

# Tracheal bronchus and pulmonary, hepatic and renal vascular congenital abnormalities – a case report

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Tracheal bronchus, also referred to as bronchus suis or pig's bronchus, is a rare tracheobronchial anomaly in which an ectopic bronchus arises from the lateral wall of the trachea above the carina and supplies the entire upper lobe or a segment of the upper lobe. It affects 0.5 - 2% of the population and may be detected incidentally, or in patients who present with bronchospasm, persistent cough, recurrent upper lobe infections and haemoptysis. Surgical resection is reserved for patients with severe or persistent symptoms that are resistant to treatment. We present a case of a symptomatic 5-month-old baby who had a type II right-sided tracheal bronchus on bronchography and CT.

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We present a case of a symptomatic 5-month-old girl who had a type II right-sided tracheal bronchus on computed tomography (CT), which was later confirmed on bronchography. Tracheal bronchus is a rare tracheobronchial anomaly where an ectopic bronchus arises from the lateral wall of the trachea.

## Case report

A 5-month-old girl presented with a clinical picture of bronchiolitis and showed minimal improvement on medical treatment. The chest radiograph revealed a hypoplastic right lung-associated mediastinal shift to the right and cardiac dextroposition (Fig. 1).

A CT angiogram of the chest was performed to further evaluate the persistent right upper lobe consolidation and to exclude an endobronchial lesion. This demonstrated a right-sided tracheal bronchus arising more than 2 cm above the carina and supplying the posterior segment of the right upper lobe. There was severe stenosis of the right bronchus intermedius and proximal left main stem bronchus and a hypoplastic right lung (Fig. 2). Other anomalies present were a pulmonary sling with an anomalous left pulmonary artery originating from the right pulmonary artery (Fig. 3), azygos continuation of the IVC (not shown) and a circumaortic renal vein (Fig. 4). The hepatic veins drained directly into the right atrium.

The patient was treated successfully with medical therapy and was discharged from hospital after 2 weeks.

At 7 months of age, cardiac catheterisation was performed electively to fully delineate other possible cardiac anomalies, whereat the anomalous origin of the left pulmonary artery was confirmed. This was the only positive finding and an otherwise normal anatomy was demonstrated.

At 10 months of age, bronchoscopy and bronchography were performed. The decision to perform bronchoscopy was made to

avoid further radiation from a repeat CT and to fully evaluate the endobronchial anatomy. The bronchogram confirmed a right tracheal bronchus (Fig. 4) supplying the posterior segment of the right upper lobe. The patient was discharged from hospital after responding well to medical treatment for bronchospasm, and is being followed up as an outpatient at the paediatric pulmonology department.

## Discussion

Tracheal bronchus is also referred to as bronchus suis or pig's bronchus (as it is a normal finding in pigs and some ruminant animals). It has been described in the literature as a rare tracheobronchial anomaly, where an ectopic bronchus arises from the lateral wall of the trachea above the carina and can supply the entire upper lobe or a segment of the upper lobe. The prevalence of the right tracheal bronchus is 0.1 - 2%, and prevalence of the left tracheal bronchus is 0.3 - 1%. Both the right and left tracheal bronchi have a high association with cardiovascular and costovertebral defects.<sup>[1]</sup>

Tracheal bronchus is subdivided into supernumerary and displaced types. The ectopic bronchus is supernumerary if the right upper lobe bronchus has a normal trifurcation into apical, posterior and anterior segments. The displaced type arises from the lateral wall of the trachea and supplies one or more segments of the upper lobe, most commonly the apical segment, as in our patient.

In most cases, the tracheal bronchus originates less than 2 cm from the carina. However, it has been described up to 6 cm from the carina.<sup>[2]</sup> There are various classifications,<sup>[3]</sup> but Conacher<sup>[4]</sup> has presented a simpler one that describes the anatomical relationship between the tracheal bronchus and the carina. Type I is more than 2 cm above the carina with narrowing of the distal trachea. Type II is more than 2 cm above the carina with a normal diameter of distal trachea, and Type III is less than 2 cm above the level of the carina.

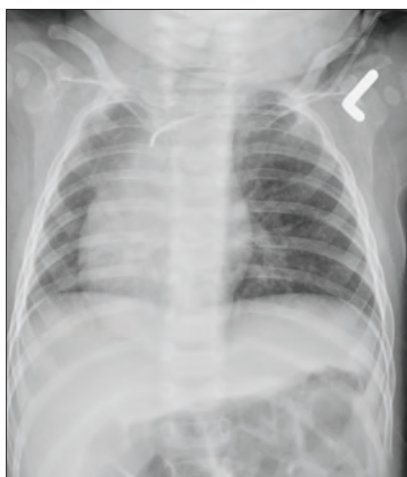


Fig. 1. Antero-posterior radiograph of the chest demonstrates cardiac dextroposition and a hypoplastic right lung. The left subclavian central line is in situ.

In the past, tracheal bronchus was diagnosed using bronchoscopy or bronchography. More recently, multidetector computed tomography (MDCT) with 3D volume reconstruction has replaced these more invasive techniques. MDCT has the advantage of improved temporal, spatial and contrast resolution, decreased scanning time and reduced sedation requirements.<sup>[5]</sup> In our patient, MDCT initially diagnosed, and bronchography later confirmed, the presence of the tracheal bronchus and evaluated the associated endobronchial pulmonary anatomy.

Patients with tracheal bronchi are often asymptomatic, and the finding is incidental. However, several articles have been published describing symptomatic cases where patients presented with bronchospasm, persistent cough, recurrent upper lobe infections and haemoptysis. Co-existing bronchiectasis, focal emphysema and cystic lung formations have also been reported.<sup>[3]</sup> Tracheal bronchus is also associated with cardiovascular abnormalities.

McLaughlin *et al.* conclude that the presence of a clinically significant tracheal bronchus should be considered in every child with recurrent right upper lobe pneumonia, especially in those with Down's syndrome or rib abnormalities.<sup>[6]</sup>

A higher occurrence of tracheal bronchus has been found in patients with congenital heart diseases, with other vascular abnormalities also described.<sup>[7]</sup> However, no direct association has been made between the presence of tracheal bronchus and congenital vascular abnormalities. Therefore, careful

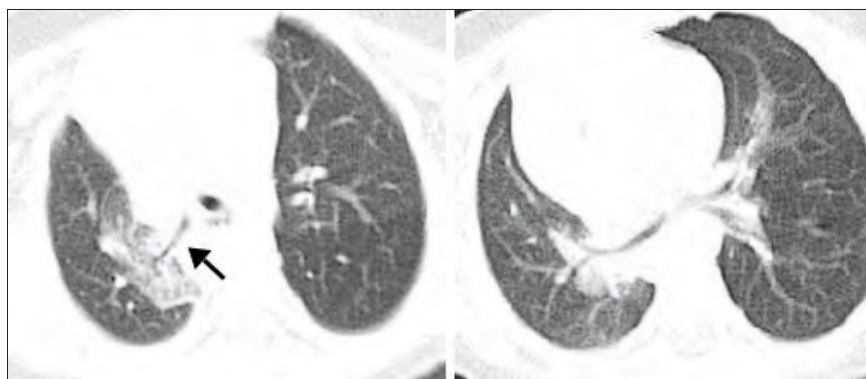


Fig. 2. Axial CT of the chest – lung window demonstrates the tracheal bronchus (arrow) on the right, which supplies the posterior segment of the right upper lobe. This segment demonstrates ground-glass opacification and is possibly dysplastic. The image on the right is lower down, at the level of the carina, and demonstrates that the trachea distal to the tracheal bronchus is narrowed and the carina is low (at T5/T6 level).

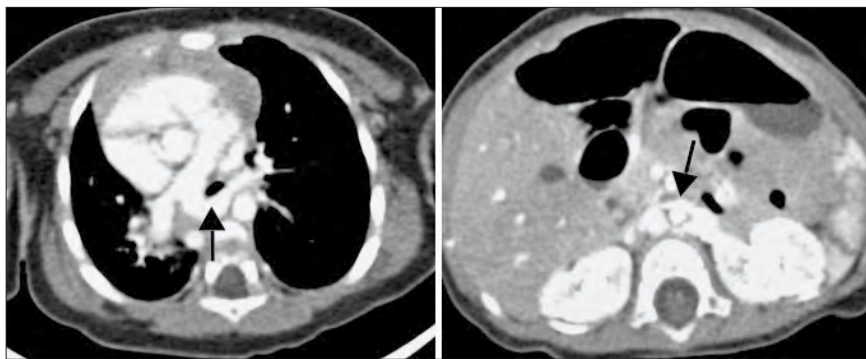


Fig. 3. Axial contrast-enhanced CT demonstrates the left pulmonary sling (arrow) and circumaortic left renal vein (arrows).



Fig. 4. Frontal and lateral radiographs of the bronchogram study demonstrating the right tracheal bronchus that supplies the posterior segment of the right upper lobe.

evaluation and a high index of suspicion is necessary when evaluating such patients, so as to recognise and diagnose any associated vascular abnormalities, as was the case in our patient. In most cases, expectant management is preferred, while surgical resection is

reserved for patients with severe or persistent symptoms that are resistant to treatment.

Our patient had a displaced type II right-sided tracheal bronchus, with multiple associated pulmonary, hepatic and renal vascular anomalies.

## Conclusion

Paediatric patients presenting with non-resolving respiratory symptoms should be investigated to exclude congenital anomalies of the trachea-bronchial tree. If a tracheal bronchus is detected, it is important to exclude other cardiovascular and pulmonary abnormalities.

1. Srivastava A, Warriar G, Trehan M, Radha AS. Tracheal bronchus: A cause of unexplained prolonged hypoxemia during ventilation. *Paedtr Cardiol* 2010;31(8):1229-1231. [<http://dx.doi.org/10.1007/s00246-010-9759-9>]
2. Wiser SH, Hartigan PM. Challenging lung isolation secondary to aberrant tracheobronchial anatomy. *Anesth Analg* 2011;112(3):688-692. [<http://dx.doi.org/10.1213/ANE.0b013e318206917a>]
3. Ghaye B, Szapiro D, Fanchamps JM, Dondelinger RF. Congenital bronchial abnormalities revisited. *Radiographics* 2001;21(1):105-119.
4. Conacher ID. Implications of a tracheal bronchus for adult anaesthetic practice. *Br J Anaesth* 2001;86:155-156.
5. Lee EY, Boisselle PM, Shamberger RC. Multidetector computed tomography and 3-dimensional imaging: Preoperative evaluation of thoracic and tracheobronchial anomalies and abnormalities in pediatric patients. *J Paedtr Surg* 2010;45(4):811-821. [<http://dx.doi.org/10.1016/j.jpedsurg.2009.12.013>]
6. McLaughlin FJ, Strieder DJ, Harris GB, Vawter GP, Eraklis AJ. Tracheal bronchus: Associations with respiratory morbidity in childhood. *J Paedtr* 1985;106(5):751-755. [[http://dx.doi.org/10.1016/S0022-3476\(85\)80348-6](http://dx.doi.org/10.1016/S0022-3476(85)80348-6)]
7. Suzuki M, Matsui O, Kawashima H, et al. Radioanatomical study of a true tracheal bronchus using multidetector computed tomography. *Jpn J Radiol* 2010;28(3):188-192. [<http://dx.doi.org/10.1007/s11604-009-0405-5>]