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Case Report

Paediatric airway and challenges during covid era

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ABSTRACT

Pediatric airway brings some unique challenges to anesthesiologist. Anaesthesiologists are at particularly high risk of being exposed to Covid cases because airway management, particularly tracheal intubation, positive pressure ventilation through a mask, and management of tracheostomy tubes, causes widespread aerosolization of the virus.¹ But these cases cannot be deferred. The aim is to present a case series of difficult pediatric airway scenarios managed successfully with different techniques and airway gadgets during COVID times taking all safety precautions. The following cases were managed successfully with appropriate airway techniques from the period of April 2020 to September 2021 in our institute.

First case series of Tracheobronchial foreign bodies removal using controlled ventilation. Secondly Juvenile onset recurrent laryngeal papillomatosis for excision under coblation, one case managed by tubeless anesthesia and other by intubation using videolaryngoscopy. Third case scenarios of Laryngeal web for excision with MLS scissor managed by LMA followed by tracheostomy. These airway related complications during COVID era, not only had logistic problems but also to optimize and work in a coordinated way with ENT surgeon in the common airway is a challenging task. These three case scenarios of pediatric airway during COVID times, were successfully managed with appropriate airway gadget suitable for each case without any complications.

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1. Introduction

Airway management of patients during this pandemic of COVID times is a great challenging task. Pediatric patients are even more challenging due to less available guidance and protocols. Many routine pre-COVID-19 practices, such as mask induction of general anaesthesia in anxious, crying, and agitated children or carrying them into the operating room (OR), may be less desirable because of the risk of viral exposure to the OT staff. Though the virus appears to have its most damaging clinical effects in adult patients, infection does occur in children.¹⁻³

2. Case Preparation and Anaesthesia⁴

Motivation of parents for these cases, routine investigation, preparing the cases by weighing the patient and preparing drugs, premedication with atropine to aid management of hypoxia induced bradycardia and to decrease the secretion was done. Adequate equipments with difficult airway armamentarium were kept ready so that the first intubation be the best one. Preoperatively nebulization in all cases was done. Operating room team wore PPE, N95 MASKS, goggles, face shield, Bronchoscopy instruments and appropriate optical forceps were selected. Preoperative nebulization of the child was done with the bronchodilators and steroids in almost every case as in this COVID era chest congestion and cough was present in almost every cases. 2% lignocaine sprayed in oropharyngeal

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cavity before instrumentation.⁵ In the OT temperature was maintained and regulated with warm blankets and fluid warmers.^{6,7} According to the guidelines monitors like ECG, Capnography, SpO₂, temperature was connected to every cases.⁸ Breathing circuits -Ayers T Piece breathing circuits with HME filters (<20kg) was used.^{9,10} Endotracheal tubes of proper size appropriate to the case are kept ready. Supraglottic airways were kept ready. Second-generation supraglottic airway devices have higher leak pressures than first-generation masks so that was considered.¹¹

For controlled ventilation and smooth intubation Neuromuscular blocking agents were preferred.¹² Adequate oxygenation and ventilation was maintained with nasal cannula or Ayers T-piece connection in scope side port.

These patients received gentle positive pressure ventilation with the goal of using just enough tidal volume to achieve chest rise while maintaining a tight mask seal. We considered deep extubation using techniques that minimize coughing and bucking during emergence.^{13,14}

2.1. Case scenario 1-Tracheobronchial foreign bodies

Foreign body aspiration is a potentially critical airway emergency in children. The state of art in our institute for these cases is endoscopic foreign body retrieval using rigid bronchoscopes and optical forceps for optimal imaging and surgical removal. With advance in anaesthesia techniques, rigid bronchoscopy is done under general anaesthesia. Use of flexible bronchoscope was started in the 1970s specially for aspirated foreign material localised in the distal airways.

We have done few cases of tracheobronchial foreign bodies in pediatric age group. Most of the patients presented as elective surgeries. (Table 1)

Tracheobronchial bronchial foreign bodies generally present with symptoms of coughing, dyspnea, wheezing. In case of delayed diagnosis unilateral, diminished breath sounds, audible rhonchi, persistent coughing has been observed. So before taking up the cases proper airway equipments has to be kept ready.

3. Anaesthesia Management

In most of the foreign bodies retrieval cases controlled ventilation was used with proper airway instruments.(Figure 1) Although fibre-optic bronchoscopy are preferred, rigid bronchoscopes remains the gold standard. Premedication was done with glycopyrrolate, dexamethasone. Induction was done with sevoflurane 2-6% dial concentration, oxygen, propofol 1 mg/kg, Inj fentanyl 0.5 microgram per kg, Inj ketorolac and Inj paracetamol 10-15 mg/kg IV. Maintenance of anaesthesia and oxygenation was done with Jackson - Rees anaesthesia circuit in the side stream of the Karl Storz optical bronchoscope. (Figure 2) And continuous nasal cannulation using prongs @ 2lts/hour

was considered. Succinylcholine (3mg/kg for infants and 2 mg/kg for children) for rapid induction¹⁵ and atracurium (0.5mg/kg) was used for maintenance so as to obtund the reflexes in pandemic times. Prompt recovery in all age groups makes atracurium an attractive drug for use in paediatric anaesthesia. After removal of foreign bodies with 2.5mm bronchoscope, mask ventilation was applied until spontaneous respiration was reached.

3.1. Airway equipments



Fig. 1:



Fig. 2:

4. Discussion

Tracheobronchial foreign bodies are most common in children less than 3 years old. Curiosity to explore via the oral route, failure in the laryngeal closure reflex and activity while eating are the most common etiological factors. The key to reach a definite diagnosis lies in a detailed history taking that identifies risk factors, supportive chest Xray or CT findings. In our cases even some parents didn't give history of foreign body ingestion still, after proper investigations we could diagnose it. Retrieval of foreign bodies by bronchoscopy can be done under both spontaneous and controlled ventilation.¹⁶ But in this pandemic period we have done all the cases under controlled ventilation with all precaution against dislodgement of foreign bodies more distally. Controlled ventilation decreases the risk of reflex activation of the

Table 1: Shows the age of the patients, type of foreign bodies, location, O2 saturation at the time of presentation

Age	Ingestion of foreign body	O2 saturation	Cxray/ct scan	Foreign body
9 months	History given-3 months	89-90%	CT scan shows calcified object	Bead
1.5 years	No history	90%	Opaque mass at level of right bronchus	Shell of snail
1.2 years	No history	93-94%	Mass in the right bronchus	LED blub from toy car
2 yrs	Yes history-10 days	90%	In Bronchus	Peanut

airway, hypercapnia and also associated with shorter operative times.

4.1. Case scenario 2-Juvenile onset recurrent laryngeal papillomatosis

Recurrent respiratory papillomatosis is a rare, benign and chronic disease caused by human papilloma virus (serotype 6 and 11)¹⁷

We had 2 cases of laryngeal papillomatosis during this duration, both cases presented as severe stridor.

3 years and half months old child presented with stridor and dysphonia from last 2 months. Diagnosed as Dinnkers' grade 3 JORRP.

And second case of 2 years old child presented with severe respiratory distress and stridor from last 4 months. (Figure 3) On examination diagnosed to be case of laryngeal papillomatosis.



Fig. 3: Laryngeal papilloma

4.2. Goal of the preparation

Provide ventilation, vocal cord relaxation, avoid trauma and laryngospasm, provide good surgical access. Tracheostomy was avoided as it carries the risk of virus spread. Jet

ventilation is also invasive procedure.

4.3. Problems

In case of recurrent laryngeal papillomatosis, during intubation papilloma may occlude laryngeal inlet and cause bleeding. Smaller endotracheal tubes are needed for surgical access but it hampers the ventilation as well as the concentration of volatile agents. Airway control during this procedure is again a challenge for anaesthetist because of shared airway with the surgeon.

4.4. Preparation

Preoperatively both the children were examined with flexible laryngoscopy. Routine Premedication was done with Inj Atropine, Inj Fentanyl and Inj midazolam. Inj hydrocortisone was also given preoperatively. Resuscitation equipments were kept ready. Monitors like ECG, SpO2 and NIBP were connected. The patients were Induced with 100% oxygen and 6% sevoflurane, maintenance was done by Oxygen 33%, nitrous oxide 66% and Sevoflurane 1% InjAtracurarium was used as muscle relaxant for both induction and maintenance. In the first case during the procedure, intermittent withdrawal of endotracheal tube was done for proper visualisation, so mostly done as tubeless anaesthesia. In the second case, video laryngoscopy was done and flexometallic tube of 3.5mm was given.

4.5. Procedure

Excision of the papilloma was done by using Coblation.

4.6. Reversal

At the end of the procedure, patients were reversed and maintained Oxygen Saturation with spontaneous ventilation. Post operatively all vitals were stable.

5. Discussion

Children who have laryngeal papilloma are often misdiagnosed as asthma, recurrent bronchitis and croup because of hoarseness and stridor. The treatment recommendation for papillomas is to remove as much

disease as possible but laryngeal and respiratory functions should be preserved simultaneously. Surgical ablation with carbon dioxide laser and endoscopic stripping remain the method of choice. Recurrences are known to occur.

Preoperatively, patient's airway examination should include indirect laryngoscopy or flexible nasopharyngolaryngoscopy to define the extent and severity of papilloma extension. The size of lesion and presence of obstructive symptoms or respiratory distress are critically important in anaesthetic management. In presence of obstructive symptoms, patient should not be made apnoeic until airway is secured. Airway should be maintained using awake intubation or intubating while patient is spontaneously breathing under deep inhalational anaesthesia. Tracheostomy is not a favourable option in these patients because of risk of viral spread and if at all tracheostomy is performed in emergency situation, early decannulation should be planned. Apnoeic ventilation and jet ventilation are other alternative ventilation strategies, but they carry risk of hypoxia, hypercapnia and barotrauma. Endotracheal intubation helps in avoiding these risks. Advantage of intubation is control on airway, protection from aspiration and easier to maintain depth of anaesthesia. The disease. In our patient we intubated the patient using muscle relaxant. Because of very small space available one should select small size endotracheal tube; we also encountered the similar situation. But after excision of papilloma small sized tube will create difficulty in ventilation because of leakage. Changing tube in between the surgery is difficult and problematic but we successfully replaced the tube intraoperatively to prevent further leakage.

Hence we conclude that laryngeal papilloma in children need special attention as it obstructs the already narrow paediatric airway and associated respiratory distress makes it challenging for the anaesthetist. Good coordination between surgeon and anaesthetist should be there in best interest of the patient.

5.1. Case scenario 3-Laryngeal web

Congenital laryngeal web is a rare anomaly with incidence of 1 in 10,000 births. It is a membrane like structure that extends across the laryngeal lumen close to the level of vocal cord. Its clinical presentation may range from an asymptomatic patients or mild hoarseness of voice to severe respiratory stridor.¹⁵ Symptoms depend highly on web's severity, mild hoarseness to aphonia to severe obstructive dyspnoea.

There are four grades of glottic webbing type I-IV according to Cohen's classification.(Figure 4)

Case 1- A 5 days old baby presented to us with respiratory distress. On bronchoscopy, grade III laryngeal web was diagnosed. The case was posted for endoscopic excision of web under general anaesthesia. In OT patient was induced with Oxygen 46%, nitrous oxide 46%





Classification	From	To	Endoscopic appearance
Grade I	No Obstruction	35% Obstruction	
Grade II	35%	50%	
Grade III	51%	75%	
Grade IV	76%	100%	

Fig. 4: Cohen's classification

and sevoflurane 6% dial concentration. The airway was maintained by 2 mm size ETT keeping its tip just above the laryngeal inlet with maintenance of spontaneous respiration till emergency tracheostomy was performed. We encountered intermittent desaturation till we did the tracheostomy.

Case 2- A 10 days old baby presented to us with severe respiratory distress, cyanosis during feed and aphonia on crying. On bronchoscopy, the patient had a laryngeal web type III with marked vocal dysfunction. (Figure 5)



Fig. 5: View of type III laryngeal web

Preoperatively patient was nebulised with budesonide and salbutamol and premedication was done. Induction was done with Oxygen 46%, nitrous oxide 46% and sevoflurane 6% dial concentration and paralysed with atracurium. Intermittent positive pressure ventilation was maintained with LMA size 1. Tracheotomy was performed with placement of 2.5mm ID tracheostomy tube.

Excision of the whole laryngeal web was done with MLS scissor and placement of silastic sheet was done to prevent adhesion. Stenting was done to prevent adhesion.

6. Discussion

Etiology of congenital laryngeal web is failure of recanalization of the glottic airway in the early weeks of embryogenesis. Almost 95%of congenital web are anterior, and more than 50% of the patients have chromosomes

22q11.2 deletion syndrome. These patients should undergo genetic screening and a thorough cardiovascular assessment in preoperative period. Preoperative bronchoscopy helped us to predict the size of the ETT. The time between induction and intubation was curtailed by the use of succinylcholine and adequate preoxygenation. Portex 2mm tube was held only at the tip of laryngeal inlet because we cannot intubate our patient. Second case was comparatively easily done as saturation was maintained using LMA followed by tracheostomy. Laryngeal edema was major concern in post-operative period.

7. Conclusion

In airway cases the greatest challenge during anaesthesia is to secure adequate ventilation without hampering good surgical field visibility throughout the procedure. In contrary to the pre COVID era we preferred maintenance of anaesthesia under controlled ventilation to prevent aerosolization by coughing and laryngospasm intraoperatively. The surgical triaging or categorization which was initially followed were adopted and eventually adapted according to the changing COVID 19 trend.¹⁸ Paramount importance towards advanced planning of workflows and procedures for emergent intubation and any other emergency outside the operating room is necessary. A balanced team work involving representatives from anaesthesiology, critical care, respiratory therapists and nursing is the need of the hour, since there is no standard protocol to handle COVID 19 cases as the disease is in its evolving phase.

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None

9. Conflict of Interest

The authors declare no conflict of interest.


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