



Case Report

Aortic Coarctation Visualized by Volume Rendering 64-Row Detector Multislice Computed Tomography: A case Report

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The purpose of this case is to analyze the contribution of Volume Rendering Computed Tomography Angiography (CTA) as diagnostic procedure in the diagnosis of aortic coarctation (CoA). A 35 year old male patient was examined, using 64-Row Detector Multislice Computed Tomography. Imaging results and clinical findings were consistent with CoA. The case concluded that CTA is a non-invasive method of investigation of the heart and aortic normal anatomy and congenital variants, and it can be an alternative to the invasive angiographic investigations.

Keywords: Coarctation, Computerized Tomography, Volume Rendering

INTRODUCTION

A multitude of congenital anomalies may affect various portions of the aorta, one of them is the coarctation of aorta (Tongfu et al., 2007). This anomaly is found in 8% of overall congenital heart malformations; it is three times more frequently in males than in females patients (Schintz et al., 1957) and it is the third most frequent anomaly of cardiovascular system (Maeshal and Bogaert, 1998).

Clinically; hypertension, murmurs and other associated signs including the delay of pulse between the radial and femoral artery, variation in pressure between upper and lower extremities may be existing with the coarctation (Julsrud et al., 1979).

Although the diagnosis of coarctation of the aorta can usually be made on clinical grounds, imaging is also necessary to evaluate the anatomy of the lesion and

related abnormalities (Mohamad et al., 2014). MR imaging and Multi Detector Computerized Tomography (MDCT) are correspondingly useful for noninvasive evaluation of the aorta in patients with coarctation. Computerized Tomography Angiography (CTA) can define the character of the coarctation as well as associated cardiac anomalies (Hager et al., 2002).

Doppler echocardiography is used to recognize the site and severity of the coarctation as it is noninvasive imaging method for assessment of the pressure grade across the narrowing. But sometimes it is limited and the coarctations may be missed by Doppler echocardiography (Didier et al., 2006).

CTA is a noninvasive imaging method, which allows three-dimensional visualization of vessels from any angle from a single set of data acquisition (Cademartiri et al., 2004; Catalano et al., 2004). CTA is superior to the digital subtraction angiography in the ability to characterize the vascular wall beside the neighboring structures (Yoshida et al. 2003). However the poor visualization of minute collaterals as well as lack of dynamic information made it limited (Imai et al., 2004).

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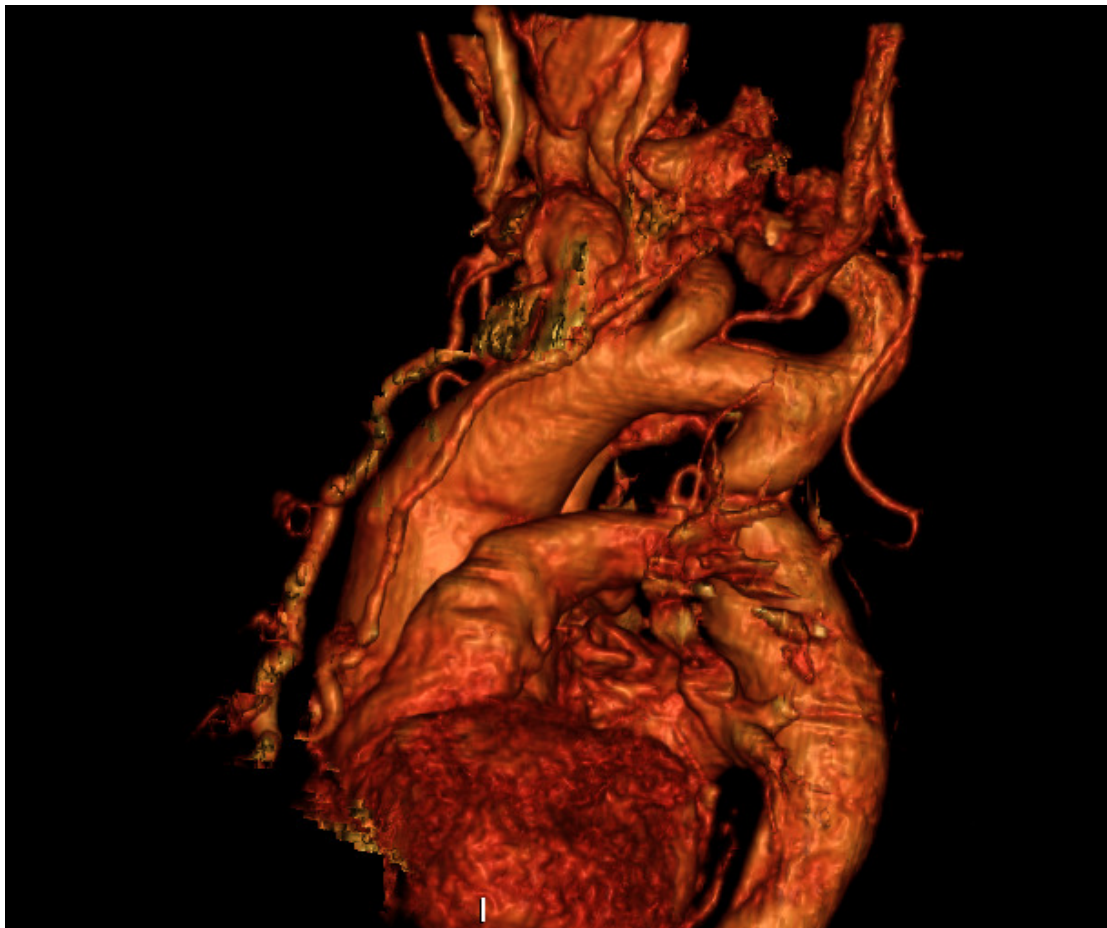


Figure 1. shows the Volume rendering technique diagnoses the coarctation, the descending thoracic aorta shows a short focal narrowing distal to the origin of the left subclavian artery, pre and post stenotic dilatation (former more pronounced). Prominent intercostal arteries from 2-8 bilaterally, ascending aorta =4.8 cm in diameter, the post stenotic segment=3.9 cm in diameter

MDCT three dimensional techniques provide morphologic images of coarctation of the aorta and its relationship to the arch (Hu et al., 2008; Utak et al., 2006).

This current study used MDCT scans to analyze the contribution of Volume Rendering Computed Tomography Angiography (VRCTA) as diagnostic procedure in the diagnosis of aortic coarctation (CoA).

CASE REPORT

A 35-year-old male patient was admitted to the department with increased shortness of breath, chest pain and fatigue. The case was diagnosed as arterial hypertension when the patient age was 17 years old; when he came for scanning; the blood pressure was 170/100 mm Hg. on the upper and 100/70 mm Hg on the

lower extremities with left inter scapular systolic murmur.

CT angiography for Aorta was done and the findings were as follows: the descending thoracic aorta shows a short focal narrowing distal to the origin of the left subclavian artery, pre and post stenotic dilatation (former more pronounced). Prominent intercostal arteries from 2-8 bilaterally, ascending aorta =4.8 cm in diameter, the post stenotic segment=3.9 cm in diameter. No aortic dissection was seen, normal brachiocephalic trunk, normal proximal stems of common carotids, normal subclavian arteries, normal abdominal aorta, normal bifurcation and iliac arteries. Normal renal arteries. No accessory supply, normal celiac trunk, hepatic and splenic arteries, normal SMA and major branches, normal IMA and major branches. The findings are consistent with coarctation of aorta. No cardiac abnormalities were found. The suggested treatment is surgical resection of the narrow segment. Figures (1,2)

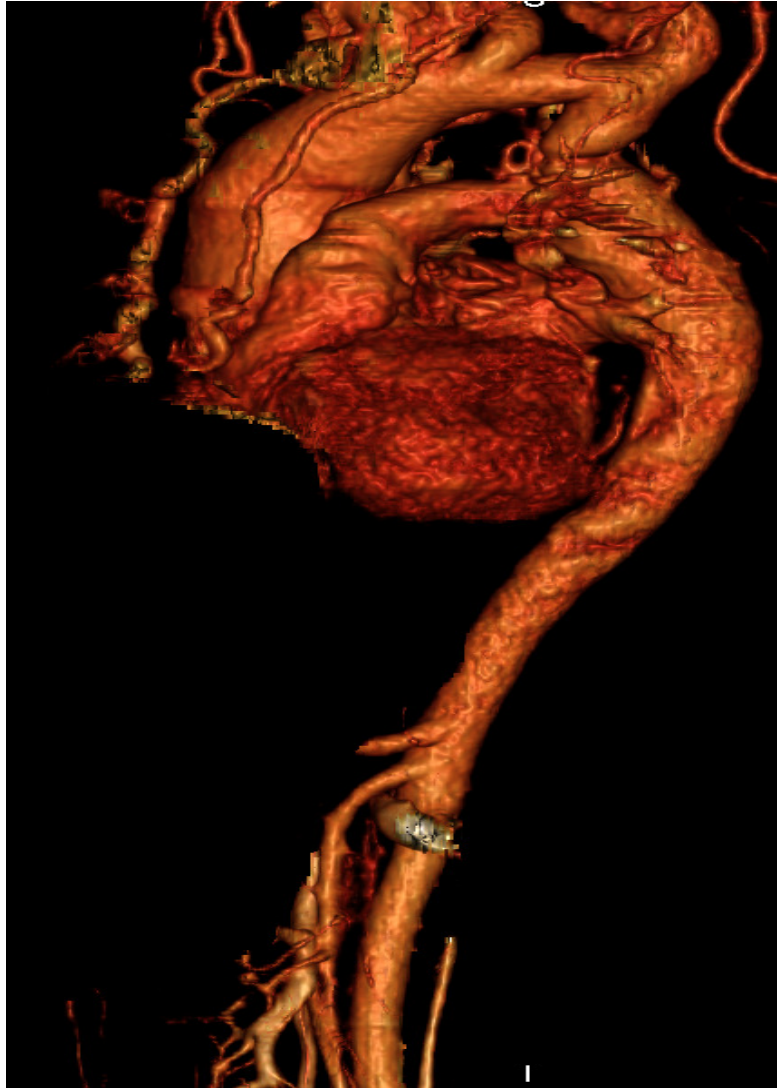


Figure 2. Volume Rendering Technique shows no aortic dissection and normal abdominal aorta.

DISCUSSION

Coarctation of the aorta is a congenital abnormality and classically considered a disease of infancy and early youth (Fixler, 1998) There are three types: Preductal, ductal and postductal coarctation (Valdes-Cruz and Cayre, 1998).

Numerous imaging modalities have been reported in the assessment of coarctation of the aorta. Conventional angiography remains the gold standard imaging method for patients with aortic coarctation before treatment for the reason that its ability to provide both anatomic and hemodynamic information allowing the visualization of the collaterals and assessment of associated cardiac malformations. However, this technique is invasive and enhances the risk for complications imposed by the coarctation (Godart et al., 2002).

When multiplanar and three dimensional post-processing techniques became obtainable, CT is considered to have a role in the assessment of vascular anomalies. MDCT has changed not only the imaging evaluation approach to aortic anomalies but also challenged the role of conventional angiography (Goo et al., 2005; Leschka et al., 2007; Schertler et al., 2007; Oguz et al., 2007)

Recently MDCT angiography has become a most important imaging method for the evaluation of vascular anomalies because of its short acquisition time and high spatial resolution (Lee et al., 2004) Its non-invasiveness gives it a great value for assessing the morphology of coarctation, characterizing the location and grade of the narrowing, presence of collaterals, Correlating to the left subclavian artery and associated cardiac anomalies. The importance of the knowledge about these considerations

is planning for operation assessment or interventional repair (Hu et al., 2008; Utak et al., 2006)

Axial CT images are insufficient for evaluation of short coarctation, Therefore three dimensional images are needed in the assessment of coarctation of the aorta (Mohamad et al., 2014)

The volume of data in CTA of the aorta makes a comprehensive review of all axial images impossible; the post processing techniques providing three-dimensional volumetric images are a prerequisite for efficient interpretation of the CTA and for reporting the findings (Tongfu et al., 2007). This is the cause why we choose the volume rendering technique for evaluation the case.

Our patient age, clinical signs and radiological findings are consigned with the diagnosis of coarctation. One study mentioned that coarctation is diagnosed in about 20% of patients at adolescence for the first time. With mean age at diagnosis is 10 years and in younger patients most frequent sign is murmur, and in older patients is systemic hypertension (Julsrud et al., 1979). Other associated signs are the delay of pulse between radial and femoral artery, difference in pressure between upper and lower extremities may take place (Julsrud et al., 1979). All these findings were obtainable in our patient.

In our series of Volume rendering CT images on CoA were confirmed in the case by scanning using Vitrea W/L:125/175, segmented VR: No Bone, KVP:120, mA: 350, msec: 450, mAs: 157, Krn: Fc18, Thk: 1mm, Aquilon, Orient: 176, 9, 0 degrees that allow an extraordinary morphologic presentation of the heart and great vascular structures as seen in Figures (1, 2).

Previous study compared the accuracy of axial CT, multiplanar reformats and 3D volume rendered images in the evaluation of coarctation of the aorta. The results showed that in the evaluation of coarctation, multiplanar and 3D volume rendered images performed slightly better than axial images. For the diagnosis of coarctation, sensitivities were 92% for axial, 100% for multiplanar and 100% for volume rendered images (Tongfu et al., 2007).

Regarding their results we also recommended the usage of VR Technique in diagnosing such cases. Management is conservative if asymptomatic, but may require surgical resection or angioplasty of the narrow segment of the artery (Radegran, 2003). The decided treatment for our case is considered to be surgery because the clinical presentation is hypertension.

CONCLUSION

Volume Rendering Multi Detector Computerized Tomography Angiography (VR MDCTA) is the method of choice for preoperative assessment of coarctation of the

aorta. It can easily diagnose the coarctation as the axial images may be insufficient for evaluation of short coarctations. Volume Rendering is fully acknowledged in the assessment of coarctation of the aorta.

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