Innominate artery compression syndrome of the trachea
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Section: Paediatric radiology
Area of Interest: Arteries / Aorta
Procedure: Contrast agent-intravenous
Imaging Technique: CT-Angiography
Special Focus: Congenital Case Type: Clinical Cases
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Patient: 7 months, male

Clinical History:

A 7-month-old male infant with a previous history of ductus arteriosus surgery at one month of age, presented with a six week history of intermittent biphasic stridor. Bronchoscopy examination revealed pulsatile extrinsic anterior compression of the middle third of the trachea, which increased with coughing or crying.

Imaging Findings:

A thoracic computed tomography (CT) was the diagnostic investigation selected; no chest radiograph was performed. CT angiography was performed on a 16-detector row CT scanner (Philips Brilliance), using a threshold technique, though the study was non-gated. Under general anaesthesia, axial sections of the thorax were obtained with intravenous administration of 1.5 mL/Kg (12 ml total) of non ionic contrast medium (Xenetix 350) at a flow rate of 2.5 mL/sec. Reconstructions were performed as maximum intensity projections and 3D-volume-rendered images were also computed. The dose length product was 57.88 mGy.cm.

The axial (Fig. 1) and sagittal (Fig. 2) sections images demonstrated the proximity of the artery to the trachea. In the coronal plane, imaging showed the innominate artery originating from aortic arch on the left side of the trachea, crossing it anteriorly from left to right (Fig. 3). The remainder of the mediastinal great vessels were normal, and no intraluminal airway abnormalities were detected.

Discussion:

Anomalies of the great vessels of the mediastinum are not uncommon, but only a small fraction of cases involving vascular compression of the airway cause obstructive symptomatology [1].
Tracheal compression by the innominate artery is the most common of the compression syndromes caused by incomplete vascular rings and often causes mechanical upper airway obstruction in children [2]. Symptomatic patients typically present with expiratory stridor, cough, recurrent bronchopulmonary infections, and occasionally apnoea [1, 3, 4].
The syndrome of innominate artery compression of the trachea was first reported by Gross and Neuhauser in 1948, and was originally thought to be attributable to an aberrant innominate artery that originated anomalously on the left
side of the aortic arch, and coursed obliquely from left to right causing an anterior indentation of the trachea [1, 5]. The diagnostic modalities include an array of radiological tests: A lateral X-ray may show tracheal deviation, indentation or hyperinflation. A barium swallow may show a persistent indentation implying a fixed obstruction. Lateral fluoroscopy may show an anterior indentation of the tracheal air column. Bronchoscopy often shows anterior tracheal compression 1-2 cm proximal to the carina as in the index case [6]. CT and MR imaging have been useful in delineating the vascular anatomy in multiple planes and have made angiography superfluous. Three-dimensional reconstruction at CT and MR imaging can provide images of even greater detail before surgery [7, 8].

In our institution, CT angiography is the radiologic procedure of choice for evaluating compressive extrinsic lesions of the trachea, and when aortic and other thoracic vascular diseases are suspected in children. Compared with MR imaging examinations, CT is often easier to schedule, the scan acquisition is faster so the anesthetic procedure time becomes shorter, and is less expensive.

The majority of patients with innominate artery compression of the trachea are successfully treated with medical management. Surgery is indicated for patients with apnea, multiple episodes of tracheobronchitis or bronchopneumonia, and after 48 hours of failing to respond to medical therapy [1].

In the presented case follow-up telephone interview was obtained 1 year after establishment of diagnosis. Family member indicated the decrease in episodes of stridor, which have a tendency to reappear when the child has a “cold”.

To our knowledge, there are no previous reports of an association between a patent ductus arteriosus and innominate artery compression of the trachea.

Our case report emphasizes the importance of CT angiography for global cardiovascular, airway and mediastinum evaluation.

Differential Diagnosis List:  Innominate artery compression syndrome of the trachea, 1. Masses which compress the trachea: bronchogenic cysts, Duplication cyst, Large neurofibroma or retropharyngeal masses, Lymphoma in the anterior mediastinum, Thymic cysts, 2. Normal structures in an atypical position: aberrant thyroid or aberrant thymic tissue, 3. Vascular anomalies: right aortic arch with aberrant left subclavian artery or double aortic arch, 4. Lymphatic malformation compressing airway, 5. Pre- or post-operative congenital heart disease

Final Diagnosis:  Innominate artery compression syndrome of the trachea

References:

Fletcher B.D., Cohn R.C. Tracheal Compression and the Innominate Artery: MR Evaluation in Infants. Radiology
**Figure 1**

**Description:** Axial section demonstrates the proximity of the artery to the trachea and provides the best approximation of tracheal narrowing. **Origin:**
**Figure 2**

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**Description:** CT image reconstructed in the sagittal plane shows the compressed section of the trachea by innominate artery. **Origin:**
Description: CT angiographic image reconstructed in the coronal plane shows the innominate artery originating from aortic arch at the left side of the trachea and crossing it anteriorly from left to right.

Origin: