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# Congenital Laryngomalacia and Anaesthetic Implications

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## ABSTRACT

**Background:** Congenital Laryngomalacia is the main cause of stridor in newborns and infants, affecting 45-75% of all the infants with congenital stridor. Short aryepiglottic folds, redundant arytenoid, omega-shaped epiglottis and inspiratory stridor worsened by feeding and crying are the hallmark presentation of laryngomalacia. It is generally associated with various anomalies. Anaesthetic management of such patients may be a difficult task due to potential collapse of airway leading to obstruction. We describe here anaesthetic challenges experienced during management of an eight-month old infant with atrial septal defect who was a diagnosed case of laryngomalacia scheduled for pyeloplasty. Proseal laryngeal mask airway proved to be a satisfactory alternative to endotracheal tube for securing the airway.

***Keywords:*** Laryngomalacia, airway obstruction, spontaneous ventilation, proseal laryngeal mask airway, atrial septal defect.

## INTRODUCTION

Laryngomalacia also known as floppy larynx syndrome is the most common cause of congenital stridor in infants.[1] The condition is caused due to weakness of supralaryngeal structures leading to their dynamic collapse into the airway during inspiration. Presentation of the disease occurs within first few weeks of life and is characterized by stridor which is worsened by sleeping, feeding and crying.[2] Most children with laryngomalacia have a benign disease course yet it carries a significant risk of morbidity. Commonly associated co-morbidities include; Gastroesophageal reflux disease (GERD), neurological diseases, secondary airway lesions and congenital heart diseases (CHD).[3]

## CASE REPORT

An eight-month old female infant weighing 7kg presented to hospital with Pelviureteric junction (PUJ) obstruction and was scheduled for pyeloplasty. The patient was a known case of congenital laryngomalacia with history of noisy breathing which increased during sleep, crying and occasionally during feeding. Initially, at one month of age, child had an episode of stridor for which she was treated with bronchodilators and fibreoptic bronchoscopy was planned. It revealed omega-shaped epiglottis, collapsed aryepiglottic folds, redundant arytenoids, mobile vocal cords with no additional secondary airway lesion. Child also had history suggestive of gastroesophageal reflux.

Routine workup to rule out other congenital anomalies revealed an ostium-secondum atrial septal defect (ASD) on echocardiography. On examination, child was active and had mild inspiratory stridor. Rest of the systemic examination was unremarkable. All hematological and biochemical investigations were within normal limits. Preoperative arterial blood gas analysis revealed; pH 7.44, PaO2 – 87 mm Hg, PaCO2 – 34 mm Hg and SO2 – 98% . The child was kept fasting as per standard guidelines. No premedication was given. Informed consent for anaesthesia was taken and parents were explained about the anticipated requirement of postoperative ventilation. An ENT surgeon was kept standby for emergency tracheostomy as a rescue plan.

In the operating room (OR), standard monitors including pulse oximeter, electrocardiograph (ECG), noninvasive blood pressure (NIBP), capnography and temperature probe were applied. Baseline parameters recorded. Child was induced with graded concentration of sevoflurane (2-6%) in 100% O2. Adequate anaesthetic depth was achieved using gentle assisted ventilation with modest amount of CPAP to prevent airway collapse. A 24G intra venous (IV) access was secured on left dorsum of hand and was ensured to be free of air bubble keeping ASD in mind. Aspiration prophylaxis and antisialogogue were administered. Fentanyl 15 microgram and dexamethasone 2 milligram were injected intravenously. Proseal laryngeal mask airway (PLMA) size 1.5 was decided to secure airway over endotracheal tube (ETT) to avoid any potential airway trauma/edema associated with it. Injection atracurium 1 milligram was then given IV. Patient was put on mechanical ventilation using PCV

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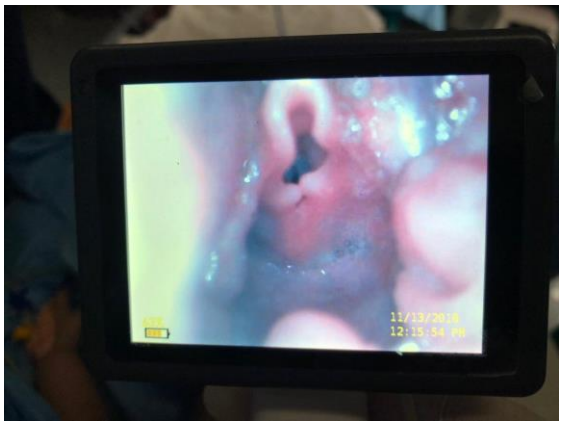
mode with inspiratory pressure 16 cm of H2O, RR – 18/min and PEEP 3 cm of H2O. Caudal block using 7 ml of 0.25% bupivacaine was administered for intra and postoperative analgesia. Child was placed in left lateral position with due care of pressure points. Anaesthesia was maintained in O2: N2O (40:60) and sevoflurane (2-2.5%) with intermittent doses of atracurium. Surgery lasted for 40 min with uneventful intraoperative course. IV fluid – ringer lactate (RL) and blood were replaced judiciously as per losses. At the end of surgery, neuromuscular blockade was reversed with injection glycopyrolate 0.07 mg and neostigmine 0.75 mg IV. PLMA was removed once the child was fully awake with adequate respiratory efforts and oxygen saturation. Patient was observed in OR for 30 min and later shifted to HDU for overnight observation. Postoperative period remained uneventful.



## DISCUSSION

Laryngomalacia is a congenital defect secondary to underdevelopment of central nervous system particularly the peripheral nerves and brainstem nuclei responsible for normal respiration. Exact etiology of laryngomalacia is still enigmatic.[3] Amongst various proposed theories, neurological theory is the most supported and accepted theory.[4] Symptoms subside as the infant grows secondary to maturation of the laryngeal muscles and nerves. That explains the benign nature of the disease. Laryngomalacia can be divided into mild, moderate and severe categories depending on the severity of obstructive symptoms. Children with mild disease usually present with inconsequential inspiratory stridor while those with a moderate disease experience stridor while feeding leading to cough, choking and regurgitation. Patient with severe disease require surgical intervention such as supraglottoplasty. Our patient presented with mild to moderate inspiratory stridor with occasional feeding associated symptoms. Stridor in laryngomalacia is high pitched in nature and is more so in supine position compared to prone. This difference is attributed to the dual effect of tongue and neck extension on the supraglottic structure.[5]

Airway management of these patients is challenging due to altered anatomy, odema and risk of total airway obstruction. Associated co-morbidities impose additional constrains to the anaesthesiologist. Reported incidence of GERD and CHD is 65-100% and 10% respectively.[3,6] Increase in intrathoracic pressure secondary to airway obstruction in such cases aggravates the symptoms. Our child presented with infrequent feeding problems, however a size 2 mm ASD was revealed on echocardiography.

Chief anaesthetic implication during induction of these children is to maintain spontaneous ventilation and to prevent airway collapse due to dynamic nature of obstruction.[7] Also, Induction may take longer due to compromised airway.[2] Spontaneous induction maintains some muscle tone and helps to maintain adequate gas exchange giving anaesthetist time.[2] We induced the child with graded concentration of sevoflurane using CPAP to maintain airway patency. However, the induction with inhalational agents should not be rapid in these patients as laryngomalacia is unmasked.[8] Additinally, excessive decrease in systemic vascular resistance in a patent with ASD may lead to hemodynamic compromise.

We preferred PLMA over ETT for securing the airway as used by Gupta A etal to prevent further airway instrumentation and edema. According to hagen-poiseuille's law, a small reduction in the radius of airway will cause a significant decrease in flow, making it turbulent which subsequently leads to increase in airway pressures.[2] Increased supraglottic edema results in obstructive symptoms due to further collapsing of these tissues into the airway. Additionally, use of PLMA would prevent coughing episodes at the time of extubation, which might lead to stridor in postoperative period. Use of PEEP during intraoperative period, ventilation acts to splint the airway open and allows better gas exchange. It also maintains pulmonary vascular resistance favourable for a patient with ASD.

## CONCLUSION

Laryngomalacia is the most common cause of stridor in infancy. Careful preoperative evaluation in consultation with pediatrician and surgeon is an invaluable tool in the management of such cases. Inhalational induction with spontaneous breathing is recommended till the airway is secured. PLMA may prove to be a better option than ETT as it decreases the incidence of post of possible perioperative complications and vigilant monitoring is essential for favourable outcome.

## REFERENCES

1. Ritcher GT and Thompson DM. The surgical management of laryngomalacia, Otolaryngologic clinics of North America 2008;41:837-846.

2. Oshan V and Robert WM. Anaesthesia for complex airway surgery in children. Continuing Education in Anaesthesia, Critical care and Pain 2013;13:47-51.
3. Landry AM and Thompson DM. Laryngomalacia disease presentation, spectrum and management. Internatinal Journal of Pediatrics 2012;2:526-532.
4. Thompson DM. Abnormal sensorimotor integrative function of the larynx in congenital laryngomalacia: a new theory of etiology. Laryngoscope 2007;117:1-33.
5. Nussbaum E and Maggi JC. Laryngomalacia in children. Chest 1990;98:942-944.
6. Thompson DM. Laryngomalacia: factors that influence disease severity and outcomes of management. Current opinion in Otolaryngology and Head and Neck surgery 2010;18:564-570.
7. Smith JL, Sweeney DM, Smallman B, Mortellitti AJ. State dependent laryngomalacia in sleeping children. Ann Otol Rhino Laryngol 2005;114:111-114.
8. Manikandan S, Sinha PK, Neema PK. Rapid sevoflurane induction unmasks laryngomalacia. Pediatr Anesth 2004;14:800-801.



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