Case Report

Keyhole anesthesia–Perioperative management of subglottic stenosis: A case report

ABSTRACT

Any narrowing in the airway presents as obstruction and with features of noisy breathing. The presence of subglottic stenosis poses a great challenge to the anesthesiologist. Diagnostic and corrective procedures by Otolaryngologist require rigid endoscopy which demands apneic ventilation. Hence, the goal of general anesthesia in the presence of subglottic stenosis requires a patent airway to maintain oxygenation and ventilation and avoid hypoxia. We present an interesting case of a preterm neonate with subglottic stenosis who was managed successfully with endoscopic release.

Key words: Apneic ventilation; rigid endoscopy; subglottic stenosis

Introduction

Subglottic is the narrowest nonexpandable and nonpliable part of airway which extends from below the true vocal cords to lower surface of the cricoid cartilage.[1] The incidence of subglottic stenosis in neonates is less than 2%.[2] Neonatal subglottic stenosis (SGS) can be either congenital or acquired. Congenital stenosis usually requires a conservative approach, but if severe and symptomatic it needs an intervention. We present an interesting case of a preterm neonate with SGS who was managed successfully with endoscopic release.

Informed and written consent obtained from parents.

Case Report

A preterm neonate born at 33^{+} 4 week, because of respiratory distress was intubated and kept on mechanical ventilation, immediately after birth. There was a history of difficult intubation with multiple attempts with smaller size endotracheal tube. Neonate had difficulty weaning. Post extubation, neonate had noisy breathing and was referred to a higher center for bronchoscopic assessment with suspicion of congenital SGS. A flexible bronchoscopic assessment under sedation revealed SGS through which the bronchoscope could not be negotiated. A formal plan for bronchoscopic assessment with plasma ablation release was planned under general anesthesia.

At the time of presentation, neonate was 38 completed weeks, weight 2.2 kg, baseline investigations and echocardiography were all within normal limits. Preanesthetic assessment a day before surgery suggested no significant abnormality, no history of cyanosis, seizures, or failure to thrive. Anesthesia plan was to keep the newborn on spontaneous ventilation using incremental dose of inhalational agent.

Access this article online	
Website: www.saudija.org	Quick Response Code
DOI: 10.4103/sja.SJA_694_19	

How to cite this article: Jafra A, Virk R, Mittal G, Arora K, Arora S. Keyhole anesthesia—Perioperative management of subglottic stenosis: A case report. Saudi J Anaesth 2020;14:403-5.

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Submitted: 31-Oct-2019, **Revised:** 21-Nov-2019, **Accepted:** 24-Dec-2019, **Publication:** 30-May-2020

Informed and written consent was obtained from parents, along with consent for tracheostomy. The surgical plan was to do a bronchoscopic assessment and proceed. Hence, it was decided to induce the neonate and hand over to surgeon in the apneic stage. Premedication included injection glycopyrrolate 10 μg/kg, injection hydrocortisone 2 mg/kg, and injection dexamethasone 0.1 mg/kg; with American Society of Anaesthesiologists standard monitoring. Nasal prongs with 3 L/min of 100% oxygen were applied to the neonate before induction of anesthesia and preoxygenation was done using 100% oxygen. Neonate was induced with incremental doses of sevoflurane in 100% oxygen, maintaining spontaneous ventilation. Gentle bag-mask ventilation was done to assist breathing and once deep enough, miller blade size 1 was inserted and used as guide for zero-degree 4 mm endoscope. After negotiating the vocal cords, the subglottic area was visualized revealing a grade III Cotton and Meyer subglottic stenosis [Figure 1].[3] Anesthesia was maintained using bolus dose of injection propofol 0.5 mg/kg. Bag and mask ventilation with 100% oxygen with sevoflurane was resumed. Since we were able to ventilate the neonate, injection succinylcholine was administered for motionless field for plasma ablation of the stenotic segment. Plasma ablation release was done with serial bougie dilatation. Post procedure, the endoscope was easily negotiated below the level of stenosis to visualize the trachea [Figure 2]. During the procedure, 100% oxygen was given using nasal cannula (apneic oxygenation). The procedure lasted less than 5 min without the need for bag-mask ventilation and there were no desaturations in between. Assisted bag-mask ventilation with 100% oxygen was resumed and once active newborn was shifted to post anesthesia care unit.

Discussion

Subglottic stenosis is the 2nd most common cause of stridor in infants with the incidence of congenital stenosis ranging from 5% in children and less than 1% if very low birth weight neonates are excluded.[4,5]

To classify the extent of luminal obstruction in subglottic stenosis, the most followed grading system is by Meyer and cotton. Grade 1: 0–50% luminal obstruction, grade 2: 51%–70% luminal obstruction, grade 3: 71%–99% luminal obstruction, and grade 4: 100% obstruction of lumen.[3]

In a full-term and preterm neonate, the diameter of the normal subglottic lumen is 4.5–5.5 mm and 3.5 mm, respectively. Any values below 4 mm in full-term and 3 mm in a preterm neonate is considered as narrowing and labeled as subglottic stenosis.[4]

In case of congenital subglottic stenosis, antenatal diagnosis is difficult and the presentation can range from respiratory distress at birth to recurrent or persistent croup in children below 6 months of age. Pediatric patients can present with suprasternal or subglottic retractions, dyspnea, tachypnea, stridor, and respiratory distress. Subglottic stenosis could be a part of a wider range of malformations in the form of syndromes or associated with other pathologies, like vertebral defects, anal atresia, cardiac defects, trachea-esophageal fistula, renal and limb anomalies (VACTERAL), downs syndrome, duodenal or esophageal atresia, and Fraser syndrome.[6-8]

Such cases require meticulous planning for anesthesia as well as surgery. Spontaneous ventilation was preferred because of the unknown status of grading of stenosis and maintenance of ventilation. During the procedure, neonate was handed over to surgeon in apneic phase. To increase safe apnea time, 100% oxygen was provided with a nasal cannula. Maximizing the duration of safe apnea for pediatric patients is vital during airway interventions to provide sufficient time to secure the airway and perform airway procedures without a critical drop in

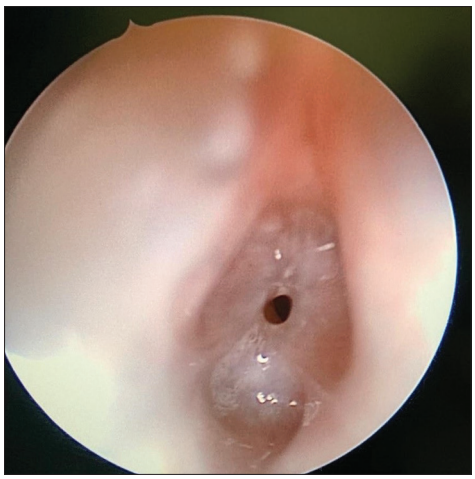

Figure 1: Subglottic stenosis; Meyer cotton grade III

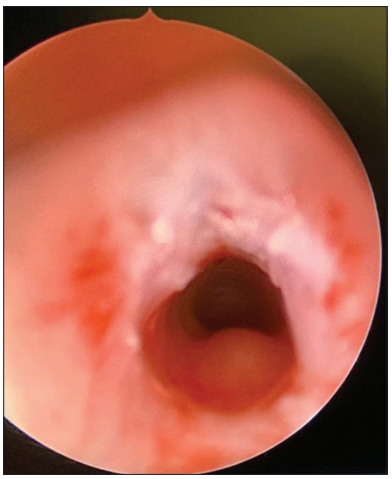

Figure 2: Subglottic view; after coblation and serial dilatation

oxygen saturation.[9] Factors contributing to the critical changes in duration of safe apnea time in pediatric patients are the effect of the physiological differences, including lower functional residual capacity and increased oxygen consumption rate.[10]

Setting up of laryngoscopes with suspension and other attachments requires more time, and hence increased duration of the apneic period. This leads to more desaturations; hence, we used Millers blade as an aid for rigid endoscopy. This technique has been studied by one of the authors.[11] This report highlights the role of paraoxygenation, and use of Millers blade as an aid, to increase safe apnea time in children undergoing procedures in apneic ventilation.

To conclude, meticulous planning and coherence is required when dealing with neonates for subglottic stenosis. There should be good communication between the anesthetist and the otolaryngologist as there is airway sharing, for better outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate guardian consent forms. In the form, the guardians have given their consent the patient images and other clinical information to be reported in the journal. The guardians understand that patient name and initial will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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