Introduction:

The right coronary artery (RCA) is a branch of the ascending aorta and arises from the right aortic sinus. It lies in relation to the atrioventricular groove (AVG) submerged in the adipose tissue of the epicardium. It continues towards the posterior interventricular groove and often crosses the crux of the heart. In most of the subjects, the RCA supplies the SA node, AV node, right atrium, most part of right ventricle excluding the part along the anterior interventricular groove and the posteroinferior part of interventricular septum.[1]

Coronary artery disease (CAD) is the single most common cause of death in the developed world. CAD accounts for 1 of every 5 deaths given the unhealthy food habits, sedentary lifestyle etc. On an average, the frequency of critical narrowing of RCA amounts to 30 to 40 %. Hence it becomes important to understand the variations associated with RCA. We report here one such case.

Case Report:

Unusually Looped and Muzzled Branches of Right Coronary Artery

Authors
Anitha Guru, Senior Grade Lecturer
Naveen Kumar, Assistant Professor
Prasad Alathady Malloor, Associate Professor
Jyothsna Patil, Lecturer
Ashwini Aithal Padur, Lecturer

Department of Anatomy, Melaka Manipal Medical College (Manipal campus), Manipal University. Karnataka, India.

Address for Correspondence
Dr. Naveen Kumar,
Assistant Professor
Melaka Manipal Medical College, Manipal campus
Manipal University, Manipal
Karnataka State,
India.
E-mail: naveentonse@gmail.com

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Abstract: Coronary artery disease (CAD) is the major cause of death in developed countries as it accounts on an average for 1 of every 5 deaths. Morphological variations of coronary arterial system is one of the causative factor for CAD. Anatomical knowledge of all possible variant patterns of coronary arterial system is imperative in the diagnostic and therapeutic approach of CAD. We report here a rare branching pattern of right coronary artery (RCA). The origin of RCA was normal but the course and branching pattern of it were atypical. RCA was not occupying its usual position in atrioventricular (coronary) sulcus and its course was incomplete. It gave a ventricular branch to right ventricle, which presented an unusual looping pattern. It terminated as right marginal artery following its muzzled appearance within the musculature of the ventricle.

Key Words: Right coronary artery, looped, atrioventricular groove

The heart of an adult male cadaver (aged about 55 years) was being dissected for the undergraduate medical students. While dissecting the right side of the heart, a small projection was seen to rise above the surface of the heart at the upper part of the border (along the right AVG) of right ventricle. Upon dissection of the right AVG, it was found unoccupied. On further probing, atrial branches bearing a proximal origin were spotted, but no ventricular branches were seen. Exposure of the upper part of the right AVG revealed the presence of the RCA (Fig 1a). Its first branch (ventricular) was atypically looped bearing two bends and passed towards the myocardium of the right ventricle (Fig 1b). The space underneath the loop was filled with adipose tissue. It then went astray in the myocardium of the right ventricle. RCA further gave rise to many long atrial branches of very thin caliber which coursed across the right AVG and went in to right atrium (Fig 1b). Few atrial branches coursed along the right AVG before entering the right atrium. The main trunk then entered the myocardium of the right ventricle. The ventricular branches initially coursed superficially in the right ventricular wall and then passed on to deeper parts. One major branch in particular (muzzled branch) travelled within the myocardium of right ventricle parallel to the right AVG, with the elevation it produced being seen on the surface. It then emerged on to the surface of the heart and continued as the right marginal artery.

For the further part, the RCA was not seen in the AVG (Fig 2) and it did not reach the crux of the heart. The coronary sinus was the sole relation to the AVG.
Coccoronary artery anomalies (CAA) are incidentally discovered during coronary angiographic study or while performing an autopsy with incidence rate of 0.64% to 1.3%.[2] In the case we report here, we discovered the variation during cadaveric dissection. Lluri et al [3] classify coronary artery anomalies in to 2 main categories. And both categories pertain to origin of the coronary artery. One category contains those originating from the opposite aortic sinus and the other includes those originating from the pulmonary trunk. Absence of RCA has been reported by few authors.[4,5] Studies on variant origin of RCA have been conducted. Elliott et al [6] and Ayalp et al [7] in their studies involving vast number of subjects enumerate the variant origins of RCA. Papadopoulou et al [8] discuss about the agenesis of the RCA ostium. In the present case, origin of RCA was normal but the variations were seen in its course and some of its branches.

In the literature review, a looped course of the RCA is reported by Satija et al.[9] In their reported case, the RCA was found to loop around the pulmonary trunk. The looping seen in the present case was not near the pulmonary trunk. The passage of the ventricular branches within the myocardium may give the appearance of a myocardial bridge. Angelini et al in their work in 1999, discuss the consequences of the severity of myocardial bridge and conclude that in most cases they are a usual variants.[10]

Olivey et al [11] and Lluri et al [3] elaborate on the embryological basis for such variations of RCA. Olivey et al propose that an elaborate interaction of epicardial cells with myocardial cells leads to the transformation of epicardial cells into mesenchymal cells, as precursors of building blocks of coronary vessels.[11] Lluri et al [3] add on that maturation of developing coronary vessels which includes migration of smooth-muscle cells, proper arrangement of these cells, growth of some vessels, and regression of others through apoptosis. Any abnormalities during this delicate, well controlled process may lead to congenital coronary artery anomalies.

Taylor et al [12] postulate that in an anomalous course of right coronary artery in the sulcus between the pulmonary trunk and the aorta there is an increased risk of malignant arrhythmias and sudden death. In the reported case the presence of the looping above the surface of the heart may also pose similar increased risks. As said by Lluri et al [3] discrepancies in reporting suggests that not all myocardial bridges cause symptoms and symptoms if present usually act secondary to ischemia. Eckart et al in their 25-year review of autopsies in military recruits mention that cardiac abnormality accounted for 51% of sudden deaths in young adults, with coronary artery abnormality accounting for 61% of it.[13] These reports provide substantial proof that knowledge of coronary artery variations and abnormalities are highly important and not to be ignored. Angelini et al propose that choice of treatment for such CAA as supported by most of literature is surgical revascularization.[10] Coronary angioplasty with stent deployment may be employed here provided normal anatomy of the concerned coronary artery.

Conclusion

In this case, the branches of RCA present a unique loop and appears to have gone astray and are muzzled in the myocardium of the right ventricle. The course of the RCA was also incomplete and atypical as compared to its normal anatomy. Such a variation in the course of RCA accompanied by the unique looping and muzzling pattern is rare. It may pose a tough challenge to the radiologists and cardiologists in performing various procedures such as coronary stenting involving the RCA.

References


