

Research article - Human anatomy case report

Single right coronary artery with hypoplastic left coronary artery represented by only descending septal branch from the right sinus of Valsalva

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Abstract

A case is presented with combined anomalies of coronary arteries: single dominant right coronary artery, ectopic origin of hypoplastic left coronary artery from the right sinus of Valsalva, anomalous interseptal course of the latter artery, absence of typical left descending and circumflex arteries from the left coronary artery and presence of myocardial bridging.

Key words

Congenital anomaly, single right coronary artery, aberrant hypoplastic left coronary artery, descending septal branch, collateral circles

Introduction

Congenital coronary artery anomalies are rare pathological conditions. There are differences from normal in origin, course, intrinsic anatomy and termination. The incidence of anomalous origin of one of the coronary arteries is about 0.16-2.2% in routine angiography, and 0.3% in autopsies (Yamanaka and Hobbs, 1990; Topaz et al., 1992; Frescura et al., 1998; Balaguer-Malfagón et al., 2005; Komatsu et al., 2008; Ouali et al., 2009; Chen, 2012; Opolski et al., 2013; Turkmen et al., 2013). The incidence of left coronary artery from the right sinus of Valsalva among patients undergoing angiography is higher (0.07%) comparing to right coronary artery arising from the left sinus of Valsalva (0.04%) (Rigatelli et al., 2004). Single coronary artery is an extremely rare anomaly, occurring in 0.024-0.066% cases (Lipton et al, 1979; Desmet et al., 1992; Braun et al., 2006; Yadav et al., 2013). The clinical significance of these abnormalities in many cases is relevant. Even among young individuals, myocardial ischemia and sudden death may arise with coronary anomalies, *e. g.* when an abnormal coronary artery is located between the aorta and pulmonary trunk (Basso et al., 2000). We report this postmortal case of such a rare congenital anomaly of single right coronary artery with hypoplastic left coronary artery having an interseptal course, represented by a descending septal branch.

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Materials and methods

The reported heart was obtained from an adult cadaver used for teaching to undergraduate students at the Department of Anatomy.

Results

No left coronary ostium was found within aortic root or near the corresponding aortic sinus of Valsalva. Two openings were seen in the depth of the orifice of the right sinus of Valsalva (Fig. 1A). The system of the left coronary artery, represented by an aberrant hypoplastic vessel, originated from an orifice from the right aortic sinus. It had interseptal course and appeared only as the descending septal branch. The size of the vessel at the level of the origin was 5 times less than that of right coronary artery and it coursed through the proximal 2/3 of the interventricular septum (Fig. 1B).

The dominant, enlarged right coronary artery arose from the right sinus of Valsalva through a large orifice just rightward to the small orifice of the left, hypoplastic coronary artery. It had normal course in the right atrioventricular groove with its typical proximal branching.

The acute marginal artery, originated from right coronary artery, went down winding along the acute margin of the heart, reached the posterior atrioventricular groove at its lower third and was coated by a myocardial bridge 2 cm long (Fig. 1C, Fig. 2). It turned over the apex of the heart and headed up into the anterior interventricular groove, going deep into the myocardium. It resurfaced twice, followed its course intramural (Fig. 1D, Fig. 2) and joined the right posterior atrioventricular branch of the right coronary artery. This branch of the right coronary artery ran in the left atrioventricular groove until the anterior surface of the heart, where it gave off two branches both corresponding to the obtuse marginal artery. One of these branches anastomosed with a large branch of the acute marginal artery, which sprang out at the top of the heart. The other branch joined one of the posterolateral branches deep within the free wall of the left ventricle (Fig. 2).

A mass of dense connective tissue with several lacunar cavities embraced the left half of the pulmonary trunk wall, extending between the pulmonary tract and the left auricle, reaching the aortic wall and filling the left atrioventricular groove up to the coronary sinus (Fig. 1E).

Discussion

Congenital coronary artery anomalies encompass a range of several anomalies. They are reported as absent coronary artery, anomalous location of coronary ostia, ectopic origin, anomalous course of coronary arteries, anomalies of intrinsic coronary arterial anatomy or its termination. The origin of the left coronary artery may present as a common coronary trunk from the right sinus of Valsalva, or as separate ostia from that same sinus, like in our case (King, 1940; Joshi et al., 2010). The course of the aberrant main left coronary artery may be of four types: prepulmonic, retroaortic,

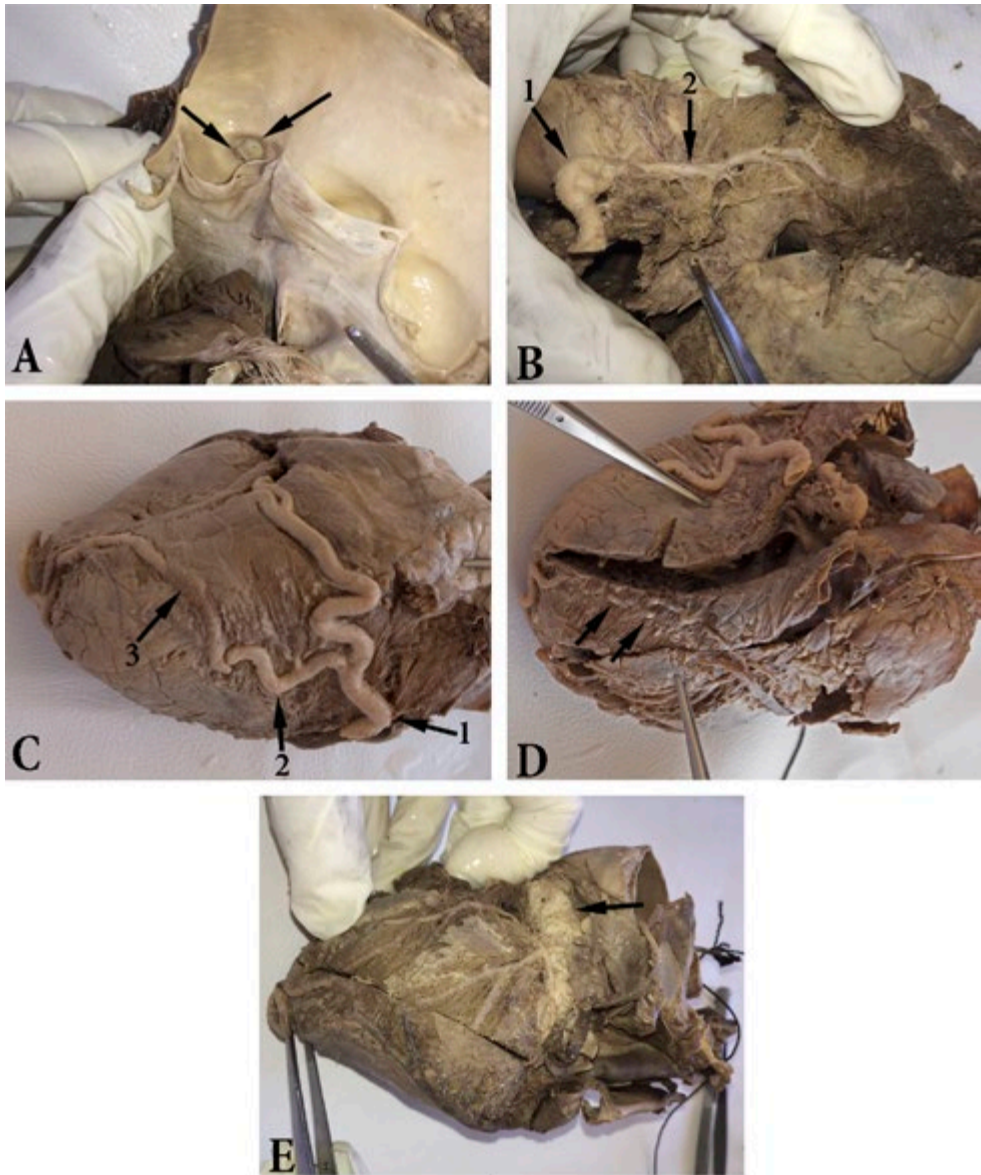


Figure 1 – A: Right coronary ostium with 2 orifices, shown by arrows. B: (1) Right coronary artery, (2) Descending septal hypoplastic left coronary artery. C: (1) Right coronary artery, (2) Right acute marginal artery, (3) Myocardial bridge. D: Intramural branch of right acute marginal artery in the anterior interventricular groove. Resurfacing is shown by arrows. E: Mass of dense connective tissue with lacunar cavities in the left atrioventricular groove (arrow).

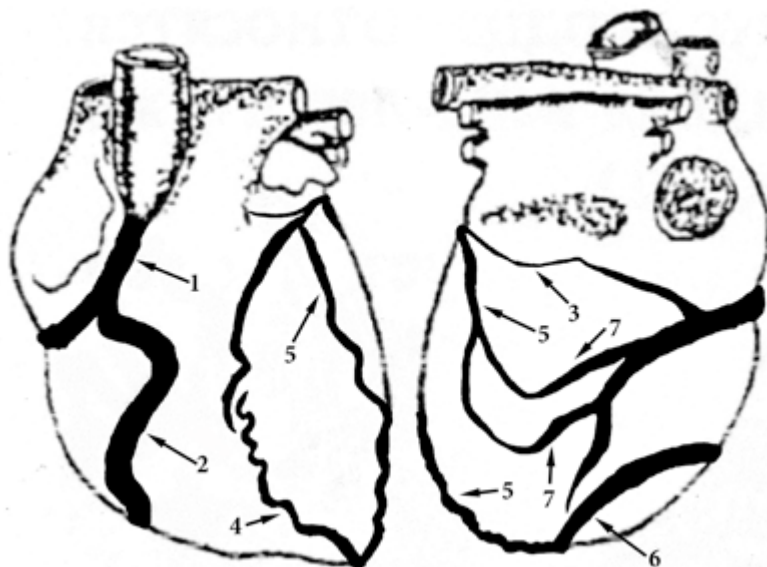


Figure 2 – Diagrams of coronary artery distribution in the reported case. (1) Right coronary artery. (2) Right acute marginal artery. (3) Right posterior atrioventricular branch of the right coronary artery. (4) Intramural branch of right acute marginal artery in the anterior interventricular groove. (5) Branches corresponding to obtuse marginal arteries. (6) Large branch of the acute marginal artery at the top of the heart. (7) Posterolateral branches.

interarterial (with potentially poor prognosis) and interseptal, which is not as severe as interarterial (Mandal et al., 2014). In most cases the anomalous left coronary artery appears on the anterior interventricular groove at different levels after passing deep in the interventricular septum, and continues as an anterior descending artery (Joshi et al., 2010). Neither the typical anterior descending artery nor circumflex arteries were seen here as branches of the left coronary artery, which was present only as a descending interseptal branch. In part, the left anterior descending artery was formed by the distal part of the right acute marginal branch, whereas the left circumflex artery was formed by the distal part of the right posterior atrioventricular branch, passing in the left atrioventricular groove.

Consequently, the right coronary artery was a dominant vessel and provided blood supply to almost all of the heart through several, large anastomotic branches, which replaced the ordinary vessels and provided substitutive blood supply for those parts of the heart which normally are supplied by the left coronary artery. The territory of the left coronary artery was secured by three collateral circles of the right coronary artery system. The right posterolateral branch replaced circumflex artery, the obtuse marginal branches of the left coronary artery, and part of the left anterior descending artery were replaced by branches continuing the acute marginal artery. Such kind of anomalies are often associated with anomalies of intrinsic coronary arterial anatomy in the way of myocardial bridging as has been found here (Shin et al., 2012).

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