Case Report
Quadrifurcation of Left Coronary Artery – An Extremely Rare Variation that can Lead to Acute Coronary Artery Syndrome

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Abstract: Coronary arteries present many variation and those variations have been well documented. Some of the variations of these arteries are life threatening since they compromise the myocardial irrigation and also pose challenges in percutaneous cardiac catheterizations. A rare variation of left coronary artery was noted during routine dissection classes. The left coronary artery had a diameter of 6mm at its origin and after a course of 4mm, it quadrifurcated. Among the four branches, one was anterior interventricular, one was circumflex and the other two were intermediate ventricular branches. The quadrifurcation might be of interest to cardiologists and radiologists.

Key Words: Coronary, Heart, Cardiac, Artery, Variation

Introduction:
Left coronary artery is a branch of ascending aorta. It arises from the left posterior aortic sinus and divides into anterior interventricular and circumflex branches. It supplies left side of the heart and anastomoses with the right coronary artery on the surface of the heart. Many variations of the left coronary artery have been reported in the literature. Some of the reported variations of the left coronary artery include its absence [1], trifurcation [2], origin from pulmonary trunk [3] and origin from right sinus of Valsalva [4]. Quadrifurcation of the left coronary artery is seen in extremely rare cases. The current case is unique compared to the earlier reported cases and might pose problems to the cardiologists during angiography procedures. The aim of this report is to alert the radiologists and cardiologists about this rare variation.

Case Report:
During regular dissection classes for medical undergraduates, a rare variation in the branching pattern of left coronary artery was noted. The heart had normal anatomy and a healthy look and size. The left coronary artery arose from the left posterior aortic sinus. The origin of the artery was broader than usual with a diameter of 6mm. After a course of 4mm between the pulmonary trunk and left auricle, the artery divided into 4 branches.

Figure 1. Left side of the heart showing the quadrifurcation of the left coronary artery.

(PT – pulmonary trunk; AA – ascending aorta; LA – left auricle; LV – left ventricle; LCA – main trunk of left coronary artery; 1- anterior interventricular artery; 2 and 3 – intermediate branches; 4 – circumflex artery; 5 – ventricular branch of circumflex artery)

Largest branch was the anterior interventricular artery, followed by the circumflex artery. The other two intermediate branches were smaller and they ran under the epicardium of the left ventricle for about 5cm before they submerged into the myocardium. The circumflex artery gave a large left ventricular branch and then ran in the left atrioventricular groove. Distribution of the anterior interventricular and circumflex arteries was normal. The right coronary artery too had a normal course and distribution.
Discussion:
Coronary arteries are the important arteries since they supply the myocardium. Coronary embolism results in irreparable damage to the myocardium. Variations in the origin and branching pattern of coronary arteries might lead to pathological changes of the vessels, which may in turn result in life threatening myocardial infarction. It is important to document all the variations of coronary arteries found during dissection of cadavers, cardiac surgeries and radiologic procedures. In a study by Cavalcanti et al., (1995), the left coronary artery trifurcated in 38.18% cases. In 1.84% cases, its circumflex and anterior interventricular branches had separate origins [5]. Another study reports the trifurcation of left coronary artery in 36.66% cases [6]. In a study by Graidis et al., (2015) 2.33 % of cases had variations in the coronary arteries [7]. In the same study, the left coronary artery took origin from the right sinus of Valsalva in 0.08% cases and from pulmonary trunk in 0.04% cases. In a study by Baptista et al., (1991) the left coronary artery bifurcated in 54.7%, trifurcated in 38.7% and quadrifurcated in 6.7% of cases [8]. The coronary artery variations can be detected in echocardiography, computed tomography (CT) and coronary angiography. Hence, for radiologists, it is good to be aware of all the variations of the coronary arteries. Very few cases of quadrifurcation of the left coronary artery have been reported earlier. Large diameter at origin and a short course before termination into four branches makes the current case unique. Cannulation of the left coronary artery might be challenging in a case like this. It could also lead to acute coronary artery disease and inadequate blood supply to myocardium supplied by left coronary artery.

Conclusion:
Current case is one among the rare variations of left coronary artery. The artery, after a very short course, quadrifurcated. At the quadrifurcation, the vessel diameter was large. This might hinder the proper irrigation of the myocardium supplied by the branches of left coronary artery. It might also pose problems in catheterization procedure.

References: