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Modified Technique of Fiberoptic Intubation in a Paediatric Patient with TMJ Ankylosis – A Case Report

KEYWORDS: Fiberoptic intubation, modified technique, paediatric patient, TMJ ankylosis

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ABSTRACT *Difficult airway, upper airway obstruction and ventilatory inadequacy added by uncooperativeness in paediatric patients with temporomandibular joint (TMJ) ankylosis demands careful airway assessment and skillful management. In these patients, to avoid technical difficulty and to have safe upper airway access special equipments, techniques, manoeuvres and preparation is needed. Though fiberoptic intubation is gold standard in patients with difficult airway, its unavailability in appropriate sizes may be a problem in some setups. Here, we are reporting fiberoptic technique modified by using an adult fiberoptic bronchoscope for successful nasotracheal intubation in a paediatric patient with left TMJ ankylosis. Under sedation and airway anaesthesia and child breathing spontaneously, larynx was visualized with 4.9mm adult fiberoptic bronchoscope by transnasal route; and via instrument channel of scope, flexometallic guidewire was advanced into trachea over which 5.5mm plain endotracheal tube was guided after withdrawing bronchoscope.*

INTRODUCTION

Patients with temporomandibular joint (TMJ) ankylosis present mostly with nil mouth opening, causing difficulty in direct laryngoscopic intubation. To manage difficult airway in these patients alternative techniques of intubation like blind nasal intubation, retrograde intubation, fiberoptic intubation or invasive technique i.e. tracheostomy have been described.[1] The problem of difficult airway may be exaggerated in children due to small anatomical structures and uncooperativeness. It is not easy to secure airway when the child is awake and prior to intubation topical anaesthesia, laryngeal nerve blocks or general anaesthesia has to be administered.[2] By using paediatric fiberoptic bronchoscope, nasotracheal intubation can be done successfully under general anaesthesia with child breathing spontaneously.[3] Its use is limited in developing countries, as this expensive instrument is not always available there. This paves the way for some novel method of paediatric airway management.[4] Here, we present airway management of a paediatric patient with left TMJ ankylosis in which airway was secured safely by using adult size fiberoptic bronchoscope and modifying its intubation technique.

CASE REPORT

A 12 year male child, weighing 35 kg was presented with pain and inability to open mouth since 4 months. He did not have any preceding history of infection or trauma in face region and had no other contributory history. His general and systemic examinations didn't reveal any abnormality. Airway examination findings were nil mouth opening, palpable bony swelling and tenderness over left TMJ region with retrognathism (Fig 1). Nostrils were patent, neck movements were free and there was no deviation of jaw. Protrusion and side to side movements of jaw were not possible. Laboratory investigations were within normal range. CT scan image, CBCT image and 3-D CT reconstruction image of face showed bony ankylosis of left TMJ with features of retrognathism (Fig 2). Thus, the patient was posted for left TMJ Excisional with Interpositional Arthroplasty (with silicon block) under general anaesthesia.

Fig 1: Swollen Lt. TMJ

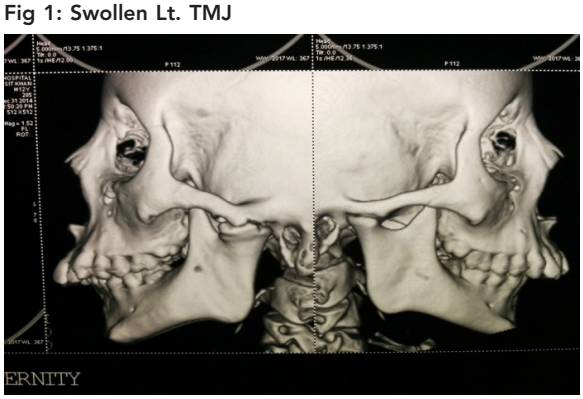

Fig 2: 3-D CT image showing left TMJ ankylosis

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Clinical examination and radiological investigations affirmed difficult airway in this patient. Due to nil mouth opening, direct laryngoscopy and orotracheal intubation was impossible. We planned awake fiberoptic nasotracheal intubation. To increase cooperation from the child during procedure, child and his parents were counseled for intubation technique. Consent for anaesthesia, awake fiberoptic nasotracheal intubation and tracheostomy, if needed, was obtained from child's parents. Patient was kept nil by mouth for solid as well as liquid food for 6 hours prior to surgery.

We had an adult fiberoptic bronchoscope whose distal end and insertion tube diameters were 4.9mm and instrument channel diameter was 2.2mm. Endotracheal tube size no. 6.5mm was the smallest endotracheal tube that could be threaded over bronchoscope and in this patient, predicted tube size for nasotracheal intubation was plain endotracheal tube no. 5.5mm. We planned to use this bronchoscope for nasotracheal intubation of child by modifying its intubation technique.

Technique modification was to visualize larynx with bronchoscope by transnasal route and pass flexometallic wire through instrument channel of bronchoscope into trachea over which endotracheal tube was to be guided. Flexometallic wire of endoscopy forceps was to be used as guide wire and to make it so, handle end of forceps' wire was cut with plier and cut end of the wire was made blunt. While making handle end of forceps' wire blunt, efforts were taken to keep the jaws of the forceps closed. Objectives of making wire blunt and keeping jaws of wire closed were to have easy passage of wire through instrument channel of bronchoscope, removal of fiberoptic bronchoscope over wire without damaging bronchoscope and guiding endotracheal tube over the wire. Other arrangement and preparation was similar for any other standard fiberoptic intubation (Fig 3).

On the day of surgery, difficult airway cart and tracheostomy set for emergency tracheostomy were kept ready. Patient was taken inside OT and routine monitors like pulse oximeter, ECG, NIBP and temperature were attached to him. An intravenous line was secured on right hand with 20G intracath. For anti-emesis, Ondansetron (2mg) and for anti-sialogogue action, Glycopyrrolate (0.1mg) were administered intravenously.

After checking patency of nostrils, for nasal decongestion, Xylometazoline 0.05% nasal drops (2drops) were instilled in left nostril and after 15min left nasal cavity was packed with 2% Lignocaine-Adrenaline guaze bandage. To have pharyngeal mucosal anaesthesia, Lignocaine 2% viscous gargle (10ml) was given to the patient.

Fig 3: Flexometallic guide wire through the instrument channel of the fiberoptic bronchoscope

Before doing serial nasal dilatation and giving laryngeal nerve blocks, child was sedated with Midazolam (0.5mg) and Fentanyl (40mg) intravenously. By using lubricant jelly, serial nasal dilatation of left nasal cavity was done with plain red rubber endotracheal tubes (from size no. 4.0 to 5.5mm). Superior laryngeal nerve block was given on either side with 0.5% Bupivacaine 1ml each; and to obtund tracheobronchial reflexes, 0.5ml of Lignocaine 4% was injected transtracheally. During fiberoptic procedure, Oxygen was supplemented (2 lit/min) through nasal catheter via right nostril.

Patient was quiet after sedation and blockade of pharyngeal as well as laryngo-tracheo-bronchial reflexes. By better communication with the patient, adult size fiberoptic bronchoscope was passed through the left nostril and with gentle manipulations larynx was visualized. Fiberoptic bronchoscope was advanced further into trachea till carina was visualized. Then jaw end of flexometallic wire was introduced into instrument channel of fiberoptic bronchoscope and advanced till it came out through distal end of bronchoscope into trachea. Fiberoptic bronchoscope was withdrawn slowly over the flexometallic wire and 5.5mm plain endotracheal tube was guided over flexometallc wire till it came into trachea. Then flexometallic wire was also withdrawn from the airway. Endotracheal intubation was confirmed with $ETCO_2$ readings and chest auscultation. The tube was secured.

Then the patient was induced with Propofol 70mg (2mg/kg) and anaesthesia was maintained on Oxygen, Nitrous oxide, Sevoflurane and Atracurium. Surgery lasted for 3 and 1/2 hours and 3.5cm mouth opening was achieved. During intraoperative period vitals were stable, blood loss was minimal and fluid balance was maintained with crystalloid solutions. At the end of surgical procedure, neuromuscular blockade was reversed with Neostigmine (1.5mg) and Glycopyrrolate (0.3mg). After oral and endotracheal suction, child was extubated on operation table. In postoperative period, child was awake and vitals were normal. For further observation, he was shifted to postoperative recovery room.

DISCUSSION

Temporomandibular joints (TMJ) are highly specialized bilateral joints comprising an articulation between cranium and mandible and these have important role in mouth opening.

In ankylosis of TMJ there is fusion of the mandibular condyle to the base skull resulting into limited or no mouth opening. Unilateral or bilateral, TMJ ankylosis is problematic to the anaesthesiologist during airway management; as difficulty in endotracheal intubation may be life threatening to the patient during anaesthesia. In such condition knowledge of airway anatomy, equipments for airway manipulations and judicious use of drugs by experienced and skilled anaesthesiologist enhances the success rate of endotracheal intubation.[5] Management of paediatric difficult airway requires forethought and training. Plan of anaesthesia, choice of technique and reason for choice, possibility of emergency tracheostomy or need of planned tracheostomy after the airway is secured should be discussed with both child and his parents.[6]

For a child with limited or no mouth opening, technique of choice is fiberoptic intubation under sedation or general anaesthesia, with the child breathing spontaneously. [1] Fiberoptic bronchoscope, the most versatile instrument provides the competent anaesthesiologist a unique facility to secure any difficult airway. But everyone may not be able to procure all sizes of costly bronchoscope; so in chil-

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dren with difficult airway, different techniques by using bigger size scope for passage of smaller size tube are used.[7] These techniques are suitable for spontaneously breathing children.

Ultrathin bronchoscope without suction channel (2.2-2.5mm) used as nasoendoscope may be used for fiberoptic intubation in neonates and infants. Suction port of bronchoscope may also be used to pass a flexon coated guidewire, a cardiac catheter or a long J shaped guidewire over which a small endotracheal tube can be advanced into trachea after withdrawing bronchoscope. If bronchoscope is too large to pass through larynx then endotracheal tube is passed through one nostril and fiberoptic bronchoscope through other nostril. After visualization of larynx, endotracheal tube is directed into trachea. A preloaded endotracheal tube can be railroaded over the fiberscope through LMA into trachea.[6,7] If mouth opening is sufficient to pass adult bronchoscope orally, it may be used to visualize glottis to facilitate transnasal intubation in children.[8]

Alternative fiberoptic intubation techniques need special preparation and a skilled assistant to manipulate endotracheal tube, bronchoscope or adjuvant instrument. Care has to be taken during alternative fiberoptic techniques; because it is costly to repair the damage, to any part of delicate fiberscope.[7]

Airway blocks for these techniques help in suppressing airway reflexes, which also increases cooperation of patient and reduces possibility of laryngospasm.[3] Vasoconstrction of nasal mucosa reduces mucosal edema and incidence of epistaxis during intubation.[5] Transnasal intubation has additional advantage of tube stability, once it is secured in position.

As estimation of nasal patency by investigator or patient has high diagnostic failure rates and anaesthesiologist should not rely on these tests.[9] In this patient, while doing serial nasal dilatation of left nostril we observed that, 5.5mm plain endotracheal tube was the largest tube size to pass through left nasal cavity which was our prediction. The fact that the child was not having nasal obstruction was confirmed during advancement of bronchoscope through nasal cavity.

Guidewire has been used in retrograde intubation, anterograde intubation through LMA or for changing oral or nasal tube.[6,10] Use of adult fiberoptic bronchoscope and J tipped guidewire or a cardiac interventional catheter for difficult paediatric intubation has been reported.[11,12]

If the endotracheal tube is directly threaded over the guide wire, the tip of the tube may get caught on epiglottis or aryepiglottic folds resulting in kinking and withdrawal of the wire from the trachea. Guiding cardiac catheter over guidewire gives firmer guide with less chances of deviation while advancement.[7] In our case, we used flexometallic guidewire via suction channel of scope to guide endotracheal tube into trachea successfully. This wire was firm; still slight obstruction to the passage of tube over wire was felt at laryngeal inlet which was tackled by tactile manipulations over thyroid cartilage externally. There was no trauma to the airway or damage to the fiberscope while passing or removing scope, guidewire or endotracheal tube.

Fiberoptic bronchoscope is a delicate instrument with high purchase and repair cost. In hospital set-ups where sophisticated paediatric bronchoscope is not available, then adult bronchoscope, by modifying its intubation technique can be better alternative for managing paediatric difficult airway.

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