Images in cardiovascular medicine

Motion-free ECG-gated 16-row multislice computed tomography in the follow-up of aortic coarctation with three-dimensional volume rendering

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Aortic coarctation consists of a localized reduction of the aortic diameter; it is generally congenital and can be diagnosed early or late depending on the severity of the stenosis. It is suspected on physical examination and then evaluated with imaging[1-4]. The accuracy of depiction of the great vessels and collaterals affects medical and surgical management[1,5]. Multislice computed tomography (MSCT) is becoming a standard noninvasive angiographic technique in diagnostic and therapeutic planning and plays an important role in the follow-up of interventional and surgical procedures[6,7].

MSCT scanners with improved temporal and spatial resolution have recently been introduced[8]. In particular, the new generation features 16 detector rows and the capability of scanning the entire thorax within a breath-hold: the retrospectively ECG-gated protocol rules out heartbeat motion artifacts.

A 35-year-old male, with a congenital isthmic coarctation of the thoracic aorta

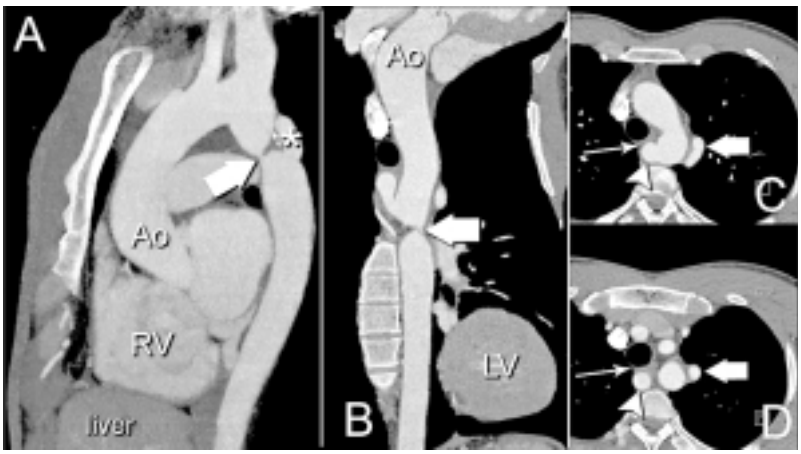

Figure 1. *Multiplanar images of multislice computed tomography scans. A para-sagittal plane of a thick maximum intensity projection shows the thoracic aorta in its entire course* (A) *with the coarctation at the level of the isthmus* (arrow) *and bypass* (*). *The curved multiplanar reconstruction along the central lumen line reproduces in one plane the same concept with the coarctation highlighted by the* arrow (B). *An axial slice at the level of the aortic arch shows the bypass* (thick arrow) *and the origin of the right subclavian artery* (arrowhead) *just posterior to the other supra-aortic trunks and above the isthmus* (C). *An axial slice taken more cranially at the level of manubrium of the sternum shows the position of the bypass* (thick arrow) *and of the right subclavian artery* (arrowhead) (D). *The position of the collapsed esophagus between the trachea and the right subclavian artery is highlighted in* C *and* D *by the* thin arrow. *This condition with the right subclavian artery running posterior to the esophagus is known as "arteria lusoria" and can determine symptoms such as dysphagia. Ao = ascending aorta; LV = left ventricle; RV = right ventricle.*

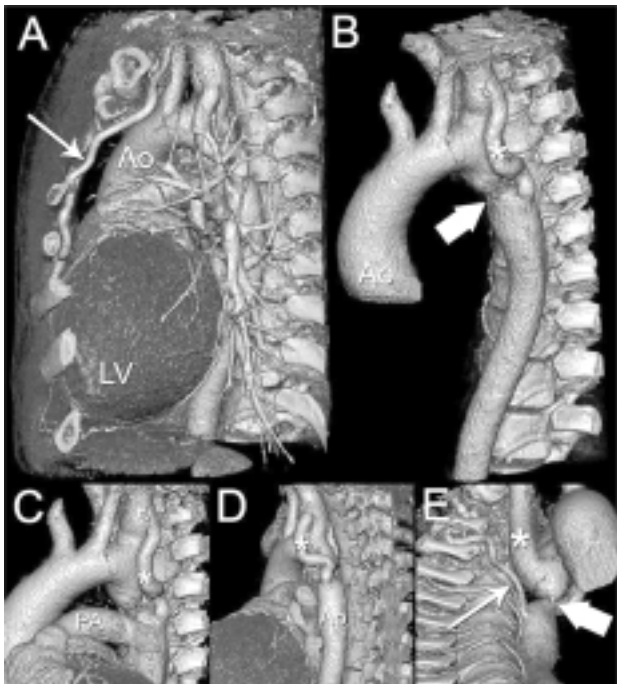

Figure 2. *Three-dimensional volume rendering of the thoracic aorta. The findings described in figure 1 are exploited with three-dimensional volume rendering. The left lateral view of the thorax* (A) *shows the macroscopic configuration of the main mediastinal vessels and the hypertrophic mammary arteries* (thin arrow). *After segmentation of all the main structures of the thorax except for the thoracic aorta and the spine, a clear view of the coarctation* (thick arrow) *and of the bypass* (*) *is available* (B). *Two magnified views taken at different angles show the relationship between the coarctation, the bypass* (*) *and the pulmonary artery (PA)* (C *and* D). *In* E *a view from below shows the hypertrophic intercostal vessels* (thin arrow) *just below the coarctation* (thick arrow)*, and the origin of the right subclavian artery* (*). *Ao = ascending aorta; LV = left ventricle.*

treated with an aorto-subclavian (left) bypass, retrospectively underwent ECG-gated 16-row MSCT (Sensation 16, Siemens, Forchheim, Germany) after the intravenous administration of 80 ml of iodinated contrast medium. The scan parameters were: detectors/collimation 16/1.5 mm, feed/rotation 6.0 mm (spiral pitch 0.25), gantry rotation time 0.42 s (effective temporal resolution 210 ms), scan time 18 s. Three-dimensional reconstructions with volume rendering algorithms were performed on a workstation equipped with a dedicated software (Leonardo, Siemens).

Relevant clinical findings were displayed with multiplanar/curved post-processing and maximum intensity projections (Fig. 1) and using three-dimensional volume rendering (Fig. 2). The coarctation as well as many hypertrophic collaterals (left and right mammary artery and intercostal arteries) were easily displayed. There was also an anomaly of the aortic arch called "arteria lusoria". The right subclavian artery originates caudally to the left subclavian artery and runs anterior to the spine.

MSCT angiography is suitable to diagnose and follow up patients with aortic coarctation, especially if completed with three-dimensional reconstructions[1,6].

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