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Research Paper

"Evaluation of Major Aorto Pulmonary Collateral Arteries in case of Ventricular Septal Defect-Pulmonary Atresia"-Three Case Report

Medical Science

KEYWORDS : Essential Medicines, Personal Drug(p-drug), Medical Representatives (MR).

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ABSTRACT

Three cases of pulmonary atresia and ventricular septal defect (PA-VSD) were examined by computed tomography angiography (CTA) using 64-MDCT to reveal the anatomy and morphology of the pulmonary circulation. We have diagnosed the cases as PA-VSD type A, B & type C. These cases show that 64-MDCT can be used to provide clinical information for PA-VSD with the appropriate examination protocols and post-processing techniques.

INTRODUCTION:

Patients with PA-VSD need clinical information, specifically the anatomy and morphology of the pulmonary circulation, to determine the surgical approach and overall outcome. Because early treatment can influence the outcome, the information should be acquired as early as possible, while the patient is still young. Capturing meticulous information in a young patient, whose anatomical structures are still small, is a challenging task in imaging. 64-MDCT is an alternative, noninvasive imaging modality that can be used for that purpose. Other information, such as coronary and intracardiac abnormalities, can be shown as well.

MATERIALS AND METHODS :

The patient was examined using a 64-MDCT scanner (Somatom Definition Flash, Siemens Healthcare). Post processing of the image data was performed using a Leonardo 3D post processing workstation with Syngo software (Siemens Healthcare). Image-reformatting techniques such as curved planar reformation (CPR), maximum-intensity projection (MIP), minimum-intensity projection (MinIP), and volume-rendering technique (VRT) were used to get the information.

The high-density contrast media filled the superior vena cava, right atrium, and right ventricle, as well as the ascending aorta, aortic arch, and descending aorta. But the contrast media density in the left atrium and left ventricle was not as high as in the aorta. Thus, the majority of the aortic flow was from the right ventricle (Fig. 1). There was no stenosis or dilatation of the ascending aorta, aortic arch, or descending aorta, The aortic arch branched to the brachiocephalic trunk, left common carotid artery, and left subclavian artery.

CASE REPORT 1:

The first patient was a 6 year old girl who had delayed growth and development without obvious signs of dyspnea and cyanosis. The patient had never experienced any serious clinical condition that required hospitalization; delayed growth and development was the major problem that led to a thorough clinical examination. The patient had a normal birth weight (2800g), but weight when examined at .

Clinical examination revealed a continuous heart murmur, and chest x-ray showed a "boot-shaped" heart with an upturned cardiac apex and concave pulmonary arterial segment. An echocardiography examination diagnosed the patient with PA-VSD and major aortopulmonary collateral arteries (MAPCAs). The CTA examination was requested for depicting the anatomy and morphology of the pulmonary circulation.

MIP CORONAL IMAGES; ⟶ MAPCAs are seen on both sides of the descending aorta reaching the hila and supplying the pulmonary parenchyma.

MIP CORONAL IMAGES; ⟶ MAPCAs, arising from the descending aorta,

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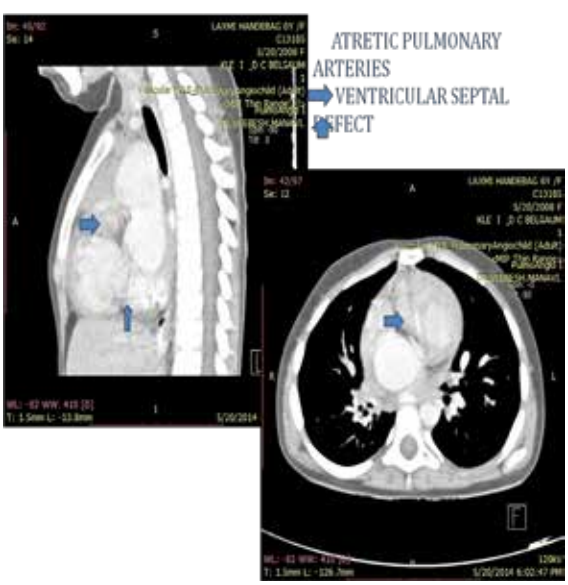
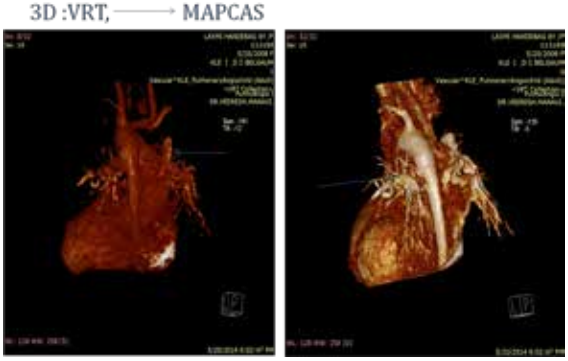
ATRETIC PULMONARY ARTERY, AORTA. Normal aorta arising from left ventricle, where as atretic pulmonary artery from right ventricle with hypoplastic or absent right and left branches of pulmonary arteries.



ATRETIC PULMONARY ARTERIES
VENTRICULAR SEPTAL DEFECT

3D :VRT, ⟶ MAPCAS



IMAGING FINDINGS:

In this case the main pulmonary trunk was atretic, the right & left pulmonary arteries are not visualized. There is no connection of vessels supplying the lungs to the right ventricle.

There are seen collaterals arising from the descending aorta on both sides, which are taking a tortuous course reaching the hila and supplying the lungs as main arteries called MAPCAs. This case is of MAPCA type C.

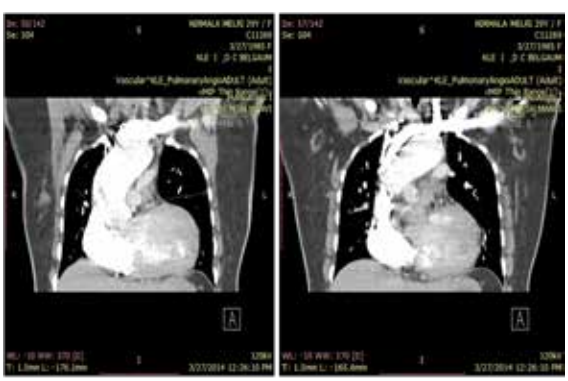
There was no patent ductus arteriosus (PDA), and no collateral vascularization from the pleura to the lung.

High-density contrast media had penetrated the at the interventricular septum. so the patient seemed to have ventricular septal defect.

Diagnosis : ventricular septal defect with pulmonary atresia and multiple aortopulmonary collateral arteries, VSD-PA with MAPCAs type C.

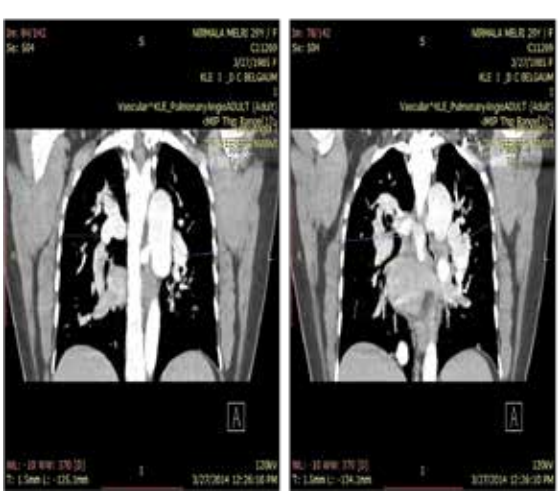
CASE REPORT 2:

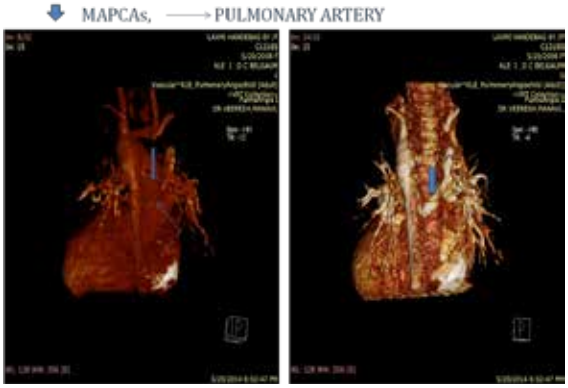
The second patient was a 29 year female who never had dyspnea and cyanosis during childhood. Patient developed dyspnea and intermittent cyanosis during her third trimester of pregnancy for which had undergone c-section. On follow up x ray was done which showed concave pulmonary arterial segment. An echocardiography examination diagnosed the patient with PA-VSD and major aortopulmonary collateral arteries (MAPCAs).). The CTA examination was requested for depicting the anatomy and morphology of the pulmonary circulation.



⟷ MAIN PULMONARY ARTERY IS ATRETIC, HOWEVER RIGHT & LEFT PULMONARY ARTERIES ARE PRESENT

MIP IMAGES; ⟶ MAPCAs





IMAGING FINDINGS:

- In this case the main pulmonary artery is atretic , the right pulmonary artery measures 1.4 cms, left pulmonary artery measures 1.3 cms.
- There are seen two MAPCAs seen to arise from the descending aorta and connecting right and left pulmonary arteries at the hila level.
- Cardiomegaly noted.
- Ventricular septal defect.
- Pulmonary veins, superior & inferior vena cava are draining normally.
- DIAGNOSIS : VSD WITH PULMONARY ATERSIA AND MAPCAs type B.

CASE REPORT 3 :

A 4 years male child referred for CT pulmonary angiography with complaints of cyanosis and dyspnea for the evaluation of the pulmonary arteries and intracardiac anomalies as echocardiography showed patent ductus arteriosus.

Imaging findings:

The main pulmonary artery is atretic,

The right pulmonary artery measures 6.0 mm

The left pulmonary artery measures 8.0 mm

There is seen a vascular channel connecting the arch of the aorta with right pulmonary artery.

Patent ductus arteriosus noted with prominent aortic knuckle.

Ventricular septal defect noted.

DIAGNOSIS: VSD-PA with PDA & RIGHT MAPCA (variant of type A MAPCA)

DISCUSSION: MAPCAs : MAJOR AORTO PULMONARY COLLATERAL ARTERIES,

They represent the fetal primitive intersegmental arteries that originate from the descending aorta have not involuted. They gain access to the lung through the hilum and connects to the native pulmonary artery at the Mediastinal level, at lobar or at sub segmental level. MAPCAs are different from the bronchial arteries in many ways. MAPCAs do not branch in the mediastinum whereas bronchial arteries do.

MAPCAs anastomose with the intrapulmonary arteries at or near hilum and do not form plexus around bronchi.

The source of pulmonary blood flow in PA-VSD is the systemic arterial circulation. PA-VSD is classified into three types according to the source of pulmonary blood flow. 2 Surgical options of each type are based on the presence or absence of NPA (Native Pulmonary Arteries) and MAPCAs.

In the most frequent type of PA-VSD, type A, pulmonary circulation is through the PDA into the confluent pulmonary arteries supplying all of the bronchopulmonary segments.

PA-VSD and MAPCAs comprises only about 25% of PA-VSD.

In type B, NPA (native confluent pulmonary arteries) are present with MAPCAs.

In type C, there are only MAPCAs, without NPA. The non-confluent pulmonary arteries exist in 20-30% of the PA-VSD patients.

MAPCAs are large and distinct arteries, highly variable in number that usually arise from the descending aorta, but uncommonly may originate from the aortic arch, the subclavian, the carotid or even the coronary arteries.3 There is at least one MAPCA in the whole cases with nonconfluent pulmonary arteries.

CONCLUSIONS:

Using various MDCT post processing techniques the total number of MAPCAs and their origin, course and intrapulmonary connections can be easily assessed.