

Difficult Airway Management in a Pediatric Patient with Bilateral Temporomandibular Joint Ankylosis Undergoing Interpositional Arthroplasty

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Abstract: ***Background:** Due to severely limited mouth opening and altered airway anatomy, pediatric patients with temporomandibular joint (TMJ) ankylosis present a significant anesthetic challenge. Fiberoptic - guided nasal intubation under general anesthesia is the recommended technique because it frequently precludes the use of traditional intubation techniques. A safe outcome depends on careful planning and preparation of the airway. **Case Presentation:** We present a case of a 4 - year - old male child diagnosed with bilateral TMJ ankylosis, scheduled for interpositional arthroplasty. The child exhibited severely limited mouth opening and normal neck mobility. Preoperative airway preparation included nebulization with 4% lignocaine and nasal decongestion with xylometazoline drops. In the operating room, standard monitors were applied, and a nasopharyngeal airway was inserted for oxygen insufflation. Anesthesia was induced with incremental doses of sevoflurane while preserving spontaneous ventilation. A 4.5 mm endotracheal tube was successfully placed via fiberoptic bronchoscopy through the contralateral nostril. Anesthesia was maintained with sevoflurane in oxygen - air mixture, and atracurium was used for muscle relaxation. Intravenous paracetamol provided intraoperative analgesia. The surgical procedure was completed without complications. The patient was successfully extubated and transferred to the pediatric intensive care unit (PICU) for observation, with an uneventful postoperative course. **Conclusion:** A safe and efficient method for managing airways in children with TMJ ankylosis is fiberoptic - guided nasal intubation performed under general anesthesia while maintaining spontaneous ventilation. Safety and procedural success are improved using nasopharyngeal oxygenation, preoperative topical anesthesia, and carefully selecting pediatric airway equipment. The significance of tailored planning and a methodical approach in handling challenging pediatric airways is emphasized in this case.*

Keywords: Pediatric airway, temporomandibular joint ankylosis, fiberoptic intubation, nasopharyngeal airway, difficult airway, general anesthesia

1. Introduction

Airway management in pediatric patients presents unique challenges, especially in congenital or acquired abnormalities such as temporomandibular joint (TMJ) ankylosis [1]. TMJ ankylosis is characterized by the fusion of the mandibular condyle to the glenoid fossa, either by fibrous or bony tissue, leading to restricted mouth opening, facial deformities, and functional limitations. In children, this condition is most commonly post - traumatic or congenital and, if untreated, can result in serious sequelae, including obstructive sleep apnea, poor nutritional intake, and psychosocial difficulties due to facial disfigurement [1, 2].

From an anesthetic perspective, bilateral TMJ ankylosis constitutes a formidable airway challenge. The severely limited or absent mouth opening precludes conventional oral intubation, and the altered airway anatomy makes blind nasal intubation risky and unreliable [3]. Fiberoptic bronchoscopy has emerged as the gold standard for managing anticipated difficult airways, particularly in patients with restricted oral access. However, in pediatric populations, fiberoptic - guided intubation is further complicated by anatomical considerations such as smaller airway diameters, reduced functional residual capacity, and increased oxygen consumption [4, 5]. Furthermore, awake fiberoptic intubation—ideal for adult difficult airways—is generally not feasible in young children due to poor cooperation and heightened risk of airway trauma or laryngospasm [4, 5].

Inhalational induction with sevoflurane, spontaneous ventilation maintenance, and nasopharyngeal airway use to provide continuous oxygenation during fiberoptic intubation are techniques that enhance safety and improve intubation success in such complex cases [4]. Preoperative topical anesthesia and nasal decongestion optimize visualization and reduce complications [4]. This case report describes the perioperative management of a 4 - year - old child with bilateral TMJ ankylosis, emphasizing the importance of meticulous preoperative preparation, a structured anesthetic approach, and the practical application of pediatric fiberoptic intubation strategies in ensuring a safe and uneventful outcome.

2. Case Report

A 4 - year - old male child was scheduled for elective interpositional arthroplasty for the treatment of bilateral temporomandibular joint (TMJ) ankylosis. The child presented with severely restricted mouth opening since early infancy, progressively worsening with age. There was no history of trauma, infection, or systemic illness. Clinical examination revealed a well - nourished child with typical developmental milestones. The hallmark feature was the inability to open the mouth beyond a few millimeters. There was no mandibular deviation, and both condyles were palpable. Bilateral prominent antegonial notches were noted, consistent with long - standing ankylosis (Figure 1).



Figure 1: Preoperative photograph: The child is seen attempting to open the mouth, demonstrating severely restricted mouth opening—a hallmark clinical feature of TMJ ankylosis. There is no deviation of the mandible, and on examination, both condyles were palpable. A prominent antegonial notch is observed bilaterally, consistent with long-standing ankylosis. This image highlights the functional limitations and facial characteristics commonly associated with TMJ ankylosis in pediatric patients.

The preoperative evaluation confirmed the absence of associated congenital anomalies or craniofacial syndromes. Neck movement, including flexion and extension, was within normal limits. Airway examination revealed a severely restricted interincisal distance (<5 mm), rendering conventional direct or video laryngoscopy infeasible. The child weighed 13.5 kg and had normal baseline vital signs. Routine hematological and biochemical investigations were within normal limits. A high-resolution computed tomography (CT) scan of the craniofacial region confirmed bilateral bony ankylosis of the TMJ.

Given the anticipated difficult airway, a detailed anesthetic plan was formulated, emphasizing the preservation of spontaneous ventilation and preparedness for emergency surgical airway access. The procedure and potential risks were thoroughly explained to the parents and informed written consent—including for emergency tracheostomy—was obtained. The patient fasted for 6 hours preoperatively.

Preoperative Preparation:

In anticipation of potential airway challenges, all resuscitation equipment and a difficult airway cart, were kept readily available in the operating room. Before taking patient in operating room intravenous access was secured and an infusion of Ringer lactate with 10% dextrose was initiated at a rate of 2 ml/kg/hour to maintain hydration and glucose levels during the procedure. To minimize secretions and optimize airway visualisation, intravenous glycopyrrolate 0.04 mg/kg was administered.

Thirty minutes before induction, the patient received nebulization with 2 mL of 4% lignocaine for airway topicalization and Xylometazoline nasal drops were instilled into both nostrils to reduce mucosal congestion and facilitate nasal intubation. In the operating room, standard ASA monitoring was established.

Induction and Intraoperative Medications: Intravenous fentanyl 0.5 µg/kg, hydrocortisone 2 mg/kg, and dexamethasone 0.1 mg/kg were administered preoperatively. Gaseous induction was initiated with sevoflurane in 100% oxygen using a Jackson Rees (JR) circuit. A titrated dose of propofol (0.5–1 mg/kg) was administered cautiously, ensuring preservation of spontaneous respiration. Once effective mask ventilation was ensured, the depth of anaesthesia was gradually increased by adjusting the inspired concentration of sevoflurane to achieve a minimum alveolar concentration (MAC) of 1–1.5%.

A well-lubricated size 5.0 nasopharyngeal airway fitted with a ETT connector was gently inserted into the more patent nostril. Proper placement was confirmed by unobstructed airflow, and the airway was used to facilitate continuous oxygen insufflation during the procedure. Anesthesia was induced with incremental concentrations of sevoflurane in 100% oxygen using a Jackson - Rees circuit, with careful attention to maintaining spontaneous ventilation.

Once the adequate depth of anesthesia was achieved, a flexible pediatric fiberoptic bronchoscope (2.8 mm diameter) was introduced through the contralateral nostril. A well-lubricated 4.5 mm cuffed endotracheal tube (ETT) was loaded over the scope. During advancement, 1 mL of 2% lignocaine was instilled through the bronchoscope's suction channel at the level of the vocal cords to minimize laryngeal reflexes. The scope was navigated through the vocal cords, and the ETT was advanced successfully into the trachea (Figure 2).



Figure 2: Intraoperative image showing fiberoptic-guided nasal intubation in a 4-year-old child with bilateral temporomandibular joint (TMJ) ankylosis.

Continuous oxygenation was maintained throughout via the nasopharyngeal airway. Correct ETT placement was confirmed by capnography and bilateral chest auscultation. Intravenous atracurium was administered for muscle relaxation. Anesthesia was maintained with sevoflurane in an oxygen - air mixture, and intravenous paracetamol was used for analgesia.

The intraoperative course remained stable and uneventful. After completion of the arthroplasty, the patient was reversed with neostigmine and glycopyrrolate once spontaneous respiration and adequate muscle tone returned. The child was extubated smoothly and shifted to the pediatric intensive care unit (PICU) for observation. No complications were observed in the postoperative period.

3. Discussion

Bilateral temporomandibular joint (TMJ) ankylosis in pediatric patients presents one of the most formidable airway challenges for anesthesiologists. It restricts mouth opening significantly, rendering conventional oral intubation techniques impossible. Moreover, children with TMJ ankylosis often have craniofacial deformities such as retrognathia and a hypoplastic mandible, further complicating airway access and contributing to conditions like obstructive sleep apnea if left untreated, as reported by Kamat et al. [6].

The present case describes the successful anesthetic management of a 4 - year - old child with bilateral TMJ ankylosis using fiberoptic - guided nasal intubation under general anesthesia while maintaining spontaneous ventilation. This approach aligns with existing literature that identifies fiberoptic bronchoscopy (FOB) as the gold standard for anticipated difficult airways, particularly in cases where oral access is not feasible [7]. However, awake fiberoptic intubation, commonly used in adults, is typically impossible in young children due to a lack of cooperation and higher susceptibility to airway reflexes such as laryngospasm [8].

Instead, inhalational induction with sevoflurane and maintenance of spontaneous respiration is the most recommended approach in pediatric patients. In the current case, nebulized lignocaine and xylometazoline nasal drops were used preoperatively to anesthetize and decongest the nasal passages. This technique has been shown to reduce mucosal trauma and facilitate smoother intubation [9]. Similar preparation was reported by Jaju et al. in a 7 - year - old child with bilateral TMJ ankylosis, where a nasopharyngeal airway was also used to deliver oxygen during intubation, enhancing safety by avoiding desaturation during the fiberoptic procedure [10].

While both cases utilized fiberoptic nasal intubation, the equipment choice was tailored to the child's size and age. In our case, a 2.8 mm bronchoscope and 4.5 mm ETT were used compared to a 3.8 mm bronchoscope and 5 mm ETT in the earlier report [10]. This reflects the importance of customizing equipment size to pediatric anatomy, as larger instruments increase the risk of trauma and unsuccessful intubation [8].

Pediatric patients have a higher oxygen consumption rate and lower functional residual capacity, making them more vulnerable to rapid desaturation during apnea [7, 11]. Continuous oxygen insufflation through the contralateral nostril using a nasopharyngeal airway was essential to maintaining oxygenation throughout the procedure. Topical lignocaine was administered directly onto the vocal cords through the bronchoscope channel, reducing the risk of laryngospasm, which has been reported to occur in up to 27.6 per 1000 children under anesthesia [12].

Intraoperative analgesia was effectively managed with intravenous paracetamol, aligning with a multimodal pain management strategy that minimizes opioid use and associated respiratory depression [10]. The entire intraoperative and postoperative course remained uneventful, emphasizing the efficacy of preemptive planning, gentle technique, and age - appropriate modifications in managing difficult pediatric airways.

4. Conclusion

The anesthetic management of pediatric patients with bilateral temporomandibular joint (TMJ) ankylosis demands meticulous preoperative planning, judicious technique selection, and appropriate use of pediatric - specific airway equipment. Fiberoptic - guided nasal intubation under general anesthesia, with maintenance of spontaneous ventilation and continuous oxygenation via a nasopharyngeal airway, remains the cornerstone of managing anticipated difficult airways in this population. This case illustrates how combining inhalational induction, adequate topical anesthesia, and tailored equipment choices can ensure safe and smooth intubation in a high - risk scenario. Compared to previous reports, our approach reaffirms the importance of individualized, age - appropriate airway strategies, highlighting that successful outcomes in pediatric TMJ ankylosis depend on both technical skill and anticipatory preparation. The absence of intraoperative and postoperative complications underscores the safety and reliability of this method when executed with careful planning and precision.

Conflict of interest: none

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