A two-month-old boy suffering from dyspnea was referred for evaluation. Physical examination showed systolic murmur located at the apical left precordial region. Chest X-ray showed cardiomegaly. Echocardiography revealed left ventricular enlargement with severe systolic dysfunction.

Imaging Findings:

Chest X-ray revealed cardiomegaly (Fig. 1). CT angiography using dual-source CT revealed anomalous origin of left main coronary artery from the pulmonary artery (ALCAPA) to the right (Fig. 2A) and superior to origin of right pulmonary artery (Fig. 2B). Left main coronary artery was arising from the right sided aortic facing pulmonary sinus. Volume rendered image (Fig. 3) reveals the crisscross orientation of branch pulmonary arteries. Coronal image (Fig. 4) shows the dilated left ventricle with subendocardial ischemic hypodensity. Axial image (Fig. 5A) and volume rendered image (Fig. 5B) shows that the left coronary artery is arising from the main pulmonary artery. The origin and course of right coronary artery was normal. The child underwent repair for ALCAPA. Left main coronary artery was incorporated into proximal aorta using right saphenous vein graft. Graft was sutured to left main coronary artery bifurcation and wall of proximal aorta. LeCompte’s maneuver (anterior translocation of pulmonary artery) was done.

Discussion:

Crossed pulmonary artery is a classic form of malposed branch pulmonary arteries with both an abnormal origin and course. The key feature in this abnormality is to identify the exact relationship of the branch pulmonary arteries. The detection of malposed pulmonary arteries is extremely important especially in preoperative assessment as it is invariably associated with many other complex cardiac and extracardiac anomalies. Crisscross or crossed pulmonary arteries (CPA) is a rare malposition of the branch pulmonary arteries where the left pulmonary artery (PA) originates from the pulmonary trunk to the right and usually above the origin of the right PA and then they cross each other on their course to each respective lung [1]. CPA is almost always associated with several other congenital and chromosomal abnormalities like atrial septal defect, truncus arteriosus, interrupted aortic arch, tetrology of fallot, right aortic arch, ventricular septal defect, double aortic arch, 22q11 deletion and trisomy 18 [2-9]. The anatomic relationship of the branch PAs can be difficult to diagnose on echocardiography [10]. Also, on catheter angiography it is a challenge to recognize the catheter position and course [11]. Multislice dual source CT has high
temporal and spatial resolution and provides noninvasive accurate interpretation of such complex cardiac anomalies and associated malformations [12]. Multiplanar reconstructions and volume rendered techniques improves preoperative assessment and help in surgical planning. The closest differential of the entity is pulmonary artery sling in which the left PA arises from right PA and then courses between the trachea and esophagus to reach the left lung. This may cause airway obstruction. However, the CPA does not result in any mechanical or hemodynamic consequences. [10] In the present case, the systolic dysfunction and left ventricular enlargement was due to the anomalous origin of left coronary artery from the pulmonary artery (ALCAPA).

TAKE HOME POINT
Anomalous left coronary artery from the pulmonary artery (ALCAPA) is a rare cardiac malformation associated with other congenital malformations like atrial septal defect and ventricular septal defect. Its association with criss-cross pulmonary arteries is extremely rare. Multislice CT and three dimensional volume rendered techniques are invaluable in accurate preoperative imaging and surgical planning of this abnormality.

Differential Diagnosis List: Criss-cross pulmonary arteries with ALCAPA, Criss-cross pulmonary arteries with ALCAPA, Pulmonary artery sling

Final Diagnosis: Criss-cross pulmonary arteries with ALCAPA

References:
Description: Plain chest radiograph of the infant shows evidence of gross cardiomegaly. Origin: Department of Cardiac Radiology All India Institute of Medical Sciences, New Delhi-110029, India
Figure 2

Description: CTA axial image shows the origin of left pulmonary artery from the main pulmonary artery to the right and superior to the right pulmonary artery.
AO: aorta; PA: Main pulmonary artery; LPA: left pulmonary artery

Origin: Department of Cardiac Radiology All India Institute of Medical Sciences, New Delhi-110029, India
Description: The subsequent inferior section of axial CT shows the origin of right pulmonary artery. AO: aorta; PA: Main pulmonary artery; RPA: right pulmonary artery. Origin: Department of Cardiac Radiology All India Institute of Medical Sciences, New Delhi-110029, India
Description: Volume rendered image shows the criss-cross pattern of branch pulmonary arteries. RPA: right pulmonary artery; LPA: left pulmonary artery; PA: main pulmonary artery Origin: Department of Cardiac Radiology All India Institute of Medical Sciences, New Delhi-110029, India
Description: Multiplanar reconstructed coronal image shows gross dilatation of left ventricle with presence of subendocardial ischemic hypodensity (arrow).

LV: Left ventricle  Origin: Department of Cardiac Radiology All India Institute of Medical Sciences, New Delhi-110029, India
Description: Axial CT image shows the anomalous origin of left main coronary artery from the pulmonary artery from right lateral aspect.
LM: left main; PA: main pulmonary artery; AO: aorta; LAD: left anterior descending coronary artery
Origin: Department of Cardiac Radiology All India Institute of Medical Sciences, New Delhi-110029, India
Description: Volume rendered image shows that left main coronary artery is arising from main pulmonary artery and dividing normally into left anterior descending and left circumflex artery. LM: left main coronary; LCX: left circumflex coronary artery 

Origin: Department of Cardiac Radiology, All India Institute of Medical Sciences, New Delhi-110029, India