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Case Report
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Double Left Anterior Descending Artery in Anomalous Left Coronary Artery from Pulmonary Artery: A Rare Malformation

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Abstract

Double left anterior descending artery (LAD) in an anomalous origin of left main coronary artery from pulmonary artery (ALCAPA) is an uncommon congenital cardiac malformation. Here we are reporting a case of 7 years old male child who had double LAD with ALCAPA. The patient underwent successful surgical correction with coronary translocation technique.

Case Presentation

The index case was a 7 year-old male child, weighing 20kgs, who presented with complaints of dyspnea on exertion NYHA class II since 3 months. On examination, a chest radiograph showed presence of cardiomegaly. Echocardiogram revealed mild left ventricular dysfunction with mild pulmonary hypertension with mild mitral regurgitation (MR). Contrast enhanced computed tomography confirmed presence of double LAD with ALCAPA. Left main pulmonary artery was arising from main pulmonary artery from posterior sinus and it was divided into short LAD and left circumflex artery. After giving a septal branch, the short LAD was then terminated into large diagonal branches which were tortuous in their course. LCX showed normal course in the left atrioventricular groove. Right coronary artery (RCA) showed normal origin from the right coronary cusp and both were dilated. A long LAD was originating from RCA which was coursing in the anterior interventricular groove and reaching up to the cardiac apex. Long LAD was giving origin to multiple septal and diagonal branches which were supplying the interventricular septum and the anterior wall of the left ventricle (Figures 1 & 2).

The patient underwent surgical repair on cardiopulmonary bypass with aortic and single right atrial cannulation with moderate hypothermia and ante-grade blood cardioplegia both into aorta and pulmonary artery. The left main coronary artery was translocated from pulmonary artery to aorta using in-situ trapdoor technique. Patient was rewarmed and was weaned off from CPB without any problem. The postoperative course was uncomplicated. Post op echocardiography showed presence of mild LV dysfunction with mild MR. The patient was discharged on the 6th postoperative day. Patient is still under follow up and he is doing fine.

Discussion

Double left anterior descending artery (LAD) is a very rare coronary artery anomaly with an incidence of 0.13-1% and it is especially common with Tetralogy of Fallot.1 Double LAD was traditionally classified into 4 types by Spindola-Franco [1]. Subsequently six additional subtypes including new variant of type 7 were later published [1,2]. There may be different branching patterns of diagonal and septal branches in the dual LAD anomalies. In general, short LAD lies in proximal interventricular groove and gives major septal branches while long LAD reaches up to the apex and gives rise to diagonal branches [2]. Anomalous origin of left coronary artery from the

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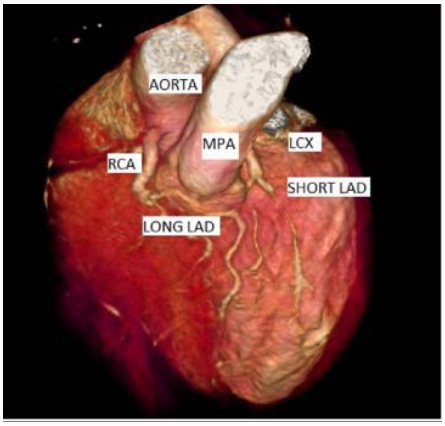

Figure 1: Figure 1 & 2 showed CT coronary angiography image showing anomalous origin of LAD with combination of dual LAD and ALCAPA. Left main pulmonary artery was arising from main pulmonary artery from posterior sinus and it was divided into short LAD and left circumflex artery. Right coronary artery showed normal origin from the right coronary cusp and it was giving origin to long LAD.
MPA: Main Pulmonary Artery; LAD: Left Anterior Descending Artery; RCA: Right Coroary Artery; LCX: Left Circumflex Artery.

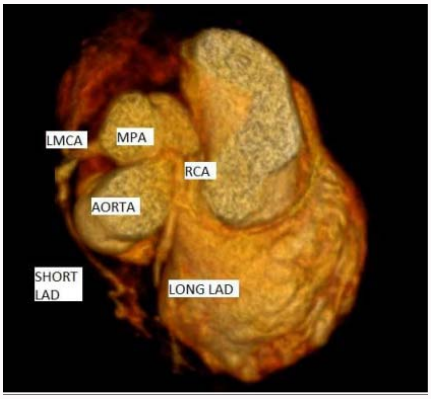

Figure 2: Figure 1 & 2 showed CT coronary angiography image showing anomalous origin of LAD with combination of dual LAD and ALCAPA. Left main pulmonary artery was arising from main pulmonary artery from posterior sinus and it was divided into short LAD and left circumflex artery. Right coronary artery showed normal origin from the right coronary cusp and it was giving origin to long LAD.
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pulmonary artery is usually detected in infancy and is often fatal if left untreated, due to left ventricular ischemia [3]. Successful surgical repair in a presence of double LAD with ALCAPA has been not been reported to best of our knowledge and it can also added to the existing classification as a newer type.

Anomalous origin of left main coronary artery (LMCA) from the pulmonary artery, also referred to as Bland-White-Garland syndrome is a rare congenital cardiac anomaly with a reported incidence of 0.25-0.5% of all congenital cardiac anomalies [3]. In this condition left to right shunt with coronary steal occurs due to reversal of flow in LMCA which is arising from pulmonary system. It is one of the most common causes of myocardial infarction and cardiac death in children. Diagnosis is usually made from Echocardiography. Additional imaging techniques such as computed tomography scan are undertaken only when definitive diagnosis by echocardiography is not possible or to exclude other potential diagnosis. After stabilizing the patient with medical management, surgical repair of the anomaly is the treatment of choice. The surgical goal of the various techniques is establishment of two coronary systems. Various techniques include a direct reimplantation of the left main coronary artery in the aorta , left subclavian artery—coronary artery anastomosis, saphenous vein bypass graft, and intrapulmonary tunnel operation (Takeuchi procedure) [4-6]. Re-implantation of the LCA to aorta has been treatment of choice in most of the patients as performed in index case.

Several features of this rare anomaly we would like to mentioned here. In patients with double LAD with ALCAPA, left ventricular function is better preserved because only the myocardium supply by LCX is at risk from coronary steal phenomenon. This observation further supported by the fact that anomalous origin of LAD from the pulmonary artery has better prognosis as compared to anomalous origin of LMCA from the pulmonary artery [7]. Patients with this anomaly also tend to have less MR due to the same reason. Intraoperatively surgeon has to be very careful while reimplanting LMCA because there is a chance of acute LCX kinking. To prevent this complication in situ trapdoor or trapdoor alone technique should be used. Post-operative course of the patient generally remain smooth due to comparatively better preserved LV function and less MR then patients with ALCAPA alone.

Conclusion

Combination of double LAD with ALCAPA is a very rare anomaly. Multi-slice CT provides accurate diagnosis of these coronary artery anomalies with good anatomical detail non-invasively. Successful translocation of LCA to aorta is feasible in this anomaly and results of surgery remains good in this subset.

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