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Case Report

Rare case of congenital tracheal diverticulum presenting as tubercular diverticulitis: a case report

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ABSTRACT

Congenital tracheal diverticulum (DV) is often discovered incidentally during imaging unless the patient becomes symptomatic. We report the case of a young female who presented with a 10-week history of cough accompanied by minimal sputum production and weight loss. Due to a mismatch between chest X-ray findings and sputum results, a high-resolution CT scan of the chest was performed, which revealed normal lung parenchyma but demonstrated a multiloculated tracheal DV. Bronchoscopic evaluation identified a small opening of the DV in the central portion of the trachea. Microbiological analysis of the bronchial wash tested positive for *Mycobacterium tuberculosis* (MTB) on both CBNAAT and MGIT. The patient made a complete clinical and radiological recovery in response to standard antitubercular treatment. Based on clinical presentation, imaging, and microbiological evidence, a diagnosis of congenital tracheal DV with tubercular diverticulitis was made-an extremely rare presentation that, to the best of our knowledge, has not been previously reported.

Keywords: Tracheal diverticulum, Tuberculosis, Diverticulitis

INTRODUCTION

Tuberculosis is known for its wide spectrum of clinical manifestations, both during active infection and as part of its post-treatment sequelae.[1] Tracheal or bronchial diverticula may arise in the large airways as a late complication, typically acquired due to chronic inflammation, tractional forces, or persistent coughing following tuberculosis.[2]

While congenital tracheal DV can present with symptoms such as chronic cough and recurrent respiratory infections, co-infection with MTB has not been previously documented. Congenital form more frequently occurs on the right posterolateral aspect of trachea.[3] This case highlights a young woman with congenital right tracheal DV who developed tubercular diverticulitis-an extremely rare occurrence, not mentioned in previous literature.

CASE REPORT

A 29-year-old female makeup artist presented to the outpatient department with a 10-week history of intermittent cough accompanied by minimal expectoration, occasional retrosternal chest discomfort, and significant unintentional weight loss. The cough was non-productive and episodic, and there was no history of hemoptysis. Chest pain was described as sharp, mild in intensity, non-radiating, and not associated with sweating or palpitations. The patient did not report any consistent exacerbating or relieving elements for her symptoms. She did not have any complaint of fever, dyspnea, dysphagia, allergy, gastroesophageal reflux disease (GERD) or postnasal drip. The patient was fully immunized, a lifelong non-smoker, and had no other significant past medical or surgical history.

On physical examination, including a thorough assessment of respiratory system, no abnormal findings were detected. She presented with a sputum smear report showing scanty acid-fast bacilli (AFB) positivity. However, her chest X-ray appeared normal. Sputum CBNAAT testing was subsequently performed, yielding a negative result for MTB. A comprehensive diagnostic workup was initiated to explore etiology. Routine laboratory investigations-including complete blood count, liver and renal function tests, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP)-were all within normal limits. Ultrasonography of the whole abdomen, pelvis, neck, and bilateral axillae revealed no abnormalities.

Given the discrepancy between the sputum smear positivity and the normal chest X-ray, a high-resolution computed tomography (HRCT) of the chest was performed to detect subtle parenchymal or endotracheal involvement. The CT scan revealed a multiloculated tracheal DV measuring 25.4 mm (craniocaudal)×8.34 mm (anteroposterior) × 8.33 mm (transverse) situated on the right posterolateral wall of the trachea (Figures). A thin stalk-like connection between the DV and the tracheal lumen was noted at the lower margin of the T2 vertebra, approximately 6.8 cm distal to the vocal cords (Figure 1). Patchy wall thickening within the DV suggested ongoing inflammation (Figure 2 A). No abnormalities were seen in the lung parenchyma, vasculature, or mediastinum.

To further investigate tracheal pathology, a flexible bronchoscopy was performed. This revealed a small opening on the right posterolateral tracheal wall, located approximately three tracheal rings below the vocal cords (Figure 3). Mucoid secretions emanating from the opening were aspirated along with a bronchial wash for microbiological analysis. The remainder of the tracheobronchial tree was normal, with no evidence of endobronchial lesions or other abnormalities.

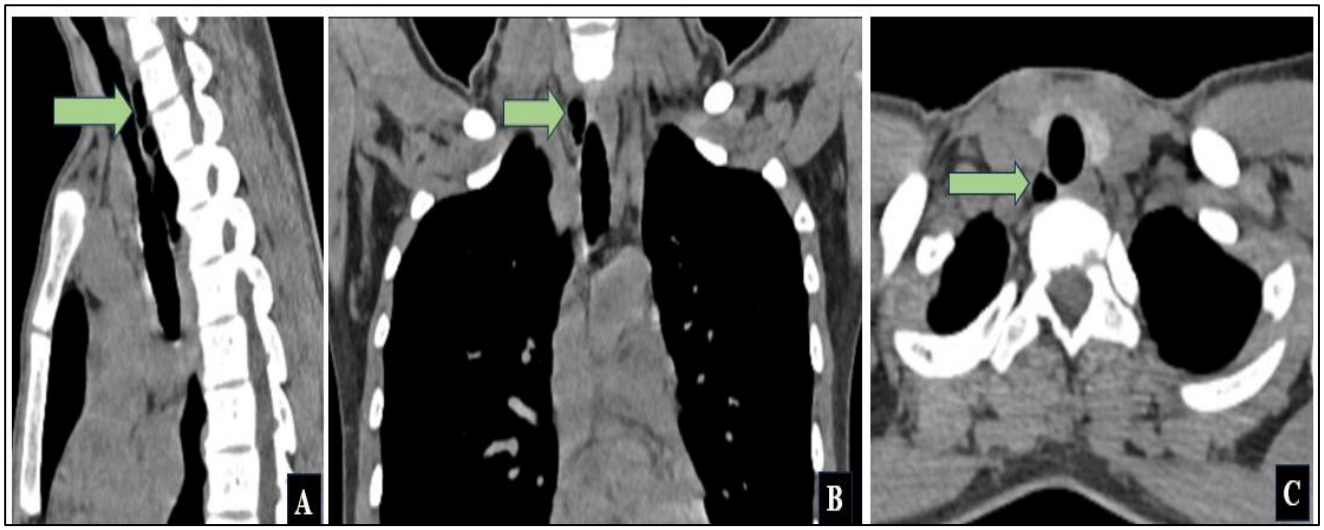

Figure 1: Sagittal (A), coronal (B) and axial (C) section of CT scan chest images showung multiocilated tracheal DV (green arrows) in right postrolateral aspect of trachea.

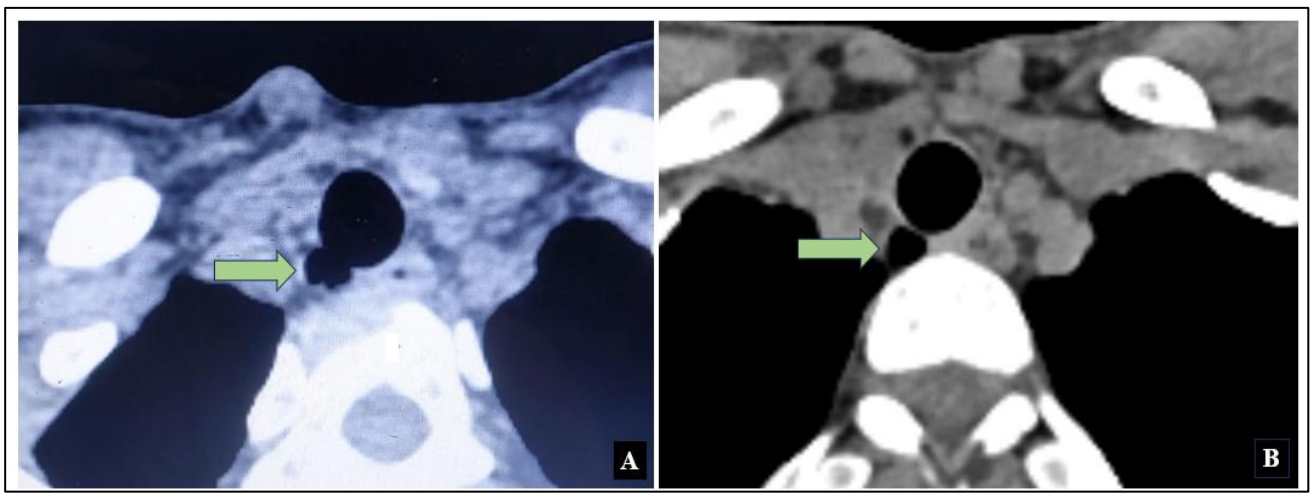

Figure 2 (A and B): During the time of diagnosis, wall thickening (green arrow) of tracheal DV suggestive of DV. Resolution of wall thickening after 6 months of anti-tubercular therapy.

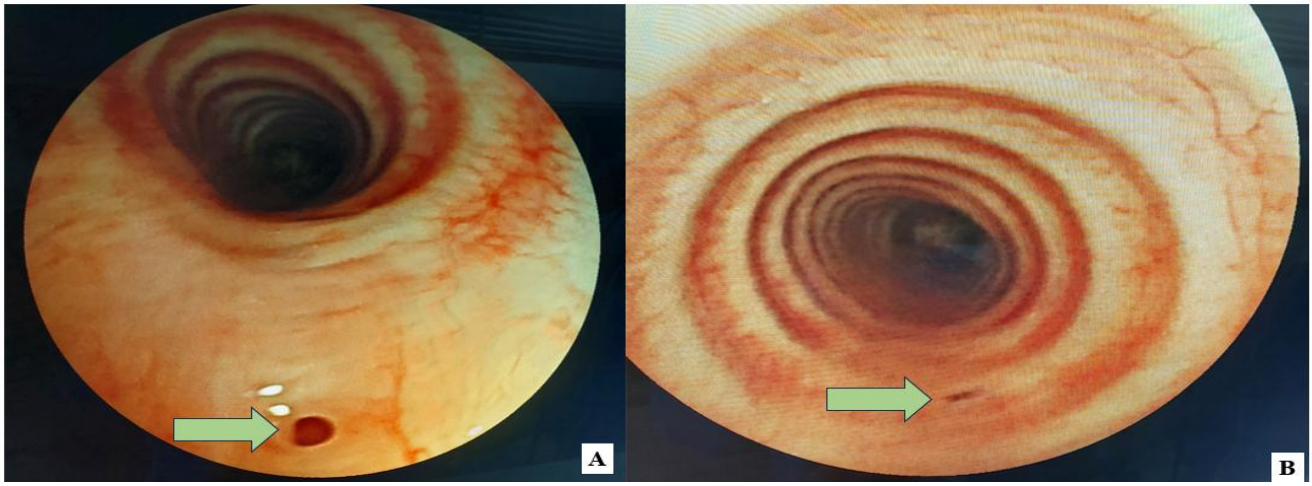

Figure 3 (A and B): Bronchoscopic view of central trachea. Greem arrows pointing towards the small opening on the right postero-lateral wall of trachea.

Gene Xpert (CBNAAT) analysis of the bronchial wash sample detected MTB with a low bacterial load, and no resistance to rifampicin was identified. The AFB smear of the same sample was negative. Additionally, pyogenic and fungal cultures showed no growth, and cytological examination of the bronchoalveolar lavage (BAL) fluid revealed no evidence of malignant cells.

Based on the patient's clinical presentation, high-resolution CT chest findings, and bronchial wash analysis, a diagnosis of congenital tracheal DV with superimposed tubercular diverticulitis was established. The patient was initiated on standard anti-tubercular therapy in accordance with national treatment guidelines. After six weeks of therapy, the bronchoalveolar lavage (BAL) AFB culture confirmed the presence of MTB, further validating the diagnosis.

The patient adhered well to the treatment regimen, and by the end of six months, she demonstrated significant clinical improvement, including a 6 kg weight gain and complete resolution of her initial symptoms. A follow-up CT scan of the chest showed no change in the size of the DV, consistent with a congenital origin, while the previously noted wall thickening had resolved (Figure 2B). Repeat flexible bronchoscopy at six months revealed a clear diverticular opening with no visible secretions. BAL samples at that time tested negative for AFB smear, CBNAAT, and MGIT culture, indicating successful treatment of the tubercular infection.

DISCUSSION

Tracheal DV denotes an area of small air collection lined by ciliated columnar epithelium at the paratracheal area.[2] Most of the time it is asymptomatic and remains unnoticed, incidentally detected by imaging methods. It comes under the umbrella term paratracheal air cysts (PTACs) which also includes tracheocele, lymphoepithelial cysts, and bronchogenic cysts.[2,4,5]

Tracheal DV has an incidence rate of approximately 2.4% in general population. Among those 2.9% appear on the left side, whereas majority (97.1%) of them occur on the right posterolateral aspect of the trachea.[3] This was observed in our case also. Tracheal DVs can be congenital or acquired. The congenital form is more frequently identified in males and is typically smaller in size with a narrow opening into the trachea. These are usually situated around 4-5 cm below the vocal cords or near the carina.[6] This variant is believed to originate due to abnormal endodermal differentiation during the development of the membranous posterior wall of the trachea or due to improper formation of tracheal cartilage around the sixth week of foetal life.[7] These congenital tracheal diverticula consist of the complete tracheal architecture, comprising respiratory epithelium, smooth muscle fibres and cartilage layer-and commonly mucus-filled. Although uncommon, they may occasionally coexist with other congenital anomalies, such as tracheoesophageal fistula.[8] In our case, patient didn't have any other congenital anomaly. Based on the anatomical features and absence of any previous history of respiratory infection or other respiratory ailments we consider our case as a congenital tracheal DV.

Acquired tracheal diverticula generally have a wider opening, can develop at any tracheal level, and tend to be larger than their congenital counterparts. Their development is often linked to prolonged elevation of intraluminal pressure, commonly resulting from chronic cough associated with tuberculosis (both active infection and post-tubercular lung disease) or chronic obstructive airway disease (COAD), especially when coupled with a weakened tracheal wall.[9]

While many tracheal diverticula remain clinically silent, some patients may present with persistent cough, breathing difficulty, stridor, or recurrent episodes of tracheobronchitis.[9] Less commonly, symptoms such as neck discomfort, hoarseness, difficulty or pain while swallowing, hemoptysis, choking episodes, and repeated

hiccups or belching may occur.[7,10] Recurrent upper respiratory infections can lead to secondary infection of the DV, which in some cases may progress to a paratracheal abscess. Complications may encompass airway obstruction, vascular rupture, infection, aspiration, leading to bleeding. While extremely rare, patients may present with more serious complications such as fistula formation, pneumomediastinum, or stenosis of the trachea.[11,12] Recurrent respiratory infections are also very common. In this case we found the evidence of infection with MTB in congenital TD and we labelled this case as a tubercular diverticulitis in a case of congenital tracheal DV which has never been reported in the past. Therefore, AFB smear, CBNAAT as well as MGIT culture of sputum or bronchial aspirate should be a part of work up while investigating a case of tracheal DV with suspected secondary infection.

Among the survivors of TB, up to 27% suffer from TB sequelae.[1] These complications typically arise from the progression of untreated infection and inflammation, along with structural alterations in the airways, lung parenchyma, vasculature, and pleura-both during and after the completion of TB treatment. Airway-related complications are generally categorized into large and small airway involvement. Within the spectrum of large airway disorders, while conditions such as stenosis and bronchiectasis are more frequently encountered, cases of multiple tracheal diverticula have also been documented, sometimes presenting with features of large airway obstruction.[6,13]

Currently, multidetector computed tomography (MDCT) is regarded as the imaging modality of choice for identifying tracheal diverticula.[6] Characteristic MDCT features include a thin-walled air-filled sac in the paratracheal region, which may or may not communicate with the tracheal lumen.[14] Through multiplanar reconstruction, MDCT allows detailed evaluation of the DV's location, size, wall thickness, and morphology. It is also capable of identifying any connection between the DV and the trachea. MDCT can help differentiate between congenital and acquired forms based on the presence or absence of cartilage and the width of the diverticular neck.[6] Magnetic resonance imaging (MRI), though less commonly used, provides superior delineation of wall thickness and is particularly valuable in cases of infected tracheal diverticula, often appearing as a round or oval air-filled lesion (signal void) posterior to the right tracheal wall across all sequences. MRI is considered more effective than CT in detecting paratracheal abscesses associated with infected diverticula.[15] In this case sagittal, coronal and axial view of CT chest gave a three-dimensional image of TD as well as showed the evidence of diverticulitis with wall thickness.

Bronchoscopy is an essential step in diagnosis of tracheal DV. It helps in confirming the diagnosis and ruling out other endobronchial pathology. In certain cases, tracheal diverticula with a very narrow opening or those connected to the trachea via a fibrous band may be challenging to identify on bronchoscopy.[6] Nonetheless, when paratracheal air collections are observed, it is essential to first ascertain whether they originate from the trachea or an adjacent structure-a distinction that bronchoscopy can often help clarify. In our case, the presence of a small opening supported the diagnosis of a congenital tracheal DV.

Management of most tracheal diverticula is conservative, involving mucolytics, antibiotics, and chest physiotherapy.[16] In symptomatic or complicated cases, alternative interventions such as endoscopic laser cauterization, electrocoagulation, or surgical excision may be considered. The choice of treatment depends on the patient's clinical condition, symptom severity, and the presence of any complications.[6,16,17] After completing course of ATT, currently our patient is asymptomatic and she has been advised to report immediately upon appearance of any signs or symptoms.

CONCLUSION

It can thus be concluded that while working up for a case of symptomatic congenital tracheal DV, one should not only rule out pyogenic secondary infection but tuberculosis as well with the help of AFB stain, Gene Xpert and MGIT culture particularly in high burden countries.

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