibulo-hyoid distance, decreased chin to neck angles etc. The lateral profile has a reduced mandibular projection with "bird face deformity" in the most severe cases. The degree of mandibular recession depends on the severity, unilateral or bilateral joint involvement, age of onset, and duration of TMJ ankylosis. Overall it disturbs facial and mandibular growth, leads to acute compromise. As observed in patients with micrognathia, the additional space occupied by tongue, soft palate and redundant pharyngeal mucosa reduces the

cross-sectional area of oropharyngeal airway by an average of 25 %.

The patients pose the following anaesthetic risks Extreme sensitivity to all central depressant drugs; avoid sedation and opioids.

Peri-operative risk of apnoea, desaturation and dysarrhythmias; careful and intensive monitoring pre-operatively extending to the postoperative period.

Difficulty in securing the airway; earlier awake intubation is a safer approach.

Post extubation desaturation and hypoventilation; extubate only when the patient is fully awake and out of the effect of all the anaesthetic agents. Monitor in intensive care unit or high dependency unit.

Associated cardiovascular and respiratory complications of OSA like right ventricular failure and car pulmonale, systemic and pulmonary hypertension, polycythaemia and its adverse influences on anaesthetic management: careful planning of anaesthetic management and readiness to treat complications.

Fibreoptic intubation is the gold standard for intubation in case of TMJ ankylosis but is quite expensive, and a variety of sizes are needed in paediatrics. Although the use of the fibreoptic bronchoscope is simple conceptually, there is a significant learning curve that must be overcome before becoming proficient. Endotracheal intubation frequently induces intense autonomic responses such as tachycardia, hypertension, dysrhythmias, bronchospasm, and bronchorrhoea. 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 anaesthetic nebulizer, topical local anaesthetic application with cotton pledgets or by various nerve block techniques. In our study, we have administered transtracheal local anaesthesia prior to intubation, which had reduced the incidence of vocal cord spasm and reflex cardiac arrhythmia.

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. whereas some are dramatic and immediately life-threatening (unrecognized oesophageal 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. A bony thickening is often felt in the preauricular area of the affected TMJ.

4. Conclusion

The study highlights the diagnostic as well as prognostic role of cephalometry for clinical perception of geometry of pharyngeal airway in patients having Temporomandibular ankylosis. Fibre-optic intubation can be performed with

minimal complications in patients with upper pharyngeal width of 10mm -20mm and lower pharyngeal width of 6mm to 14 mm while elective tracheostomy is recommended in patients with upper pharyngeal width less than 10 mm and lower pharyngeal width less than 6 mm

5. Future Scope

Various other methods can be used to cephalometric analysis and similar methods can be compared for optimum management of the airways. Other methods for airway management including blind nasal intubation can be compared with patient outcome.

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