

Cardiovascular Imaging In-a-Month

Chest Roentgenogram Mimicking Double Aortic Arch in a 30-Year-Old Female With Effort Dyspnea and Dysphagia

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CASE

A 30-year-old female was generally healthy, but sometimes experienced low grade intermittent effort dyspnea with wheezing and mild dysphagia when swallowing a large piece of solid food. Physical examination revealed no abnormalities, and her blood pressure was 130/82 mmHg. Electrocardiography and echocardiography revealed no abnormalities. Chest roentgenography(**Fig. 1**)and swallow esophagography(**Fig. 2**)were performed.

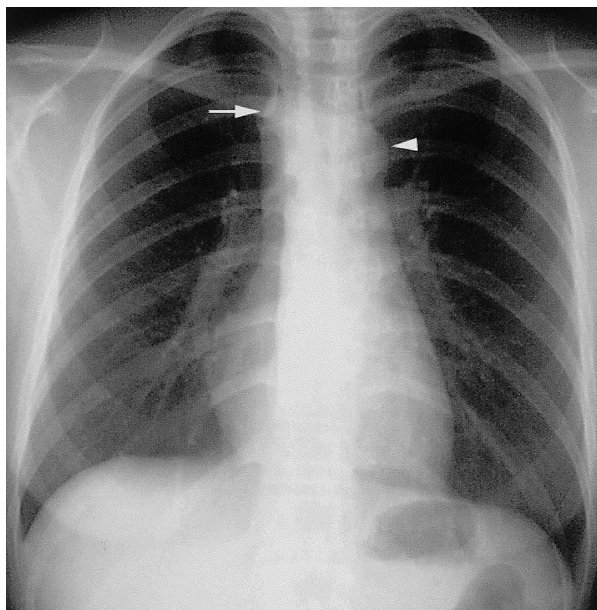


Fig. 1

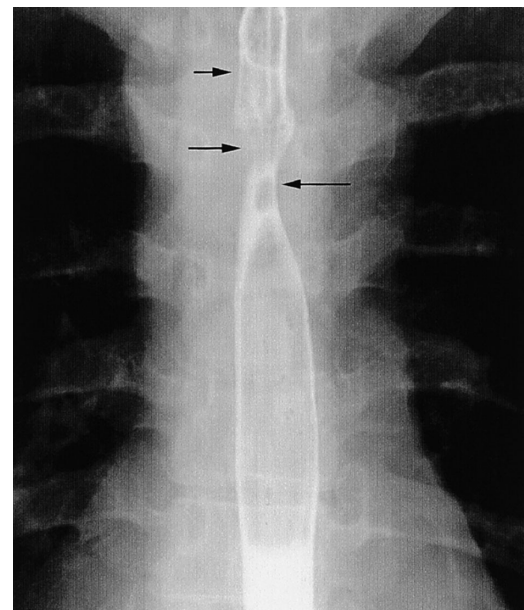


Fig. 2

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Points for Diagnosis

Chest roentgenography (Fig. 1) suggested mild enlargement of the right lower cardiac margin, and showed two nodular shadows in the bilateral upper mediastinum, which were considered to be aortic knobs. In addition, the margin of the right aortic knob was apparently connected to the longitudinal stripe line parallel to the right border of the thoracic spine, which suggested the margin of the descending thoracic aorta on the right. However, no intracardiac defects were revealed by echocardiography. We thought that chest roentgenography showed the silhouette of a double aortic arch, and that vascular ring in association with double aortic arch had caused the esophago-respiratory symptoms, although we could not confirm tracheal or esophageal narrowing on the chest roentgenogram. Furthermore, we found right and left esophageal impressions on swallow esophagography (Fig. 2) in association with the double aortic arch, whereas the right esophageal impression was located at the aortic knob (short arrow) and just inferior to the right aortic knob (middle arrow).

In contrast, cross-sectional and coronal spiral computed tomography (CT) with contrast medium image disclosed unanticipated radiological features of right aortic knob and left mediastinal round nodule of 3 cm in diameter (Figs. 3, 4).

Three-dimensional CT angiography (Fig. 5) demonstrated the nature of the thoracic vascular anomalies prior to angiographic examination, as right aortic arch with mirror image branching, and aortic diverticulum (asterisk) which was located at the proximal portion of the descending thoracic aorta. Digital subtraction angiography of the posteroanterior projection (Fig. 6) confirmed right aortic arch with mirror image branching, but we could see only a small part of the aortic diverticulum, because of overlapping by the ascending thoracic aorta and left common carotid artery.

Right aortic arch with mirror image branching has been classified into two types (Type A and Type B) caused by the different breaking point of

the left aortic arch of the "hypothetical double aortic arch"¹²⁾. The break of the aortic arch is intimately associated with the origin of the ductus arteriosus and intracardiac anatomy. Interruption of the left arch posterior to the left ductus arteriosus leads to a right aortic arch with mirror image branching and ductus arteriosus originating from the left innominate or left subclavian artery. This type of thoracic vascular anomaly (Type A) is commonly encountered, and is not associated with vascular ring, but cardiac anomalies such as tetralogy of Fallot or truncus arteriosus. On the other hand, interruption of the left arch between the left subclavian artery and left ductus arteriosus leads to a right aortic arch with mirror image branching and ductus arteriosus derived from the aortic diverticulum of the proximal descending thoracic aorta. This type of thoracic vascular anomaly (Type B) is rarely encountered and is not associated with intracardiac defects, but vascular ring.

The thoracic vascular anomalies of the present patient are eventually considered to be Type B right aortic arch with mirror image branching. This combination of Type B right aortic arch with mirror image branching and mediastinal nodule is extremely rare.

Diagnosis: Right aortic arch with mirror image branching (Type B) causing vascular ring, and left upper mediastinal nodule

Key Words: Aorta (right aortic arch, vascular ring); Computed tomography (three-dimensional CT angiography); Neoplasms

References

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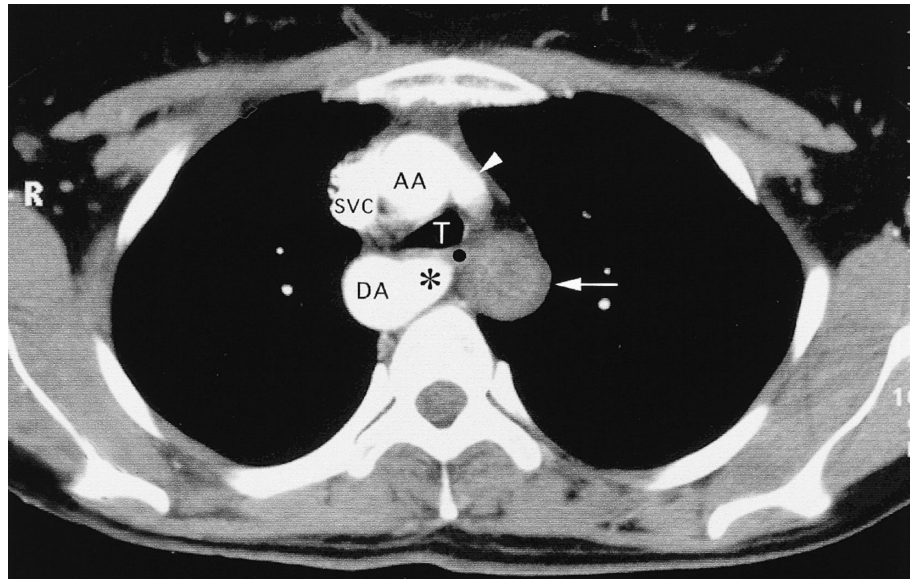


Fig. 3

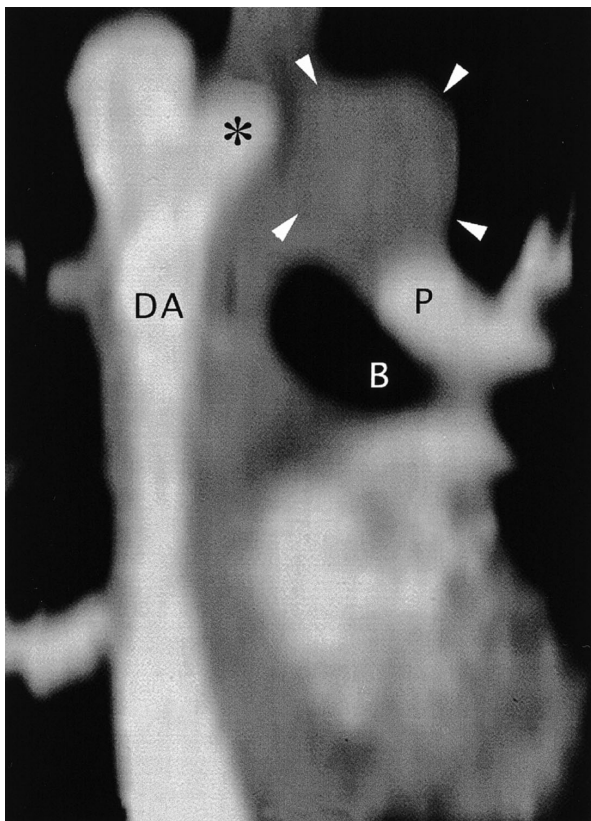


Fig. 4

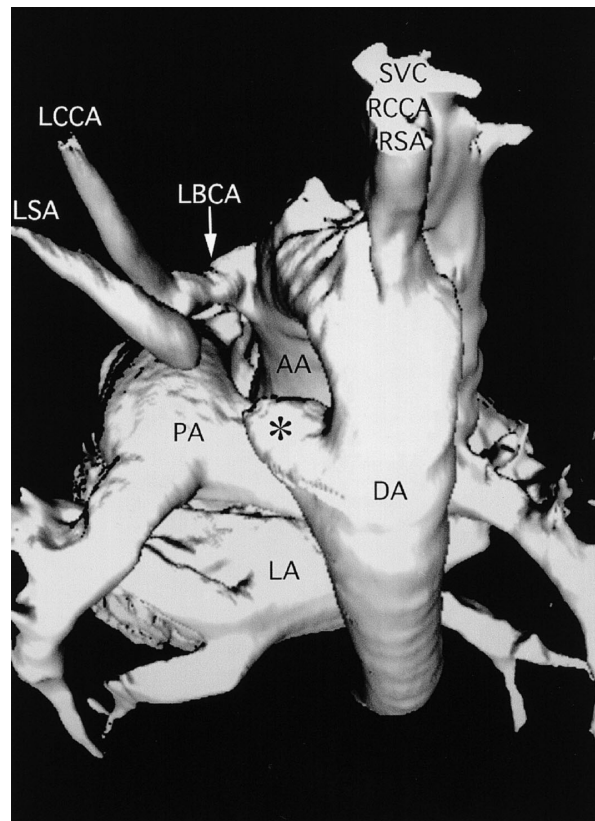


Fig. 5

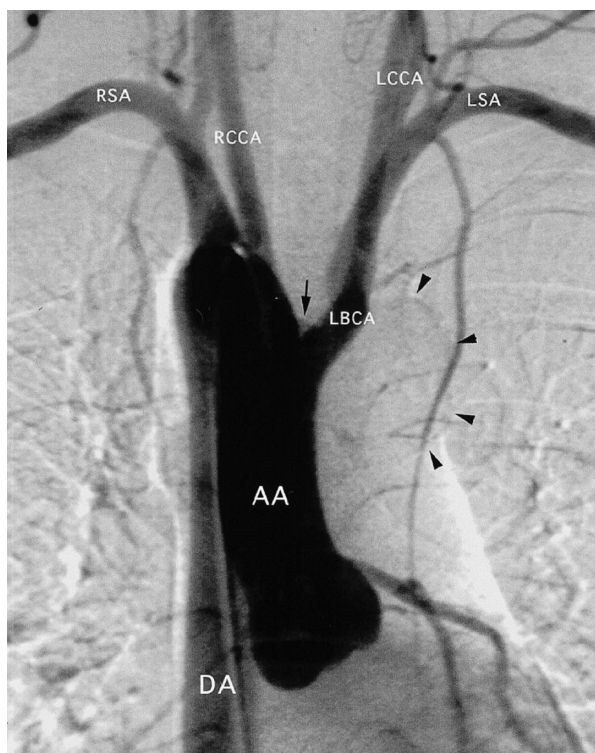


Fig. 6

Fig. 1 Chest radiogram demonstrating two nodular shadows in the bilateral upper mediastinum

The right nodular shadow (arrow) is a right aortic knob, whereas the left nodular shadow (arrowhead) is a left upper mediastinal nodule.

Fig. 2 Swallow esophagogram, posteroanterior projection, showing esophageal impressions

The esophageal impressions located on the right (short and middle arrows) are caused by right aortic knob and aortic diverticulum, and on the left (long arrow) by left mediastinal nodule, respectively.

Fig. 3 Cross-sectional computed tomographic scan at the upper mediastinal level

The right aortic arch compresses the trachea with resultant narrowing of the lumen. The round medi-

astinal nodule (arrow), aortic diverticulum (asterisk) and the left brachiocephalic artery (arrowhead) are visible. The esophagus (small black circle) is surrounded by trachea, aortic diverticulum and mediastinal nodule.

SVC = superior vena cava; AA = ascending thoracic aorta; DA = descending thoracic aorta; T = trachea.

Fig. 4 Coronal computed tomographic scan, multiplanar reconstruction, at the level of the posterior mediastinum

The round mediastinal nodule (arrowheads) is located just above the left main pulmonary artery. The aortic diverticulum (asterisk) is seen.

P = pulmonary artery; B = left main bronchus. Other abbreviation as in Fig. 3.

Fig. 5 Three-dimensional computed tomography angiogram, left posterocranial projection, demonstrating right aortic arch with mirror image branching

The aortic diverticulum (asterisk) is situated at the proximal portion of the right-sided descending thoracic aorta. The ligamentum arteriosus, which is a component of the vascular ring, is supposed to be located between the aortic diverticulum and the pulmonary artery.

LCCA = left common carotid artery; LSA = left subclavian artery; LBCA = left brachiocephalic artery; RCCA = right common carotid artery; RSA = right subclavian artery; PA = pulmonary artery; LA = left atrium. Other abbreviations as in Fig. 3.

Fig. 6 Digital subtraction angiogram, posteroanterior projection, showing right aortic arch with mirror image branching

The first branch of the thoracic aorta is the left brachiocephalic artery, which is divided into two branches of the left common carotid artery and left subclavian artery. The second and third branches are the right common carotid artery and right subclavian artery, respectively. Opacification of the mediastinal nodule is barely visible, whereas the outer margin (arrowheads) is noted. The aortic diverticulum (arrow) overlaps the ascending thoracic aorta and left brachiocephalic artery, but a small part of the aortic diverticulum without overlapping is visible.

Abbreviations as in Figs. 3, 5.