CASE REPORT

Anesthetic Management of Pediatric Difficult Airway in Child with Left Temporomandibular Joint Ankylosis

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Abstract

Anticipated or unanticipated pediatric airway difficulty is always challenging for a nonpediatric anesthetist. Improper difficult airway management is the main reason for pediatric anesthesia-related mortality and morbidity. Concepts and protocols for managing difficult airways must be well established for this reason. There are several algorithms for managing difficult airways. Fiberoptic intubation (FOI) is an effective technique for establishing airway access in patients with both anticipated and unanticipated difficult airways. This article seeks to review the clinical technique of managing the airway in a 7-year-old child with left temporomandibular joint (TMJ) ankylosis. The child has a history of recurrent ear infections following a small injury to the face 3 months prior to admission. Infection, trauma, rheumatoid arthritis, and congenital deformity could be the leading cases of narrowing of the oropharyngeal airway.

Keywords: Airway challenge, Case report, Deformity, Fiberoptic intubation, Pediatric difficult airway.

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Background

Anesthesia for jaw arthroplasty in a child with temporomandibular joint (TMJ) ankylosis would be factually challenging due to its accompanying obscurities like reduced mouth opening and limitation in protrusion of the jaw along with lack of cooperation and negligible lung reserves adding on to difficult airway. Fiberoptic intubation remains a benchmark in establishing an airway. We decided to perform fiberoptic intubation in deep sedation with spontaneous ventilation to tackle the existing situation.

Case Description

A young child aged 7 years and weighing 17 kg came to the emergency room with a history of falls and developed difficulty in opening his mouth after that incident. Following this, he was diagnosed with TMJ ankylosis after an untreated fracture of the bilateral mandibular condyle. The child had severely restricted mouth opening (interincisor gap–0.5 mm). Neck movements were not restricted. Child's dentition–missing tooth (Fig. 1). Orthopantomogram showing the bilateral condyle fractured (Fig. 2).

The child was assessed to fit under the American Society of Anesthesiologists grade II with an anticipated difficult airway.

Following a 6-hour oral fast for semisolids and full parental consent regarding the risks and benefits associated with challenging airways. For emergency airway protection, an ear, nose, and throat surgeon was on standby in the operation theater along with a difficult airway cart. Glycopyrrolate was nebulized into the youngster to assist with a difficult airway and to lessen the excessive production

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Fig. 1: Preoperative picture of the child showing restricted mouth opening

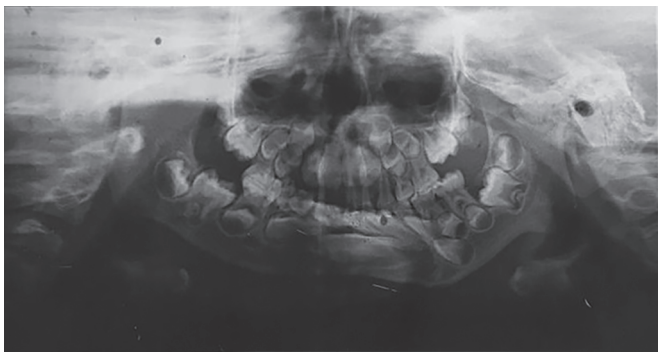

Fig. 2: Preoperative orthopantomogram showing bilateral mandibular fractures

Fig. 3: Intraoperative picture after FOB insertion in the left nostril

of mucus. Sevoflurane was used to induce the child after xylometazoline drops were placed in both nostrils, the youngster was moved to the operation theater, the line was secured, and he was preoxygenated with 100% oxygen for 5 minutes. In order to preserve spontaneous breathing, 8% in 100% oxygen was administered *via* the Jackson Rees (JR) circuit and then progressively lowered to 2.5%. Intravenous (IV) hydrocortisone 1 mg/kg, IV fentanyl 0.5 µg/kg. Propofol injection 0.5–1 mg/kg was administered in graduated doses and was given with alertness to maintain spontaneous respiration.

The plane was gradually deepened to maintain the minimum alveolar concentration of 1% for sevoflurane to allow the passage of the pediatric fiberoptic bronchoscope (FOB) once the adequacy of mask ventilation was confirmed. The scope's tip was angled upward by over forty degrees to facilitate intubation from the head of the bed. The scope's tip is then moved toward the base of the tongue and then toward the glottic aperture by moving a little bit farther. The scope can be aimed toward the vocal cords with the help of small adjustments performed with a tiny wrist motion and elevation or depression of the tip utilizing the angulation with the thumb control lever. Our aide gave a jaw shove in between to help the

Fig. 4: Postoperative picture showing better mouth opening with movements

bronchoscope move through the laryngopharynx and oropharynx.

In order to maintain an appropriate plane and deliver intermittent ventilation, a well-lubricated nasopharyngeal airway was put in the right nostril, and the JR circuit was connected to it *via* an endotracheal tube (ETT) connector. Preloaded with a cuffed ETT (5 mm ID), a pediatric flexible FOB (OD 3.8 mm and length 60 cm) was introduced *via* the left nostril under a deep plane of anesthesia. After advancing the FOB, the vocal cord visualization was sprayed with 2% lignocaine. To improve visualization, intermittent suction was used. Following the placement of FOB into the trachea, ETT was railroaded and its location was verified by FOB. After the scope passes over the vocal cords, the previously loaded ETT is slid in the direction of placement. If resistance is felt during installation, the tube should be cautiously rotated counterclockwise while retracting properly. The goal is to lessen trauma to the larynx. After passing the ETT, the location is confirmed by a bronchoscopic view, which is maintained slightly above the carina. After that, the scope is removed while a hand holds the tube in position.

The JR circuit was connected to the ETT and injection and capnography were used to confirm the tube location. They were administered 0.5 mg/kg of atracurium. Sevoflurane at 2%, oxygen, and air (50:50) were used to maintain anesthesia. Using a JR circuit, intermittent positive pressure breathing and an atracurium dosage of 0.1 mg/kg were administered (Fig. 3) The child's vitals were stable during the procedure. At the end of the surgery, the child was reversed and extubated, the child maintained saturation in room air, and recovery was monitored, postoperatively.

Recovery was uneventful, and mouth opening improved after the procedure (Fig. 4). Computed tomography/orthopantomogram is an essential tool for the assessment of mandibular fractures (Fig. 2).

Discussion

Temporomandibular joint (TMJ) ankylosis following a traumatic injury causes fusion of the mandibular condyle with the glenoid fossa, resulting in obliteration of normal articulation and immobilization of the mandible. Occurrence in childhood causes narrowing of the oropharyngeal airway. Infection, trauma, rheumatoid arthritis, and congenital deformity could be the leading cases.

Challenges faced would be difficulty in mask ventilation along with limited mouth opening, which predisposes to stress in performing conventional laryngoscopy with poor visualization of vocal cords. Retrognathia-related pseudomacroglossia constricts the oropharynx which may further add to the difficulty in cord visualization. So alternative methods to be utilized in rescuing an airway consist of[1]:

- Fiberoptic nasotracheal intubation.
- Seeing optic stylet system.
- Flexible airway scope tool aided intubation.
- Light wand-aided intubation.
- Retrograde intubation.
- Tracheostomy.

All of these methods have their own advantages and disadvantages, a blind nasal intubation may cause bleeding and edema of the larynx on repeated attempts. Retrograde intubation is harder because of the age factor along with restricted mouth opening makes it difficult to bring the catheter orally. Since Tracheostomy is an invasive technique it serves in crisis as a last resort.

Awake fiberoptic intubation (FOI) is the benchmark in difficult airway establishment.[2] Direct tracheal intubation or even one main bronchus over an intubating bronchoscope may enable the trained senior practitioner to bypass the life-threatening lower airway lesion or obstruction.[1] FOI is also used for the exchange of airway guide-wire catheters and the implantation of endobronchial stents. Lastly, the laryngeal mask airway and any airway exchange catheter can be used to precisely measure vocal cord function, subglottic stenosis, and pharyngeal airway swelling during extubation procedures with the aid of fiberoptic. Pediatric patients undergoing awake FOI require the administration of sedative medicines and supplementary oxygen.[3] The objectives are to guarantee patient comfort and sufficient anxiolysis while preserving a patent airway and guaranteeing sufficient breathing. An added advantage is the patient's responses to fiberoptic scope advancement and tracheal stimulation and also intubation can be prevented. To be cautious hypoxemia and aspiration are the most common complications associated with awake FOI.[4]

Performing it in a child is out of the question, so we planned to perform fiberoptic intubation with the substitutional method of inhalational induction with sedation to maintain an adequate plane with spontaneous ventilation. As jaw thrust and chin lift are difficult to perform in a child with TMJ ankylosis it is ideal for us to prevent airway collapse associated with the usage of muscle relaxants.[5] We have utilized this technique in managing our case successfully (Fig. 4).

Apart from the airway difficulty, the child had recurrent infections, so intraoperative bronchospasm is avoided, by adequate steroids and antibiotic coverage.

Fiberoptic intubation (FOI) especially in pediatric airway difficulty has become vital airway equipment. When the procedure is done in awake patients in the setting of anticipated airway difficulty, neck motion can be avoided, and evaluation of the airway is also easy. The value of FOI in the management of the difficult airway is well established with a high success rate. Inadequate topical anesthesia led to hyperactive airway reflexes in a minimal number of patients but no permanent injuries.

Awake FOI with topical anesthesia solely is a superior choice which reduces risks of aspiration, inadequate ventilation, and any airway compromise leading to hypoxemia.

Any kind of trauma to the TMJ joint followed by difficulty in mouth opening, especially in children is considered a challenging problem for anesthetists and surgeons. TMJ gap arthroplasty, a good surgery combined with the cooperation of family and child, is vital for preventing recurrence. Success depends upon vigorous physiotherapy, which is to be maintained in the long term.

Take-home Points

In addition to airway placement, and avoiding all the difficult airway complications, the fiberoptic bronchoscope is the accepted standard for confirming the ideal positioning of ETTs in difficult scenarios and has proved the margin of safety with placement positioning compared with auscultation. Recommended as a vital tool in the pediatric anticipated difficult airway.

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