Takayasu arteritis diagnosed by 16-row multidetector CT angiography

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ABSTRACT

Takayasu's arteritis is a well-known systemic disease that involves the aorta, major aortic branches, and pulmonary arteries. Conventional catheter angiography remains the 'gold standard' for disease diagnosis, in correlation with clinical data and laboratory findings. Multislice computed tomography angiography (MSCTA) has the advantage of non-invasively providing the angiographic data and combining morphological mural assessment with luminal evaluation. We present 2 such cases diagnosed by 16-slice MSCTA.

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Aortic stenosis has many causes including coarctation, midaortic dysplastic syndrome, atherosclerosis, Takayasu's arteritis, aortic dissection, or as a result of surgical repair. Takayasu's arteritis or nonspecific aortoarteritis is a rare disease of unknown etiology that usually affects young women. Although it has a worldwide distribution, it is most common in Southeast Asia. Takayasu's arteritis is an inflammatory process mainly affecting the thoracic and abdominal aorta and their branches and the pulmonary arteries. In the majority of patients, the onset of the disease is insidious. The current 'gold standard' investigation for the diagnosis and follow-up of patients with Takayasu's arteritis is catheter angiography. However, being an invasive procedure, it has its inherent limitations. Moreover, the findings are unreliable during the early inflammatory phase, as it does not provide information on mural inflammation or thickening. Multislice computed tomography angiography (MSCTA) has emerged as a promising non-invasive approach to vascular diseases by allowing simultaneous evaluation of luminal and vessel wall changes. We highlight the role of 16-slice MSCTA in the assessment of aortic diseases such as Takayasu's arteritis, and we assert that MSCTA is on its way in replacing catheter angiography as the new 'gold standard' in aortic imaging.

Case Report. *Patient 1.* A 21-year old female patient presented to the outpatients' department of Medicine with a complaint of headache for 12-14 months. She also complained of a vague abdominal pain for 8 months. There was no history of fever or exertional dyspnea. On physical and clinical examination, the patient was thinly built and hypertensive. A systolic bruit was auscultated in the left lumbar region and lower abdomen. There was a discrepancy in blood pressure measured in the upper extremities and the lower extremities. No cardiac murmur was auscultated. No bruit was heard over the subclavian and carotid arteries. The brachial pulses were normal. No abdominal mass was palpated. The hematological examination revealed erythrocyte sedimentation rate of 125 mm in the first hour and elevated C-reactive protein levels. Tuberculin test result was negative. Immunologic markers such as antinuclear antibody and antineutrophil cytoplasmic antibodies were negative.

Patient 2. A 33-year old female patient presented to the outpatients' department of Vascular Surgery with complaints of intermittent claudication and malaise for 10-12 months. She also complained of intermittent nausea and vomiting for 10 months. A history of weight loss for 8 months was also present. There was no history of fever, dizziness or exertional dyspnea. On physical and clinical examination, the patient was of average-build. A systolic bruit was auscultated in the mid-abdomen. The peripheral pulses in both lower limbs were feeble. There was a discrepancy in the blood pressure readings measured in the upper extremities and the lower extremities. No cardiac murmur was present. No bruit was present over either the subclavian or the carotid arteries. Both brachial pulses

were normal. The hematological examination revealed erythrocyte sedimentation rate of 147 mm in the first hour and elevated C-reactive protein levels. Tuberculin test result was negative. Immunologic markers such as antinuclear antibody and antineutrophil cytoplasmic antibodies were negative.

The x-rays of the chest and abdomen for both the patients were normal. Ultrasound examination showed localized aortic narrowing in the mid-abdomen in both the patients. The abdominal solid viscera were normal. An MSCTA was performed in both the patients to assess the status of the entire thoraco-abdominal aorta and its major branches. A 16-row multidetector CT scan machine was used with slice thickness 1.25 mm, pitch 0.75 with rotation time 0.6 seconds. The scan was performed in the cranio-caudal direction starting from the level of the root of neck until the level of mid-thigh. A 120 cc bolus of non-iodinated contrast (Inj. Iohexol 350 mgI/mL) was injected at a flow-rate of 6 mL/sec, followed by saline chase and the scan was started using the 'smart prep' software. Submillimeter axial sections were reconstructed with 50% overlap for post-processing techniques. Multiplanar reconstructions in sagittal and coronal planes were performed. Three-dimensional images were reconstructed by maximum intensity projection and volume rendering techniques. The abnormality of the aorta and its major branches seen on the three-dimensional images was correlated with the axial and multiplanar images. The MSCTA demonstrated concentric mural thickening of the abdominal aorta inferior to the origin of the superior mesenteric artery in both the patients. Left renal artery stenosis was also seen in the first patient (**Figures 1a & 1b**). Kinking of the aorta was seen in the second patient (**Figures 2a & 2b**). Smooth luminal narrowing was seen in the involved aortic segment (**Figure 1a**). Both pulmonary arteries as well as the aortic arch were uninvolved.

Discussion. Takayasu's arteritis or nonspecific aortoarteritis is a panarteritis of unknown etiology that primarily involves vessel walls. It usually affects young women, and its prevalence in females is approximately 10 times higher than in males. It is more common in the orient. However, it has no racial or geographical predilection. Takayasu's arteritis is an inflammatory process mainly affecting the thoraco-abdominal aorta with its branches and the pulmonary arteries. According to the diagnostic criteria established by the American College of Rheumatology (ACR), radiology is directly involved in the diagnosis of the disease, demonstrating the typical angiographic abnormalities. Recently, noninvasive methods such as MSCTA, magnetic resonance angiography (MRA) and positron emission tomography (PET) scanning have been investigated for their ability to clinch diagnosis and monitor disease activity in large vessel vasculitis.[1] Computerized tomography angiography has the advantage of combining morphological mural vessel assessment with luminal abnormality evaluation.[2] The MSCTA can be combined with two-dimensional multiplanar reformations and maximum intensity projection reconstructions in evaluating the occlusive lesions. Furthermore, axial images demonstrate circumferential wall thickening of the aorta and its involved branches. Three-dimensional volume rendered images clearly demonstrate the extent of aortic stenosis and the status of the distal vessels and

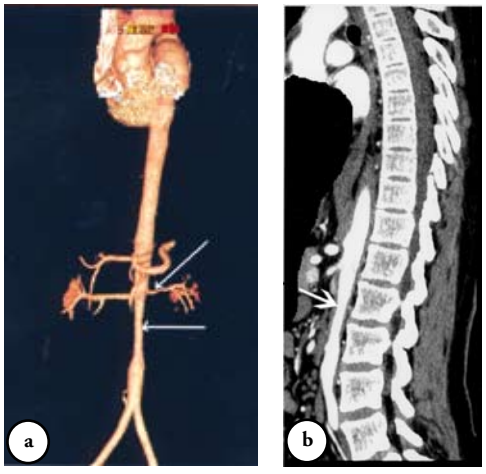

Figure 1 - Volume rendered **a)** and sagittal reconstructed **b)** CT images show concentric aortic mural thickening with aortic stenosis. The mural thickening extends to also involve the left renal artery (arrows).

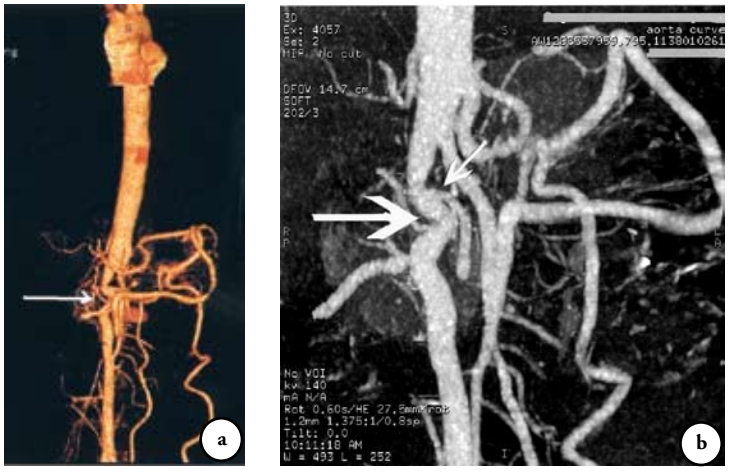

Figure 2 - Volume rendered **a)** and maximum intensity projection **b)** images show localized aortic stenosis and kinking (thick arrow) with multiple visceral collaterals. The left renal artery also shows mild ostial stenosis (thin arrow).

its branches. Aortic stenosis occurs most frequently in the descending thoracic and abdominal perirenal aorta, whereas, occlusions may affect the distal abdominal aorta or the aorto-iliac bifurcation. Aortic dilatation is less frequent and generally occurs in the ascending thoracic aorta. According to the ACR 1990 criteria, a pan angiography must be considered the first-choice technique for confirming a suspicion of Takayasu's arteritis. In many patients, diagnosis can be easily and noninvasively established through an accurate sonographic and color Doppler evaluation.[3] It however lacks the spatial resolution, is operator dependent, and does not provide a global view of the entire aorta and the pulmonary arteries. The PET technique could be helpful in the diagnosis and detection of inflammatory activity in patients with Takayasu's arteritis, because of its capacity to detect increased metabolism.[4] Catheter angiography is still the 'gold standard' technique for the diagnosis of vascular diseases. Detailed information concerning the site and extent of vascular involvement can be obtained with intra-arterial digital subtraction angiography (DSA). Thickening of the vessel wall cannot be recognized with either intravenous or intra-arterial DSA.[5] Sharma et al[6] assessed the morphologic mural changes in the aorta revealed by CT in patients with Takayasu's arteritis and concluded that CT showed distinctive changes in the aortic wall in patients with Takayasu's arteritis. The MSCTA can depict mural changes in the aorta and main vessels and also the luminal changes similar to DSA.[7] The MSCTA can show the various luminal changes, including stenosis, occlusion, dilatation, and aneurysm in the aorta. Furthermore, MSCTA depicted mural changes, including wall thickening, calcification and mural thrombi not seen with DSA.[8] Yamada et al[9] in 1998 evaluated the thoracic aorta in patients with Takayasu's arteritis with CT angiography and found its sensitivity and specificity in the diagnosis of Takayasu's arteritis to be 95% and 100%. The MSCTA has the potential for detecting Takayasu's arteritis and maybe superior to DSA, particularly at the early non-obliterative stage.[10]

We suggest that all the patients suspected of aortic stenosis should be subjected to 16-slice MSCTA for detection of the level and severity of aortic stenosis as well as mural wall thickening, as the standard diagnostic work-up protocol to establish the diagnosis of Takayasu's arteritis.

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