Case Report

Tracheal bronchus: A rare unforeseen anaesthetic challenge

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ABSTRACT

The most common congenital central airway anomaly, a tracheal bronchus is of concern during airway management especially if previously undetected. If present, it can lead to inadequate ventilation both during intubation with a normal endotracheal tube and an attempted double lumen tube insertion for one lung ventilation. Meticulous preoperative assessment and use of adjuncts like bronchoscopy before lung isolation can safely and successfully assist the anaesthetic management of such cases.

Key words: Endotracheal tube, one lung ventilation, tracheal bronchus

INTRODUCTION

Tracheal bronchus, a rare anatomical variant of an accessory bronchus occurring due to abnormal embryogenesis more commonly on the right side, supplies a part or the entire right upper lobe.[1] Commonly asymptomatic, a tracheal bronchus is of significance to the anaesthesiologist. We describe the anaesthetic management of a patient with an incidental chest X-ray finding of tracheal bronchus and enumerate the challenges of administering general anaesthesia and managing one-lung ventilation in such patients.

CASE REPORT

A 4 year old, 16 kg, 105 cm female patient presented with swelling on the left side of the neck since 3 years, progressively increasing in size. There was no history of fever, cough, loss of weight or appetite. She did not complain of difficulty or pain on swallowing, voice change or difficulty in breathing. Neuropsychomotor development was normal.

There was no significant past or family history. Her heart rate was 98/min, blood pressure 82/50 mmHg and mallampati grading (MPG) II. ENT and systemic examination were normal. The American Society of Anesthesiologists physical status was I.

The left-sided neck swelling measured 5 cm × 4 cm. It was soft, cystic, mobile, non-tender and non-pulsatile. There was no bruit or lymphadenopathy. The left carotid artery was palpable. There was no airway compromise or intrathoracic extension clinically. No other swellings were seen elsewhere.

Complete blood count was normal. Chest X-ray showed no intrathoracic extension but revealed the presence of a tracheal bronchus arising about one cm above the carina [Figure 1]. Ultrasonography neck suggested a lymphangioma.

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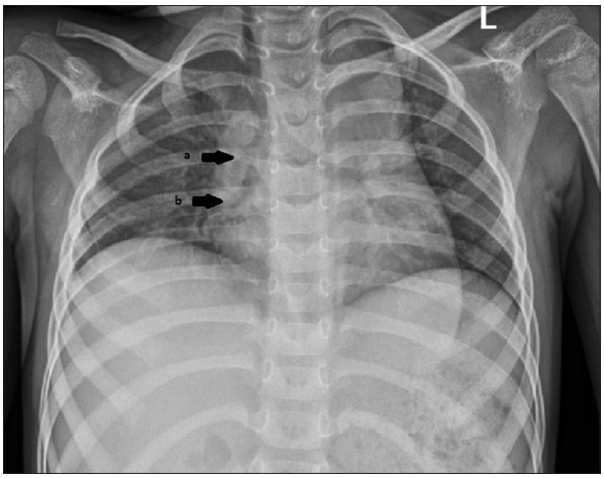

Figure 1: Chest xray showing type II tracheal bronchus indicated by arrow a and the right upper lobe bronchus by arrow b

After a written, informed anaesthetic consent from the parents and following preoperative fasting guidelines, the patient was premedicated with syrup Triclofos. In the operating room intravenous (IV) access (22G, Vasofix, BBraun) was secured on the right hand. Pulse oximetry, non invasive blood pressure, three lead electrocardiogram, temperature and anaesthetic agent analyser monitoring were used. Injection fentanyl 2 μg/kg, sevoflurane with air and oxygen 70%were used for induction. With assisted ventilation, injection Atracurium 0.5 mg/kg IV was given. The trachea was intubated with a 5.0 mm internal diameter uncuffed endotracheal tube (ETT) fixed at 14 cm at the lip. Bilateral breath sounds were confirmed.

Fibre optic bronchoscopy done after intubation confirmed a tracheal bronchus in close proximity to the carina. The tip of the ETT was neither in the tracheal bronchus nor obstructing it.

Anaesthesia was maintained with oxygen (60%), nitrous oxide and isoflurane with GE Systems, Aespire™ workstation. Incremental doses of morphine up to 0.1 mg/kg and paracetamol suppositories provided analgesia. Breath sounds were monitored intraoperatively. The cyst extending from level II to V was separated from the surrounding structures and excised. After an uneventful intraoperative period, residual neuromuscular blockade was reversed, and the trachea was extubated when the child was awake. Post-operative chest X-ray did not reveal atelectasis.

DISCUSSION

Sandifort in 1785 described an anomaly wherein the right upper lobe bronchus originated from the trachea and termed it as a tracheal bronchus.[2] Recent literature defines it as one originating from the trachea, usually within 2 cm, and up to 6 cm from the carina.[3] A variant, the pig bronchus has the entire upper lobe displaced on the trachea.[4] Right upper lobe bronchial anomalies are seven times more common than left-sided ones,[2] with a prevalence of 0.1–2% on bronchographic examinations.[1]

Tracheal bronchus are classified as displaced and supernumerary, the displaced variant being more common.[1] Anomalous bronchi are usually asymptomatic, hence picked up as incidental radiological findings.[5] Occasionally, they present with recurrent respiratory infections including pneumonia and bronchiectasis, haemoptysis, cough, stridor and acute respiratory distress.[3,5]

The initial radiological investigation, usually a chest X-ray shows a bronchus directly arising from the tracheal wall more commonly on the right side as was seen in our case [Figure 1].[6] To depict exact anatomy, computed tomography is the imaging modality of choice.[6] Bronchoscopy and tracheo bronchography have been used for a definitive view.[7] We performed a diagnostic fibre optic bronchoscopy post-intubation instead of a CT chest preoperatively owing to the cost factor and the clarity of the tracheal bronchus on chest X-ray.

Based on origin, there are three types of tracheal bronchus of significance to the anaesthesiolgist. Type I has the carina arising at mid tracheal level, manifesting most severely among the three, usually in childhood with a wheeze or stridor, misdiagnosed and managed as asthma.[7] There may be associated congenital anomalies including cyanotic heart disease.[8] A type II tracheal bronchus arises about 1 cm above the carina. Carinal trifurcation or type III arises from the carina [Figure 2].[7]

Intubating a type I anomaly will obstruct ventilation to the rest of the lung causing hypoxia while intubating the true trachea will bypass the upper lobe causing atelectasis.[9,10] The usage of short tubes to prevent ETT entry into the tracheal bronchus and fibre optic confirmation of the position of the tip of the ETT post-intubation are recommendations for non-thoracic surgeries.[10,11]

Using a standard length ETT in a type II anomaly can cause a hypoxic shunt by obstructing the tracheal

Figure 2: A schematic overview of types of tracheal bronchus of importance to the anaesthesiologist

bronchus since such offsets have been reported to be situated as much as 6 cm from the carina.[3,7] If desaturation occurs following intubation in such anomalies, the ETT should be carefully withdrawn, monitoring for improvement in oxygen saturation while auscultating the apical zone of the lung.[7]

Both type II and III anomalies pose problems during one-lung ventilation, especially of the right side.[7] For right lung isolation, the opening for the right upper lobe on a right-sided double lumen tube does not correspond with the tracheal bronchus; hence, a left double lumen tube should be used. A bronchial blocker in the right main bronchus and a Fogarty catheter in the tracheal bronchus can also be considered for right lung isolation. For left lung isolation, a bronchial blocker or a left double lumen tube can be used.[12]

Yoshimura *et al*. reported multiple unsuccessful attempts at positioning a left-sided double lumen tube to achieve right lung isolation in a previously undetected tracheal bronchus with an apically retracted left main bronchus. They managed the case with two lung ventilation using small tidal volumes and retrospectively suggested using a selective bronchial blocker or a single-lumen ETT in the left main bronchus for such patients.[13] Apart from the planned surgical procedure, the exact location of a tracheal bronchus and the presence of intralobar micro airway communications are important to achieve successful lung isolation.[14]

Although not practiced routinely, bronchoscopy before insertion of any lung separator can prevent inadvertent accidents in patients with undetected anomalies.[7] Failure to identify the origin of the right upper lobe bronchus about 1–3 cm distal to the carina on bronchoscopy should alert the anaesthesiologist to the possibility of a tracheal bronchus.[15] Bronchoscopy can also confirm the position of the tracheal bronchus in relation to the ETT cuff.

In conclusion, recognition of a tracheal bronchus before anaesthesia can guide airway management. Although rare, preoperative chest radiographs should be observed carefully for the presence of a tracheal bronchus. The differential diagnosis of desaturation occurring post-intubation should include an undiagnosed tracheal bronchus. Furthermore, bronchoscopy before lung isolation can detect anatomical variants and guide the use of a suitable lung separator.

Declaration of patient consent

The authors certify that they have obtained all appropriate parent consent forms. In the form the parent(s) has/have given his/her/their consent for his/her/their child's images and other clinical information to be reported in the journal. The parent(s) understand that their child's names and initials will not be published and due efforts will be made to conceal their child's identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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