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Case Report

Adult fiberoptic bronchoscope assisted tracheal intubation in a child with extremely limited mouth opening

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Abstract

Tracheal intubation under vision in a child with extremely limited mouth opening requires the aid of pediatric fiberoptic bronchoscope. Often there can be only adult size bronchoscope in a center leading to a difficult situation when compromised pediatric airway requires stabilization. Aim of this case report is to describe the technique and feasibility of use of an adult fiberoptic bronchoscope for tracheal intubation of in child with extremely inadequate mouth opening unsuitable for conventional intubation. A 9-year-old boy with temporo-mandibular joint ankylosis was admitted for exploration of mastoid abscess under general anesthesia. In the absence of a pediatric fiberoptic bronchoscope we performed nasotracheal intubation of the child with the aid of an adult bronchoscope while maintaining spontaneous breathing with inhalational anesthetics. In remote locations, in centers with inadequate/non-working equipments and in emergency situation where appropriate equipments are not available, adult fiberoptic bronchoscope may be helpful for tracheal intubation of pediatric patient.

Key words: Airway management; Endotracheal intubation; Fiberoptic endoscope; Pediatric

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Introduction

Tracheal intubation in children with complete closure of mouth resulting from temporomanidibular joint ankylosis is a difficult task.[1-3] Placement of the tracheal tube under direct vision with the help of pediatric fiberoptic bronchoscope is desirable for securing of such airway. Appropriate sized bronchoscope for pediatric patients is not always available. However, many centers possess adult size bronchoscope because of the frequent demand from relatively large population of adult patients. In this report we describe the technique and feasibility of use of an adult fiberoptic bronchoscope for pediatric tracheal intubation when mouth opening is inadequate for conventional laryngoscope-aided intubation. The objective of the case report is to widely spread this knowledge of airway management for securing of difficult pediatric airway under vision in similar situation.

Methods & Results

A 9-year-old boy weighing 30 kg was admitted in our hospital with right mastoid abscess for modified radical mastoidectomy. Airway examination revealed almost complete closure of the mouth with micrognathia (Figure-1). Radiological investigations confirmed the presence of right temporomandibular joint ankylosis. The child had patent bilateral nostrils, normal neck mobility and a thyro-mental distance of 2.5 cms. He did not have any history of difficulty in breathing while awake or asleep.

Figure 1: Almost complete closure of mouth with micrognathia

In the absence of pediatric bronchoscope and to avoid tracheostomy, we planned to perform nasotracheal intubation under direct vision with assistance from an adult fiberoptic bronchoscope to secure airway and to administer general anesthetics. Our plan was to insert the bronchoscope into the laryngopharynx through one nostril to visualize the supraglottic area and to put a polyvinyl chloride tracheal tube through other nostril for its final placement into the trachea under the vision of the fiberoptic light. Initially, considering this as a difficult airway, we decided to perform the procedures under tropical anesthesia and airway blocks. Accordingly, we explained the procedure to the child and his mother. However, the child became very afraid and we changed our plan to perform the procedure under inhalational anesthesia after obtaining written informed consent from parent.

The child received tablet ranitidine 75 mg in the night as well as on the morning of surgery. We instilled 2% xylometazoline solution into both the nostrils 1 hour before and at the beginning of the procedure. In the receiving area of the theater complex, we secured an intravenous line with a 20 G cannula, administered glycopyrrollate (0.1mg) iv and then shifted him to operating room. General anesthesia was induced with gradually increasing concentrations of halothane starting with 0.5 vol% in 100% oxygen via face mask and Ayer's T peace with Jackson Rees' modification. Patient's respiration was monitored during the induction and halothane was increased gradually till the patient turned sleepy and his breathing was then assisted. With the confirmation of easy mask ventilation the depth of anesthesia was increased with gradually increasing concentration of halothane (up to 2.5 vol%) to make the depth adequate to perform the procedure. The patient continued to breathe spontaneously with assistance as and when required for.

A 5 mm soft lubricated nasopharyngeal airway (Portex Limited, Kent, England) was inserted sequentially into both the nostrils to dilate the nasal passages so as to reduce the possible trauma from the subsequent insertion of endoracheal tube and adult fiberoptic bronchoscope. This caused interruption of anesthesia for about a minute. Following this, inhalation anesthesia was continued for 3 minutes. An adult fiberoptic bronchoscope (50cm x 5mm, Karl Storz, Tuttingen, Germany-Model No. 11001BN1), connected with a video monitor for real time display, was inserted through left nostril and advanced under vision upto the oropharynx with the epiglottis in view. Immediately following this, a pre-lubricated 5.5 mm un-cuffed polyvinyl chloride endotracheal tube was inserted through the right nostril and was placed in the hypopharynx under the fiberoptic vision. The anesthesia circuit was now connected to the endotracheal tube and the patient continued to breathe spontaneously through the tube as evidenced by the movement of the bag and the capnograph.

Fiberoptic bronchoscope was advanced and manipulated to obtain a full view of the glottis. Keeping the glottic view on the monitor the endotracheal tube was advanced towards the glottic aperture for its placement into the trachea. However, initially the tube was advancing towards the right pyriform fossa; it was then withdrawn, rotated 90º anticlockwise and advanced again; however this time it went posterior to the glottis. To get the correct alignment of the glottis and the nasotracheal tube, the neck was extended by placing a pad under the shoulder and external compression over the larynx was applied. These maneuvers improved the alignment of airway axes and made axis straighter facilitating easy passage of endotracheal tube into the trachea under vision without any trauma (Figure-2). During the procedure the child continued to breathe spontaneously maintaining stable hemodynamic parameters without any episodes of laryngospasm or other airway morbidity.

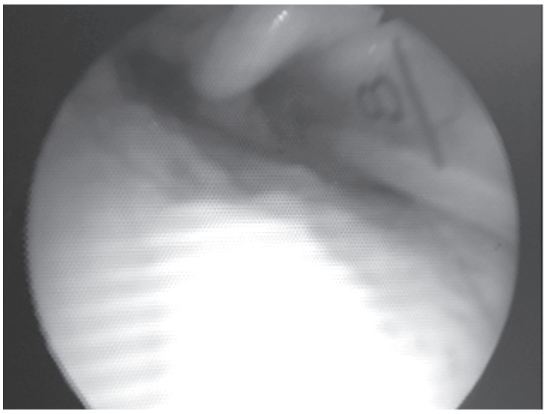

Figure 2: Passage of endotracheal tube into the trachea under vision.

The fiberoptic bronchoscope was taken out after confirming the bilateral equal air entry on assisted ventilation and continuous presence of the end tidal carbon dioxide waveform. Balanced general anesthesia was continued with halothane, inj vecuronium bromide 0.1 mg /kg, inj pethidine 1.5 mg/kg and positive pressure ventilation. At the end of the surgery, residual neuromuscular blockade was reversed and trachea was extubated when the patient was conscious with protective cough reflexes. His rest of the hospital stay was uneventful.

Discussion

In any patient, tracheal intubation under vision is the best way to obtain a secured airway. Without fiberoptic bronchoscope securing the airway under vision in children with limited mouth opening unsuitable for laryngoscopic intubation because of temporomandibular joint ankylosis, is not possible. Blind nasotracheal intubations in these patients are often unsuccessful due to the associated anomalies of larynx, facial asymmetry and retrognathia.[(1,4)] Various catheter or wire guided retrograde intubation can be performed; however, these techniques are relatively invasive and blind in nature.[(2,5,6)] Kundra et al in 2006 had shown that adult fiberoptic bronchoscope with real time video monitoring can be used to secure airways of children with temporomandibular ankylosis.[(7)] Later both Xue et al[(8)] and Arora et al[(9)] in 2009 demonstrated successful intubation in similar situation and their experiences emphasize that anesthesiologists often have to face such difficult situation of pediatric airway management in different parts of world. Our patient re-emphasizes that similar situation of difficult pediatric away is a reality in this part of world and adult bronchoscope can be used for tracheal intubation in pediatric patient.

For a healthy 9 year old boy, 6 mm cuffed or uncuffed endotracheal tube seems to be appropriate, especially for patients who are paralysed with neuromuscular blocking agents. This is true for oral intubation. Our patient was not paralysed and oral intubation was not possible for limited mouth opening. Therefore, we chose nasal route for securing airway. Moreover, children with temporomandibular joint ankylosis have suboptimally developed airway structures including larynx.[1-3] To accomplish easy passage of tube through nares without trauma and smooth insertion of tube through possibly suboptimally developed airway structures, we used 5.5 mm internal diameter uncuffed tube. A possible leak around the tube, if any, won't be a hindrance for mastoid surgery; rather a mild leak can avoid the development of postoperative laryngeal edema resulting from a snugly fitted endotracheal tube in pediatric airway. It is always wise to avoid any situation of stridor or laryngospasm in perioperative setting in patient who already has difficult airway.

A scope should preferably have 20% extra area around it for its proper movement inside a tube. Otherwise, forceful insertion of tube over the scope may displace the scope from the trachea facilitating its misplacement into esophagus; use of heavy force to glide tube over scope may also cause undue movements, trauma and other airway morbidities. Therefore, a fiberoptic bronchoscope with a diameter of 4.5 mm is the most appropriate for a endotracheal tube with internal diameter of 5.5 mm. In other way, a 5mm outer diameter scope requires a 6mm tube for its safest movements inside the tube. It may be highlighted that our patient was not paralysed and patient was on spontaneous ventilation with inhalation anesthetics. Thus, spontaneous breathing was maintained with a fine balance of medications. Any undue situation or forceful maneuvers of airway had always a possibility for development of laryngospasm jeopardising the safety of the whole procedure. Therefore, we opted for an endotracheal tube and fiberoptic bronchoscope with such diameters so as to place them smoothly into trachea with an intention to avoid complications.

In our case, ideally a pediatric fiberoptic bronchoscope was essential for tracheal intubation. In the absence of a pediatric bronchoscope, we applied this technique to avoid the drawbacks of most of the existing techniques of intubations in similar situations as mentioned before. Also we could place the endotracheal tube under vision – the utmost important step in the management of a difficult airway. As has been demonstrated by Kundra et al, we too found that the endotracheal tube was misplaced around the glottis at the initial attempts of insertion.[(7)] The placement of the tube in the right pyriform fossa may be because of the passage of the tube through the same-sided nostril .The subsequent progression of the tube posterior to the glottis may be because of asymmetrical development of the airway. Similar misplacements are quite common even during the attempts of blind nasotracheal intubation and corrective maneuvers we applied are the standard techniques used for alignment of nasal and laryngeal axis during such procedures.

Because of the high procurement and maintenance cost, fiberoptic bronchoscopes are available only at few centers in developing countries. Moreover, because of the same reason, the availability of both adult and pediatric bronchoscope together in a single setup is a rarity in these countries. Unfortunately, children with limited or no mouth openings continue to attend the hospitals of these countries for different surgical procedures and put a serious challenge of airway management to the attending anesthesiologists.(2,4,6,7,9)

Maintenance of spontaneous breathing is of utmost importance during any difficult airway intervention. This technique of intubation preserves spontaneous respiration and the procedure is done under direct vision with less invasiveness than many other techniques available for intubation in the absence of a pediatric bronchoscope.(4-6) Thus, we conclude that even an adult sized bronchoscope can be of immense help for tracheal intubations of pediatric population who present with extremely inadequate mouth opening.

Conflict of Interest Statement: Authors do not have any internal or external conflicts related to this manuscript.

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