Case Report

Anaesthetic Management of Airway Laser Surgery for Laryngomalacia

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Abstract

Laryngomalacia is a condition where there is intermittent resistance to airflow due to collapse of supraglottic structures. The Anaesthetic management during a Supraglottoplasty or Tracheostomy is quite challenging. Here, we present a case of laryngomalacia in an infant with stridor, managed with intermittent apnoea technique of ventilation for Laser Supraglottoplasty.

Key Words: Laryngomalacia, Supraglottoplasty, Anaesthesia

Introduction

Laryngomalacia accounts for 45-75% of congenital stridor. There is resistance to airflow intermittently due to the collapse of supraglottic structures. The symptoms depend upon the severity of the disease. Mild form of disease is associated with cough, regurgitation, emesis which is managed symptomatically and usually resolve by 2 years of age.[1] Severe forms of disease present earlier with stridor, respiratory distress and failure to thrive. This type of disease requires aggressive treatment in the form of Supraglottoplasty or tracheostomy, Anaesthetic management is a formidable challenge in this case in account of shared airway during surgery, risk of airway compromise and poor general condition of the patient. Paediatric airway management poses a unique set of challenges in special situations. The options need to be individualized and tailor made according to the patient profile, surgical conditions and available airway equipments. The anaesthetic plan has to be formulated with careful consideration in a resource limited setting.

Hence, a holistic approach with vigilant preoperative assessment and optimisation, a detailed airway management plan with back up options and a good rapport with the surgical team form the corner stone for successful management of airway surgeries. We present a case of laryngomalacia in an infant with stridor managed successfully with intermittent apnoea technique of ventilation for laser supraglottoplasty.

Case Report

A 4 month old female baby presented with complaints of noisy breathing and failure to thrive since birth. Baby was born at 40 weeks period of gestation by normal vaginal delivery, weighed 2.5kg at birth. There is history of admission to NICU in view of poor sucking and sepsis for 10 days. Baby was treated with IV antibiotics and discharged at day 10 of birth. She continued to have noisy breathing and poor feeding. She was brought to the casualty with complaints of increase in intensity of noise and increased respiratory rate. Baby failed to attain normal development milestones. There was absence of head control, grasp, social smile and failure to follow light. Mother gives history of occasional posturing and stiffening of limbs. Examination revealed a malnourished stunted baby weighing 4kgs with features of microcephaly, retrognathia, low set ears and low posterior hairline with widely spaced eyes. Pulse rate was 130/min regular, respiratory rate of 26/ min saturation 98% room air. Respiratory system examination showed visible retractions of suprasternal and sub costal region with audible stridor on inspiration which classically decreased in prone position. There was head lag, hypotonia in all four limbs and presence of Moro's reflex. Blood investigations like haematology, renal function tests, liver functions, and electrolytes were within normal limits. During the PICU admission baby had history of recurrent opisthotonus posturing and apnoea. MRI brain was done to rule out any central cause, however it showed no abnormality. Upper GI endoscopy showed significant reflux. Baby was managed symptomatically with oxygen therapy, Ryle's tube feeding, T. baclofen 1.25mg BD and syp lansoprazole 15mg OD. A direct laryngoscopy demonstrated an omega shaped epiglottis with overhanging aryepiglottic fold. A diagnosis of laryngomalacia was confirmed and patient was planned for a CO_2 laser excision of the epiglottis and aryepiglottic folds. Parental consent was taken for surgery and the risk of procedure and need for post op ventilation was explained.

Baby was kept fasting 4 hrs for milk and shifted to the operation theatre with an IV line secured. Baby was received in a pre warmed table and standard monitors were applied. Anticipating difficult airway small sized endotracheal tube (ET), tracheostomy tubes, resuscitation equipment were kept ready. Baby had a 24G intravenous cannula in situ, after preoxygenation with 100% oxygen Fentanyl 4mcg was given followed by induction with Thiopentone 20mg. After demonstrating adequate mask ventilation Atracurium 2 mg was given. Due to unavailability of small size laser tube, obstruction of operative field with a normal tube and risk of airway fire with continuous ventilation, an

alternative strategy for ventilation was necessary. Intermittent apnoea technique was used. Under visualisation using a direct laryngoscope, 4.0 inch PVC uncuffed tube was passed through the vocal cord. Tube placement was confirmed by auscultation and a capnography trace. Anaesthesia was maintained with sevoflurane 2% and 100% oxygen. After 3 minutes of ventilation and achieving a deep plane of anaesthesia, endotracheal tube (ET) was removed and the laser excision was initiated. When saturation dropped to 94% the surgeon was asked to stop the laser and the ET tube was reinserted and ventilation continued for 3 minutes with 100% oxygen. This cycle was repeated till the completion of surgery. Each time the tube placement was confirmed and the surgeon was informed 30 seconds before expected time for desaturation. The surgery lasted 70 minutes. A 4.0 uncuffed tube was used to secure the airway at the end of surgery and baby was electively ventilated for two days in view of possible airway edema and compromise. On postop day 2 baby was weaned from ventilator, extubated and put on CPAP at 3-5cm H_2O. There was no inspiratory stridor; saturation was maintained at 99%.

Discussion

Laryngomalacia is the most common cause of stridor in infancy. The characteristic stridor usually begins several weeks after birth and worsens till about 8 months of age. The most common coexisting condition is reflux disease however there are reported cases with neurologic disease, congenital syndromes and anomalies, and heart disease. Supraglottoplasty is amongst the common surgeries performed for severe laryngomalacia with stridor.[2] This procedure has a high success rate in healthy children. However associated conditions have the potential to worsen the surgical outcomes, necessitating their recognition and timely treatment when possible[1].

Supraglottoplasty necessitates an obstructed airway, clear view of the structures and use of laser for excision. This requires a well charted airway management plan considering a shared airway by the surgeon and anaesthesiologist and risk of airway fire and trauma. The options for ventilation include spontaneous ventilation, intermittent positive pressure ventilation, apnoeic ventilation and jet ventilation.[3] The appropriate strategy needs to be implemented based on the resources, facilities and the requirement of the surgeon. A small size laser tube with controlled ventilation would have been the ideal option in the present case. This technique has the advantage of minimum hypoxemia considering the low functional reserve in infants. However due to unavailability of appropriate size laser tube intermittent apnoea technique with controlled ventilation was used in this case. Studies have shown that with apnoeic oxygenation in children mean SpO_2 was maintained at up to 5 minutes in majority of patients and this technique can safely be used up to 10 minutes in children. However in our case we had episodes of desaturation at 3.5 to 4 minutes, hence the apnoeic period was restricted to 3 minutes for safety. This can be attributed to poor general condition of our patient with a compromised pulmonary reserve, the baby was continuously monitored with SPO_2 at all times and any fall in saturation was treated with immediate ventilation with 100% oxygen. Infant studies have shown hypoxemia as a good safety indicator during apnoeic technique.[4] In our case after first few cycles we were able to predict approximate time to desaturation and based on that we were in communication with the surgeon to insert the endotracheal tube and ventilate appropriately. This demonstrates the coordination and timely communication which is important especially in apnoeic ventilation.

Anaesthesia in this case was maintained with sevoflurane and ventilation was controlled. Reports comparing controlled and spontaneous ventilation for airway surgeries have been equivocal and the technique followed is based on the experience and practice of the consulting anaesthesiologist. Controlled ventilation has been shown to have lower incidence of laryngospam[5], however the risk of loss of airway control and unable to ventilate situation with use of muscle relaxant need to be considered and back up airway plan must be kept ready while using this technique. Sevoflurane offers more stable hemodynamics and faster recovery times when compared with TIVA with propofol and remifentanil. However sevoflurane also has an additional advantage of relaxing the jaw thereby aiding placement of rigid laryngoscope[6].

Conclusion

Anaesthetic management of laryngomalacia requires a meticulous preoperative assessment in addition to a well formulated airway management strategy. A close communication with the surgeon with careful planning of the operative steps and time is vital. In absence of ideal airway equipments, knowledge of various options available for airway control and utilising the most feasible and safe option is critical.

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