

# Tracheobronchial Compression by Right-sided Aortic Arch in a Middle Aged Male

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## ABSTRACT

Exertional dyspnoea is a common symptom among middle-aged population. Diagnostic evaluation of such patients is often challenging and confusing. We report a patient presenting with exertional dyspnoea and an obstructive ventilatory defect on spirometry that was refractory to bronchodilator therapy. Careful review of the chest radiograph and spirometry pointed towards variable intra-thoracic airways obstruction as a cause of dyspnoea. Contrast enhanced computed tomography (CECT) of the thorax and bronchoscopy established the diagnosis of a right-sided aortic arch resulting in tracheobronchial compression and tracheomalacia. [Indian J Chest Dis Allied Sci 2012;54:45-47]

**Key words:** Tracheomalacia, Exertional dyspnoea, Variable intrathoracic airway obstruction, Right side aortic arch.

## INTRODUCTION

Right-sided aortic arch with an aberrant origin of great vessels is a rare, but well recognised cause of tracheobronchial/oesophageal compression in infants and children. Such an anomaly is usually associated with some or other congenital cardiac defect(s) also. We encountered tracheobronchial compression secondary to a right-sided aortic arch in a middle-aged male who did not have other anomalies, such as, vascular ring, aberrant origin of great vessels, or congenital cardiac defect(s). Considering its rarity of occurrence and similarity of presentation of this condition with other common respiratory disorders, this case is being reported.

## CASE REPORT

A 55-year-old, non-smoker male presented with progressive exertional dyspnoea for the last four years. Patient denied any history of fever, expectoration, haemoptysis, and/or chest pain. Patient had received inhaled corticosteroids, short-acting/long-acting beta-2 agonists with oral corticosteroids on few occasions during this period. None of these measures resulted in a significant relief in his symptoms.

Vital signs and general physical examination were within normal limits. Chest was barrel shaped with bilateral expiratory wheezing. Cardiac and abdominal examination were normal.

Routine blood counts, serum biochemistry and urine analysis were within normal limits. Arterial blood gas analysis (on room air) showed partial pressure of arterial oxygen: 68 mmHg; partial pressure of arterial carbon dioxide: 23.6 mm Hg; pH: 7.46; bicarbonate: 18.8 meq/L suggestive of compensated respiratory alkalosis. Chest radiograph postero-anterior view (Figure 1) showed absence of left aortic knuckle and narrowing of lower tracheal air column from the level of clavicle downwards. Both the lung fields showed evidence of over-inflation. Electrocardiogram and two dimensional echocardiography were within normal limits.

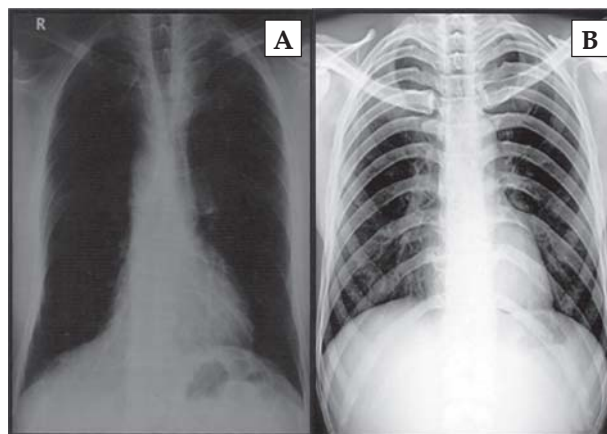


Figure 1. Chest radiograph (postero-anterior view) showing (A) absent left aortic knuckle shadow and narrowing of lower tracheal air column; and (B) left-sided aortic arch and normal tracheal lucency in a healthy adult.

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Spirometry (Figure 2) showed forced vital capacity (FVC) 2.07 L (90% of predicted), forced expiratory volume in first second (FEV<sub>1</sub>) 0.75 L (43% of predicted) with a percentage of FVC expired in first second (FEV<sub>1</sub>%) of 36.23. The configuration of the flow-volume loop, e.g., absence of sharp peak in expiratory loop and a squared-off appearance with various other indices of flow-volume graph, e.g., FEV<sub>1</sub>/peak expiratory flow rate (PEFR) greater than 10 ml/L/min, forced inspiratory flow at the 50% forced vital capacity (FIF<sub>50</sub>) less than 100 L/min, FEV<sub>1</sub>/FEV<sub>0.5</sub> (percentage of FVC expired in first 0.5 seconds) greater than 1.5 and FEF<sub>50</sub>/FIF<sub>50</sub> of 0.4, favoured the diagnosis of variable intra-thoracic airway obstruction.

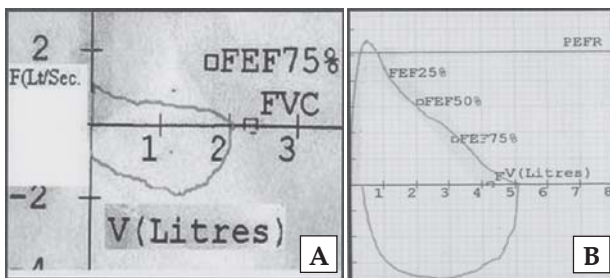


Figure 2. Flow-volume graph showing (A) absence of sharp peak of expiratory loop with a box like configuration of complete flow volume graph suggesting variable intrathoracic obstruction; and (B) a normal appearance of flow volume curve.

Contrast enhanced computed tomography (CECT) of the thorax, coronal reconstruction image (Figure 3) showed a right-sided aortic arch resulting in significant compression of lower trachea, carina and right main bronchus. Computed tomographic image in the axial plane at the level of left pulmonary artery (Figure 4) did not show any evidence of vascular ring or aberrant vessel arising from the aorta. Diameter of descending aorta (36.6 mm) was more than that of ascending aorta suggestive of aneurysmal dilation of the descending aorta.



Figure 3. Contrast enhanced computed tomography of thorax coronal reconstruction image showing right side aortic arch compressing right wall of lower trachea, carina and right main bronchus resulting in significant luminal narrowing.

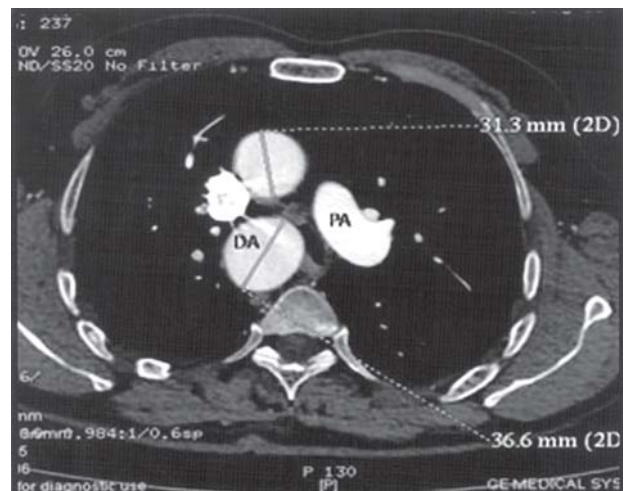


Figure 4. CT image at level of left pulmonary artery (PA) showing compression of the trachea by descending aorta (DA). No evidence of vascular ring/aberrant origin of any artery is seen. Diameter of descending aorta (36.6mm) is greater than ascending aorta.

Bronchoscopy was performed to visualise the extent and nature of intra-thoracic airway obstruction. It was found that lower tracheal lumen including carina and the right main bronchus were narrowed due to posterolateral compression. During expiration a near complete occlusion was seen, suggestive of dynamic compression and tracheomalacia.

## DISCUSSION

Clinico-radiological findings of this patient are similar to any patient with chronic obstructive airways disease (COAD). Severe airway obstruction on spirometry further supports the diagnosis of obstructive airways disease. In the present case, compression by the right-sided aortic arch and right descending aorta resulted in tracheomalacia of lower part of trachea resulting in variable intra-thoracic airway obstruction. Right-sided aortic arch is widely recognised as a cause of tracheobronchial and oesophageal obstruction in infants and children, when it forms a complete vascular ring.<sup>1,2</sup> Occasionally this can also be seen in adult patients.<sup>3-5</sup> However, right-sided aortic arch resulting in tracheobronchial obstruction in the absence of the vascular ring is exceedingly rare. Isolated case reports of the right-sided aortic arch with aberrant anomalous left innominate artery<sup>6</sup> or an aberrant left subclavian artery<sup>7</sup> causing airways obstruction have been reported. Gidding *et al*<sup>8</sup> have reported airway compression by right aortic arch in the absence of vascular ring in a six-month old infant with tetralogy of Fallot. In our patient, compression of lower part of the trachea and the right main bronchus occurred due to aortic arch descending aorta and there were no aberrant arteries and /or a vascular rings to cause

airways obstruction. This case highlights the need for critical analysis of chest radiograph and flow-volume curve in a patient presenting with exertional dyspnoea. Diagnosis of COAD should not be considered on volume-time graph alone. A careful analysis of both volume-time graph and flow-volume curve are needed to exclude intra-thoracic airway obstruction mimicking COAD.

*To the best of our knowledge, this is the first case of its kind documenting a right-sided aortic arch without vascular ring as a cause of airways compression in a middle-aged patient. Possible mechanisms of delayed onset of symptoms in our patient include atherosclerotic changes in vessel with advancing age<sup>5</sup> and progressive tracheomalacia due to prolonged compression.<sup>8</sup>*

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