

Common origin of left anterior descending artery and right coronary artery from right aortic sinus: presentation of rare variant

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The authors discuss a case of 55-year-old man admitted to hospital with clinical symptoms and electrocardiac signs of myocardial infarction, who underwent invasive diagnosis and one of most rare coronary arteries anomaly was observed: common origin of right coronary artery and anterior interventricular artery (left anterior descending artery) from right aortic sinus. Anatomical variants of coronary arteries are rare amongst general population, ranging between 0.29% to 1.3% and such anomaly is found in 0.03% of all coronarographies and is responsible for 2.3% of all coronary variations. Knowledge about coronary arteries anomalies is helpful not only in making better diagnosis but also in making better therapeutic decisions. (Folia Morphol 2014; 73, 2: 234–237)

Key words: anomaly, coronary arteries, right aortic sinus, anterior interventricular artery

INTRODUCTION

Heart development has been investigated both in animal and human studies [17], but molecular and cellular mechanisms of that process are not yet fully discovered and understood [19]. Heart development starts in the 3rd week of embryonic life. Proepicardium is a key source of cells that make up the coronary vessels. The cells that make up the coronary arteries are derived from the regions around the aorta. Newest discoveries show that cells from an embryonic cardiac structure called the sinus venosus, which directs blood into the developing heart, begin to migrate and become coronary arteries. Many molecular signals influence that complicated process. The final stage is the connection of formed vessel trunks to aorta [18].

In vast majority of the population (98.7–99.71%), heart is vasculated by 2 coronary arteries: right coronary artery (RCA) extending from the right aortic sinus and left coronary artery (LCA) with its origin in the left aortic sinus beginning with the left main, and then branching into anterior interventricular artery (LAD, left anterior descending coronary artery) and circumflex artery (Cx), and sometimes also into intermediate branch if the left main trifurcation is present [1, 3]. Adachi classification describes several types of coronary circulation depending on variety of coronary branches, their course and range of anatomical areas supplied with blood [11, 16]. In 85% of the population (type II according to Adachi classification), RCA is a dominant artery (vessel branches into posterior

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descending artery — PDA and well developed posterolateral artery — PLA), while in 8% LCA is dominant one (type III in Adachi classification), what is 8 times higher in men than in women [5]; co-dominance is found in 7% of the population [9] (type I in Adachi classification). In general, LCA is much more diverse in its anatomical variations, including number of branches and their origins, both in foetal and adult life [8].

The frequency of coronary arteries anomalies, including atypical origins, aneurysms, ectasia, atresia or arteriovenous fistulas, is estimated depending on source and studies at 0.3–2.2% [4, 10]. Atypical origins of coronary arteries are found in 0.29–1.3% [22, 23, 25] of population, what depends on prenatal development of cardiovascular system. 81% of all atypical variations are recognised as benign, as they do not result in serious consequences [2]. Typically they are diagnosed accidentally and remain asymptomatic. The rest of atypical variations, including Bland–White–Garland syndrome, congenital condition, where 1 or 2 coronary arteries originate from pulmonary trunk, may result in unspecified cardiac symptoms including: arrhythmias, fainting and chest pains. If not adequately treated, they may result in acute coronary syndromes, heart failure or sudden cardiac arrest [15, 21].

CASE REPORT

The authors present the case analysis of 55-year-old male patient with history of hypertension, admitted to hospital with clinical and electrocardiographic symptoms of ST-elevation myocardial infarction. The patient was immediately referred for cardiac catheterisation. Coronarography revealed trifurcation of the left main with residual LAD ending after first septal branch, dominant intermediate artery with net of branches typical for circumflex and with significant 90% proximal stenosis and recessive circumflex branch (Figs. 1, 2).

Right coronary artery angiogram revealed medial occlusion (what is typical for myocardial infarction), but also coronary anomaly — the artery originating together with RCA from right aortic sinus with septal branches supplying interventricular septum, what is typical for LAD.

The area supplied by artery originating together with RCA is the same as the area typically supplied by LAD — there are intervertebral branches that usually originate from LAD (Figs. 3, 4). Effective percutaneous

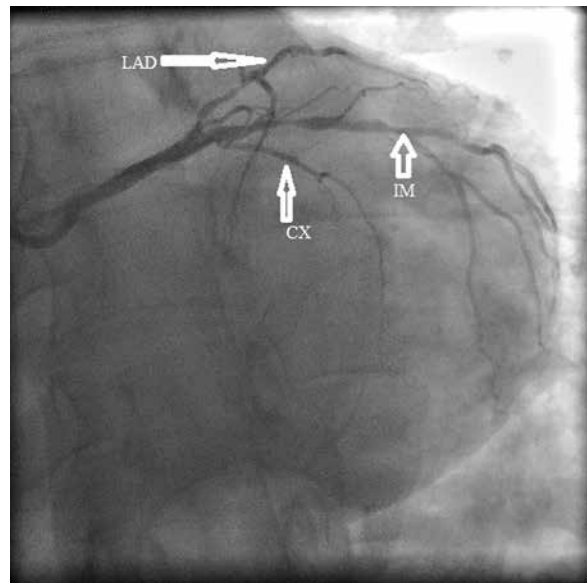


Figure 1. Coronarography, LAO 25 CAUD 25 view. Left main trifurcation — up perspective with residual left anterior descending coronary artery (LAD), then dominant intermediate artery (IM) and recessive circumflex branch (Cx).

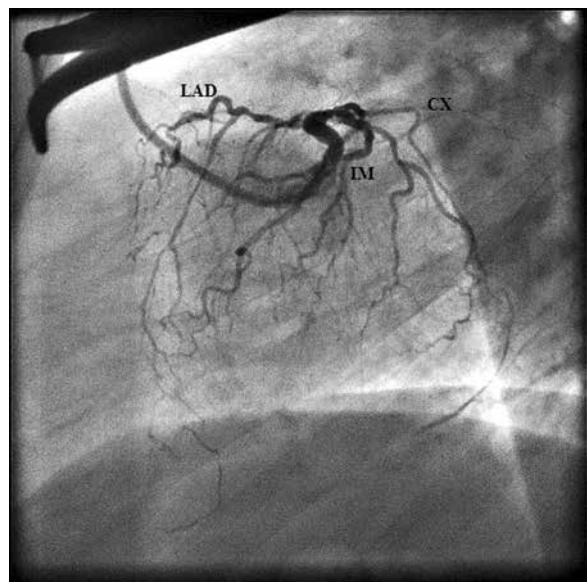


Figure 2. Coronarography, LAO 90 view. Depiction of left anterior descending coronary artery (LAD) and circumflex artery (Cx); IM — intermediate artery.

coronary intervention (PCI) of the RCA was performed. Further hospitalisation was uncomplicated. The patient was discharged from hospital and second stage PCI was planned due to significant 90% stenosis of intermediate artery.

The anomalous origin of coronary arteries in the presented patient is shown in Figure 5.

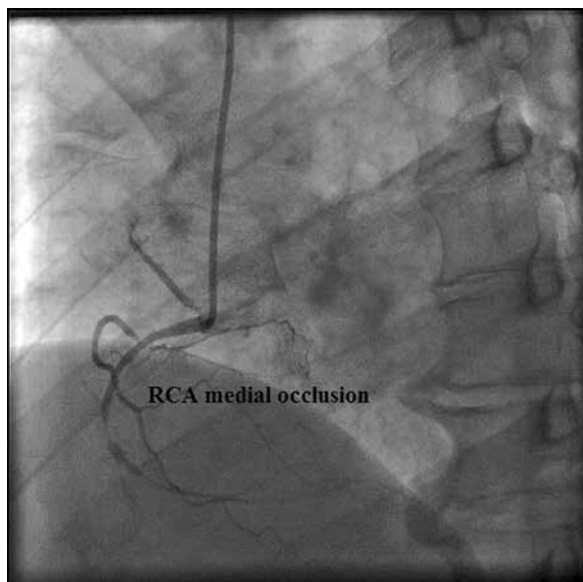


Figure 3. Coronarography, LAO 45 CRAN 5 view. Medial occlusion of right coronary artery (RCA) responsible for acute coronary syndrome and origin of artery supplying the area of left anterior descending artery.

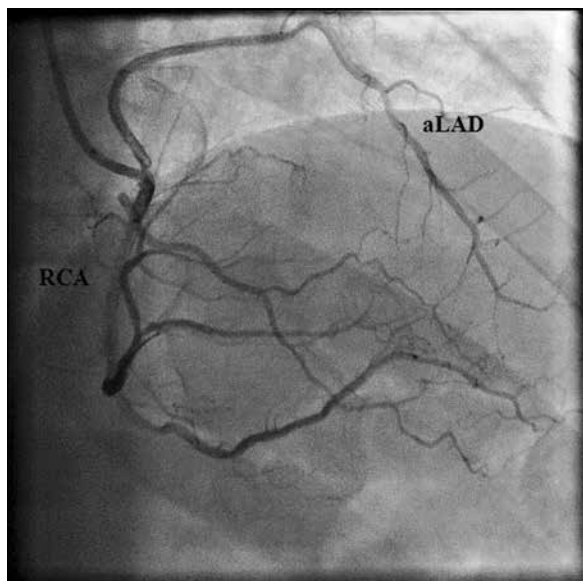


Figure 4. Coronarography, RAO 30 CRAN 25 view. Atypical origin of artery supplying left anterior descending coronary artery (LAD) area with septal branches marked as aLAD; RCA — right coronary artery.

DISCUSSION

Presented case of common origin of RCA and LAD in right aortic sinus is recognised as potentially dangerous and is very rare. Such anomaly was diagnosed in 38 people of 126,595 who underwent coronarography between 1960 and 1988,

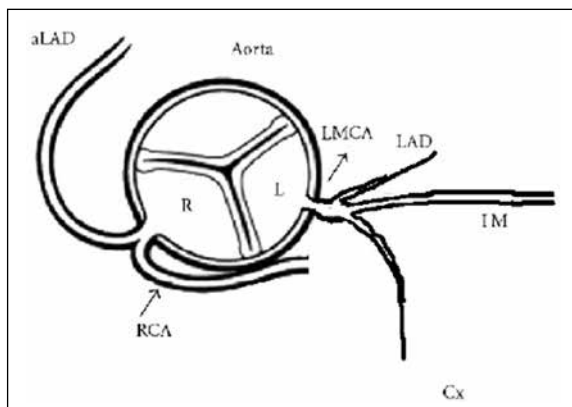


Figure 5. Schema of origin of right coronary artery (RCA) with common origin of artery supplying left anterior descending coronary artery (LAD) area with septal branches (aLAD) and left main of left coronary artery (LMCA) then branching into residual LAD, circumflex artery (Cx) and intermediate artery (IM); R — right aortic sinus, L — left aortic sinus.

what is 2.3% of all the anomalies and only 0.03% of the analysed population [23]. In that case RCA was infarct-related artery and coronary anomaly was diagnosed incidentally. Nowadays cardiac catheterisation is relatively accessible tool, what means that in future more anatomical variations may be diagnosed. Nevertheless, new non-invasive assessment studies are developed like computed tomography angiography [13, 14, 20] or magnetic resonance imaging [7, 12], that are potentially better diagnostic tools.

In other study of 16,573 patients between 2001 and 2011, anatomical anomaly was diagnosed in 48 cases. The origin of LAD from right aortic sinus was diagnosed in 5 cases, and in 4 of them LAD had common origin with RCA. This is 8.3% of all diagnosed anomalies and 0.024% of the study population [25]. In autopsy studies of 18,950 cases, 54 anomalies were observed and 38 of them amongst men [1]. Analyses of coronarographies performed due to different indications (stable coronary heart disease, acute coronary syndrome or before cardiac surgery) showed that anomalies are more often in men (68–74%), and mainly these are Caucasian men.

However, it is still difficult to diagnose those atypical variations, as in most cases they are asymptomatic with normal 12-leads electrocardiogram [6]. The rest of them is responsible for highly unspecific symptoms, so they should be considered as differential diagnosis of young people presenting with unspecific cardiac symptoms. Therefore knowledge

about coronary arteries anomalies, awareness of their potential presence and related symptoms may shorten the process of diagnosis, improve proper treatment planning and lower the risk of possible complications or mistakes during invasive procedures [24]. In the case discussed in this paper, acute coronary syndrome followed by invasive diagnosis and intervention allowed to find such rare anatomical anomaly of coronary arteries.

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