Case Report

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Anaesthetic Management of an Infant with Laryngeomalacia and CHD Scheduled for Rigid Tracheobronchoscopy

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Abstract

Introduction: Laryngomalacia is defined as collapse of supraglottic structures during inspiration. It is the most common laryngeal disease of infancy and cause of stridor in newborns.

Case Report: A 17 days old child (2.75kgs) with congential laryngomalacia was scheduled for rigid tracheobronchoscopy. Child had a history of recurrent lower respiratory tract infection which resolved with intravenous antibiotics and steroids. On auscultation he had no adventitious sounds when quiet but added sounds were heard when he cried.

Echocardiography showed CHD with situs solitus levocardia with 4mm ASD and 2mm PDA with dilated RA/RV. The child was administered atropine, midazolam, atracurium and ketamine. Maintainence with sevoflurane . During rigid bronchoscopy we provided adequate analgesia and sedation without clinically significant hemodynamic or respiratory adverse effects.

Conclusion: In summary we noted that ketamine provided a reliable and effective method of sedating infants undergoing a rigid bronchoscopic examination in spontaneous ventilating conditions and noted no clinically significant haemodynamic or respiratory problems. When these patients do present, their care is likely to be complex and challenging. As such , a multidisciplinary approach should be adopted throughout their period of care.

Keywords: Congenital heart disease; Laryngomalacia; Tracheobronchoscopy.

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Introduction

Laryngomalacia is defined as collapse of supraglottic structures during inspiration. It is the most common laryngeal disease of infancy and cause of stridor in newborns. Upto 20% infants with laryngomalacia presents with life threatening disease that necessitates surgical management in the setting of severe airway obstruction and feeding disorders.[1]

It presents in the form of stridor, a high pitched musical multiphase inspiratory noise appearing within the first 10 days of life. Signs of severity are present in 10% of cases -poor weight gain, dyspnoea with severe intercostal or xyphoid

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retractions, episodes of respiratory distress, obstructive sleep apnoea, and/or episodes of suffocation while feeding or feeding difficulties. The diagnosis is based on systematic laryngoscopy to confirm laryngomalacia and exclude other causes of supraglottic airway obstruction. Rigid bronchoscopy under general anaesthesia is performed only in the following cases: absence of laryngomalacia on laryngoscopy, presence of laryngomalacia with signs of severity, search for any lesions prior to surgery, discrepancy between the severity of symptoms and the appearance on flexible laryngoscopy, and/or a typical symptoms (mostly aspirations).

Administering sedation/anaesthesia for rigid tracheobronchoscopy in such a patient has potential risk of airway catastrophe. We describe the anaesthetic management of an infant with laryngomalacia who was scheduled for rigid tracheobronchoscopy.

Case Report

A 17 days old child (2.75kgs) with congenital laryngomalacia was scheduled for rigid tracheobronchoscopy. At 30 hours of life, baby had respiratory distress and noisy breathing. He was treated for diagnosis of congenital pneumonia with ASD with polydactyly. On the 10th day he developed sudden bluish discolouration of the body associated with fever and 2-3 episodes of convulsions. Child had a history of recurrent lower respiratory tract infection which resolved with intravenous antibiotics and steroids. He was intubated in view of respiratory distress. His preferential sleep posture was supine with no associated noisy breathing. On auscultation he had no adventitious sounds when quiet but added sounds were heard when he cried. Chest radiograph revealed basal lobar congestion.

Echocardiography showed CHD with situs solitus levocardia with 4mm ASD and 2mm PDA with dilated RA/RV. All standard monitors were applied including electrocardiogram, pulse oximeter, blood pressure and end tidal CO_2. His vital signs were: heart rate of 140bpm: blood pressure of 90/60mm Hg, respiratory rate of 22cpm and saturation of 94% on 2l of oxygen. Paediatric difficult airway cart with all adjuvants and alternatives to laryngoscopy and supraglottic airway devices was kept ready. Plan A was to maintain spontaneous ventilation during anaesthesia and plan B or the backup plan was to intubate the trachea with 4mm or smaller endotracheal tube as tracheal stent using propofol (2-3mg/kg) and atracurium (0.5mg/kg) followed by controlled ventilation. The child was administered 0.1mg atropine, 0.5mg of midazolam, 2mg of atracurium and 10mg of ketamine intravenously. A top-up dose of ketamine 5mg was administered. Maintenance with sevoflurane was kept at 2%. Patient was extubated during rigid bronchoscopy and then again intubated with size 3mm ET tube and fixed at 9cm after confirmation of bilateral air entry. During rigid bronchoscopy we provided adequate analgesia and sedation without clinically significant hemodynamic or respiratory adverse effects (hypotension, bradycardia, apnea, cough, wheezing). The procedure lasted for one hour.

Discussion

To understand the anaesthetic implications associated with congenital laryngomalacia, it is worthwhile to consider its pathophysiology.[2] Some authors believe that supraglottic narrowing represents either the effects of ill coordinated respiration and abnormal airflow on the soft, pliable supraglottic structures or repetitive supraglottic contractions that ultimately results in supraglottic narrowing resulting in stridor during inspiration.[3,4] Because of dynamic nature of the problem and the hypothetical neuromuscular etiology, anaesthetic technique that maintains spontaneous ventilation needs to be used.[5]

Rigid bronchoscopic examination requires special attention because of the potential risk of impaired ventilation and the difficulty in the management of airway, which is naturally occupied both by the anaesthesiologist and the surgeon. The anaesthetic agents that provide spontaneous ventilation with reduced airway and circulatory reflex have been appropriate options during the brief procedure.[6] Administration of general anaesthesia in the presence of laryngomalacia carries certain risk, the greatest of which being exacerbation of airway reactivity. Infants are at risk of apnea in the postoperative period because of immature respiratory control and laryngomalacia and other underlying conditions. Laryngomalacia with pneumonia and apnoeic episodes increase the risk of mortality and morbidity.

We chose sevoflurane because of shorter induction and recovery profile. However, the induction with sevoflurane should not be rapid as laryngomalacia is unmasked.[7] We preferred administering ketamine instead of propofol to suppress the potential response against the noxious stimuli and also provide a sedation level maintaining spontaneous ventilation. We could not detect any adverse effect on respiratory rate, end-tidal CO_2,

values and cardiovascular function as the dose we used in these patients. Neuromuscular blockade was avoided till the airway was secured with ETT in view of the neuromuscular etiology of the disorder. It is essential to observe such patients for at least overnight in the ICU for signs of obstruction and provide humidified oxygen supplementation. Postoperative analgesia becomes an integral part of the anaesthetic plan since excessive crying post operatively and excessive sedation with opioids may lead to life threatening airway obstruction.

Careful preoperative history, examination, consultation with the paediatrician and communication with the surgeon are invaluable tools in the management of such cases. Sedative pre medication is preferably avoided. Induction should be done preferably with inhalational agents and spontaneous breathing should be maintained till airway is secured. The presence of associated airway lesions can be circumvented by flexible fiberoptic bronchoscope. Recognition of state dependant laryngomalacia also helps to avoid unnecessary reintubation post operatively.

Conclusion

In summary we noted that ketamine provided a reliable and effective method of sedating infants undergoing a rigid bronchoscopic examination in spontaneous ventilating conditions and noted no clinically significant haemodynamic or respiratory problems. When these patients do present, their care is likely to be complex and challenging. As such, a multidisciplinary approach should be adopted throughout their period of care.

Conflicts of interest: nil

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