Indian Journal of Clinical Anaesthesia 2021;8(1):125–128

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical Anaesthesia

Journal homepage: www.ijca.in

Case Report

Asymptomatic tracheal stenosis in a child: An anaesthesiologist's plight

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ARTICLE INFO

Article history:
Received 24-08-2020
Accepted 05-10-2020
Available online 15-03-2021

Keywords:
Anaesthesia
Paediatric
Tracheal stenosis

ABSTRACT

Tracheal stenosis is a rare occurrence but maybe life threatening. Severity of this condition varies with the length of the affected trachea and the degree of luminal narrowing. Asymptomatic cases present with the highest risk as they may be diagnosed for the first time at the time of intubation. Proper history taking with a special note of any previous hospitalization or intubation, clinical examination and radiological investigations may help us prevent complications that may arise from this condition. A case of incidental finding of tracheal stenosis leading to inability to intubate in a paediatric patient posted for pyeloplasty is reported here.

1. Introduction

Tracheal stenosis signifies a functional impairment that is rarely encountered but is a possibly fatal condition.[1] Etiology of tracheal stenosis can range from congenital defects such as tracheal webs or tracheomalacia, post-intubation injury, trauma, intraluminal tracheal tumor to compression by extraluminal tracheal tumor.[2,3] Subglottic stenosis is considered the third leading cause of congenital stridors in neonates.[4] Most of these cases are self-limited, but some may need intervention that requires a multi-disciplinary approach.[4] Tracheal stenosis may present with symptoms such as dyspnoea, cough, stridor, wheezing or limited exercise tolerance though majority may remain asymptomatic and are diagnosed for first time at the time of endotracheal intubation with possible untoward consequences.[3] We are reporting one such case of asymptomatic tracheal stenosis which resulted in failure of intubation.

2. Case Report

Eight year old male child weighing 20 kg with right PUJ obstruction was posted for right pyeloplasty. On pre-anaesthetic check-up there were no active complaints. Parents gave history of repeated ICU admissions for respiratory infections in neonatal as well as infancy period. General examination revealed pulse rate of 98 beats per minute, blood pressure 110/68 mmHg, respiratory rate of 22 per minute and oxygen saturation of 100% on room air. On examination of the respiratory system there was equal air entry bilaterally in all zones with no added sounds. Cardiovascular assessment showed presence of normal heart sounds without any murmur. Laboratory investigations were within normal limits. On the day of surgery, child was shifted to operation theatre and routine monitors were attached. Patient was premedicated with Inj. Glycopyrrolate (0.1 mg), Inj. Midazolam (0.5mg) and Inj. Fentanyl (40mcg). Patient was induced on Inj. Propofol (40mg). After confirming adequate mask ventilation; Inj. Succinylcholine (40mg) was administered and direct laryngoscopy was done. Vocal cords were visualized (Cormack- Lehane grade 1) and an uncuffed ET tube no. 5.5 was easily passed between the cords but it could not be negotiated through

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https://doi.org/10.18231/j.ijca.2021.024

the subglottic region. Further attempts were made with uncuffed ETT no. 5 and 4.5 but both could not be passed through subglottic area. The procedure was abandoned and patient was awakened. On awakening he had severe bouts of cough. Inj. Hydrocortisone (40mg) and Inj. Dexamethasone (2 mg) were administered. Patient was nebulised with duolin (combination of ipratropium bromide + levosalbutamol sulphate) and budesonide, then with stable vitals shifted to post-operative room for observation.

Later, radiological investigations were done for assessment of the airway wherein the chest radiograph revealed deviation of trachea to the right as well as narrowing of right main bronchus.

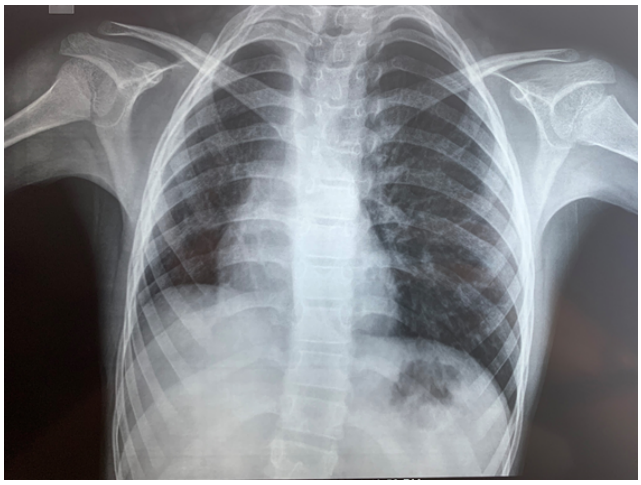

Fig. 1: Chest radiograph PA view

The echocardiography showed a normal ejection fraction with dextroversion secondary to mediastinal shift.

HRCT chest and virtual bronchoscopy was done which showed mild diffuse narrowing of intrathoracic trachea with right pulmonary hypoplasia and visualization of only lower lobe of segmental bronchus. There was shift of heart and mediastinum to the right side.

This was followed by flexible bronchoscopy where the upper respiratory tract and vocal cords were normal with tracheal narrowing causing 60-70% of luminal narrowing below vocal cords. Patient was referred to higher centre for further management.

3. Discussion

Congenital tracheal stenosis is a rare condition characterised by reduction in tracheal diameter of more than 50%.[5] It is commonly diagnosed in infancy with signs such as stridor, wheezing and various degrees of respiratory distress, though the cases may remain asymptomatic for longer.[3] These asymptomatic cases of tracheal stenosis could incidentally be diagnosed during intubation leading to an airway emergency. Moreover, multiple attempts taken

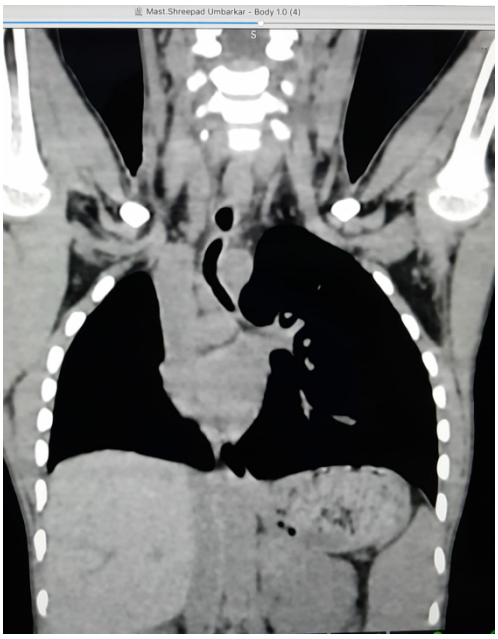

Fig. 2: HRCT showing narrowing in the air column.

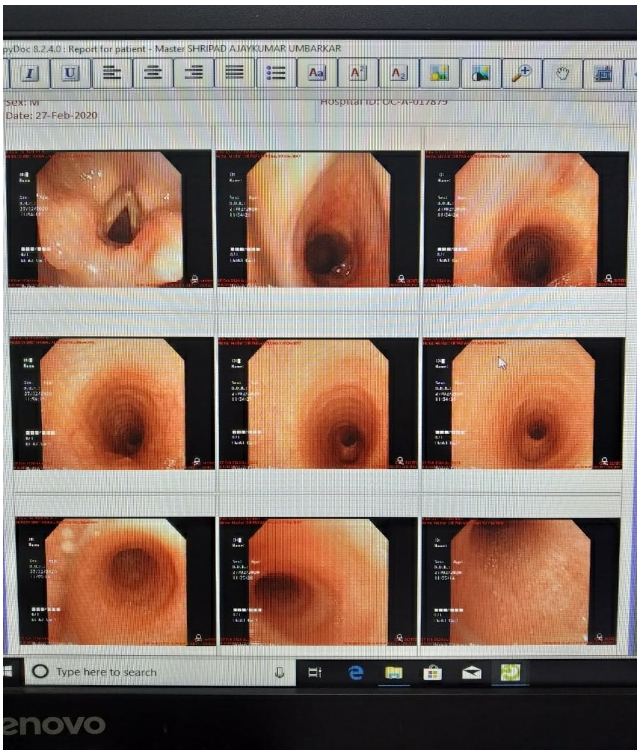

Fig. 3: Images from flexible bronchoscopy

at intubation through a narrowed trachea may cause tracheal mucosal oedema and worsening of the airway narrowing.[3]

Cardiopulmonary abnormalities such as pulmonary artery sling, cardiac defects, and lung hypoplasia or agenesis are commonly seen to be associated with this condition. Non-cardiac conditions like tracheo-oesophageal fistula, trisomy 21, VATER syndrome and others may also be seen.[5]

According to the Cantrell classification, there are 3 types of complete tracheal rings—generalized hypoplasia of the trachea (32% of cases), funnel type stenosis (50%), or segmental stenosis involving short (2-3 rings) or long segments (36%).[6]

The severity of symptoms depends on the length and degree of the stenosed region.[5] While it requires almost 50% of the lumen to be stenosed for symptoms to appear, at 75% narrowing dyspnoea will be present even at rest.[5]

Assessment of the severity of tracheal stenosis may help us with proper planning and preparation of airway management. A confirmatory diagnosis of tracheal stenosis requires multiple physical and radiological investigations. Various radiological imaging methods can be used for this. While chest radiographs maybe of limited use, computerized tomography scans are much more useful.[1] Sagital CT images along the airway provide significant information regarding the severity, location, and shape of the airway narrowing and the structures surrounding the airway.[1] A CT with 3-dimensional reconstruction or a cardiac magnetic resonance imaging may be considered to rule out any associated vascular anomalies.[5] Fibreoptic bronchoscopy can be used to measure the length and cross-sectional area of the stenotic lesions.[5] Spirometry maybe potentially useful in functionally characterizing tracheal collapsibility and for detecting the risk of critical airway collapse after induction of anaesthesia.[1]

Diverse set of airway management techniques have been reported for adult congenital tracheal stenosis cases in an emergency. For example, shallow intubation where ETT is stationed proximal to the tracheal narrowing, utilization of a thin tube without cuff, laryngeal mask, supraglottic airways, cardiopulmonary bypass or extracorporeal membrane oxygenation.[2,3] A custom-made tracheostomy tube to stent the entire trachea is a viable option.[7] Utmost care is also required in selecting the optimal site and tubing for tracheostomy.[3] Surgical intervention such as slide tracheoplasty remains the definitive treatment for this condition.[5]

Apart from the degree of tracheal stenosis, position of stenosis is important as well. In case of upper tracheal stenosis, a endotracheal tube can be inserted below the stenosis under local anaesthesia or cervical nerve block; for mild mid-level tracheal stenosis, a small tracheal tube can be inserted past the stenosis with the help of fibreoptic scope.[2] For the most severely obstructed patients with critical tracheal stenosis who are at risk for complete respiratory failure at any time, conventional anaesthetic technique would be catastrophic if attempts are made to insert a small tube which may completely obstruct the airway.[2]

In a number of patients, where the anatomy of the stenosis is such that they can only be ventilated when breathing spontaneously and if in these patients the tracheal stenosis is to be surgically repaired, cardiopulmonary bypass can be considered.[2] Extracorporeal circulation by the femoral artery and femoral vein cannulation is an effective method of gas exchange even if the trachea is totally obstructed.[2]

In our case as the child did not present with any respiratory symptoms and had stable vital parameters; preoperative extensive radiological investigations for airway examination were not considered and hence we faced difficulty at the time of intubation. Had a difficult airway been anticipated in our case, laryngeal mask could have been considered as an acceptable alternative to endotracheal intubation. Since multiple attempts were made at intubation, we did not continue the surgery using LMA for the fear of airway oedema leading to airway obstruction. However, the knowledge and information related to undiagnosed tracheal stenosis is limited to isolated case reports and thus, there are still no established airway management techniques for such situations. The case presents the importance of keeping a high index of suspicion for difficult airway in patients who give history of repeated respiratory infections and being prepared to handle such situations.

4. Conclusion

Asymptomatic tracheal stenosis may lead to potentially lethal airway emergencies and is a great threat to anaesthesiologists. Proper history taking including that of previous intubations, clinical examination and radiological examination should be done preoperatively to diagnose the stenosis and its extent to avoid intraoperative untoward consequences.

5. Source of Funding

None.

6. Conflict of Interest

The authors declare that there is no conflict of interest.

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Cite this article: Loya SJ, Bohra PR, Bhale PV, Kulkarni SJ, Kelkar V. Asymptomatic tracheal stenosis in a child: An anaesthesiologist's plight. *Indian J Clin Anaesth* 2021;8(1):125-128.