

## Airway Management of Severe Subglottic Stenosis with a Novel Airway Device

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### ARTICLE INFO

#### Article history:

Received 09 July 2019

Revised 1 August 2019

Accepted 14 August 2019

#### Keywords:

Airway management;

Subglottic stenosis;

Suction catheter;

### ABSTRACT

Airway management becomes a challenging task in subglottic stenosis due to noncompliant stricture. Location and extent of stricture also pose difficulty in securing front of neck access. management with use of available resources provides immediate lifesaving solution for anticipated or unanticipated life threatening conditions especially causing airway compromise.

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Subglottic stenosis (SS) is the leading cause of stridor in pediatric age group. It involves narrowing of subglottic lumen due to incomplete recanalization during embryogenesis (congenital) or after trauma (post intubation). Stridor is the important symptom of SS and usually present in both phases of respiration. Airway management becomes a challenging task to the anesthesiologist in SS due to difficulty in maneuvering endotracheal tube (ETT) through the noncompliant stricture. Location and extent of stricture also pose difficulty in securing front of neck access [1].

After taking consent of the child's parent for possible publication in a medical journal, we present a case of subglottic stenosis posted for emergency tracheostomy and ventilated with a novel airway device prepared by simple equipments present in operation theatre.

### Case Report

A one-year-old baby of 11 kg presented to the emergency with chief complaint of noisy breathing developed after upper respiratory tract infection (URTI), fever and cough since 2 days. Child's stridor started since birth that was progressive in severity and frequency, aggravated by recurrent URTI.

At the time of admission, child was in severe respiratory distress with intercostals and suprasternal retraction. Nasal flaring was present with weak cry.

Bilateral air entry was decreased with harsh bronchial sounds on auscultation. Hemodynamically child was unstable with heart rate 200 per minute, blood pressure 60/36 mmHg, respiratory rate 44 per minute, axillary temperature 38.5 degree Celsius and SpO<sub>2</sub> 62% at room air and 88% with Oxygen given by facemask and reservoir at 10 liters per minute. ABG showed pH 7.32, PO<sub>2</sub> 52 mm Hg, PCO<sub>2</sub> 68 mm Hg, HCO<sub>3</sub> 20.2 meq/l and Hb 10.6 mg/dl. Emergency CECT was done which showed the subglottic stenosis of 2.6 mm in length and 2.0 mm of patent airway in diameter at the narrowest point [Figure 1].

Securing the airway was planned with endotracheal intubation followed by surgical tracheostomy and definite correction. Tracheostomy could be done under sedation in a spontaneously breathing child with the aid of facemask or supraglottic airway device. However, an unsuccessful attempt in tracheostomy could completely obstruct the airway and patient may suffer hypoxia.

ETT of 2.0 mm ID was not available that day so we decided to make a novel device in place of ETT. We developed a novel airway device by using 6F suction catheter (SC), 18 G intravenous needle catheter, 3.5 mm ID Endotracheal tube connector and guide wire of 10 F Foleys catheter. We cut the connecting end of SC to resize it equivalent to the length of 2.5mm ID ETT and marking the SC with marker at 6 to 10 cm, 1 cm apart. Foleys guide wire was inserted in the SC and whole

The authors declare no conflicts of interest.

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assembly was curved like ETT [Figure 2]. The outer diameter (OD) of 6 Fr SC is around 2 mm which justified its use in place of 2 mm ID ETT.

**Figure 1- CT and endoscopy showing subglottic tracheal stenosis**



**Figure 2- Novel Airway device made with 6 Fr Suction Catheter**



Emergency airway trolley was kept ready with emergency drugs. Child was preoxygenated with 100% oxygen at 5 liter per minute using facemask size 1 and Guedel airway number 1 with Jackson Rees circuit for 3 minutes. When SpO<sub>2</sub> improved to 98% intravenous Glycopyrrolate 40 microgram, intravenous ketamine 10

mg and sevoflurane 5% w/v given in 100 % oxygen to achieve intubating condition.

Laryngoscopy using miller blade number 1 was done and intubation with 2.5 mm ID ETT was tried gently, but ETT after crossing the vocal cord failed to pass through the stricture. Second attempt made for intubation was successful with our device (6 Fr SC) using Foleys guide wire as stylet with slight maneuver. Stylet was removed and SC connected to 18 G intravenous canula, 3.5 mm ETT connector and finally to Jackson Rees circuit. After confirming correct placement of assembly with bilateral air entry and capnography, device was secured and fixed at 8cm.

Surgical tracheostomy was done and 4 mm ID tracheostomy tube was inserted after confirming the trachea by visualization and withdrawing of the device (SC) just up to the tracheostomy site. Ventilation through the tracheostomy was uneventful so the assembly was removed and patient was maintained on spontaneous respiration with oxygen, sevoflurane and nitrous oxide. Patient shifted to intensive care unit after doing a diagnostic endoscopy that showed circumferential narrowing below the vocal cord.

## Discussion

Subglottic stenosis presenting as stridor becomes a challenging task for anesthesiologist to maintain the airway. There are two types of congenital subglottic stenosis namely, membranous and cartilaginous. Membranous is circumferential, soft and dilatable while cartilaginous has more variable appearance. Post intubation or tracheostomy strictures also have abnormal shape giving an irregular patent lumen in trachea.

Temporary airway can be maintained before gaining a more secure surgical airway by facemask with inhalational agents [2]. However, this may lead to loss of airway at any point of time and may obstruct the operating field. Supraglottic airway devices are better option over facemask to maintain airway during tracheostomy in patients with SS [3]. Nevertheless, full stomach, bleeding through the stricture during tracheostomy and greater depth of anesthesia requirement are some of the hindrances to their use. We had Ambu AuraOnce™ disposable laryngeal mask airway (LMA) size 1.5 ready to maintain the airway during tracheostomy if second attempt to laryngoscopy would have failed

Kerai S et al in a case of congenital trachea esophageal fistula with subglottic stenosis in a preterm male neonate presented one such case. They used a 6 Fr feeding tube cut to the length of 2.0mm ETT. Their assembly pass through the vocal cords but not through the stenosis, as they did not use a stylet [4]. Shamsbery C etal made a similar assembly to successfully manage airway in an asymptomatic case of SS in a neonate [5]. 6 Fr Infant

feeding tube was used to make the airway which has a low risk of causing trauma while passing through the stricture but has more chances of blockage with secretions or blood clots during operation.

Timely management with use of available resources provides immediate life saving solution for anticipated or unanticipated life threatening conditions especially causing airway compromise.

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