

A left circumflex artery to right atrium fistula supplying the sinoatrial node

Sinoatriyal nodu besleyen sol sirkümfleks arter-sağ atriyal fistül

Mateusz Holda, Mateusz Koziej, Wiesława Klimek-Piotrowska

Department of Anatomy, Jagiellonian University Medical College, Cracow, Poland

In this paper, we present an extremely rare case of a left circumflex artery (LCx) to the right atrium fistula where we were able to calculate the prevalence as 1/1,000,000 individuals. Based on our results, we conclude that the artery which forms the fistula may provide oxygenated blood to the sinoatrial node.

The present heart specimen was dissected from a 61-year-old male cadaver, in whom the cause of death was non-cardiac in etiology during a routine forensic autopsy. The heart was dissected in a routine manner together with the cardiac portions of the great vessels: the ascending aorta, pulmonary trunk, superior vena cava, inferior vena cava, and all the pulmonary veins (up to 1 cm in length). The weight of the heart was 630 g with a circumference of 32.5 cm within the coronary groove. Microsurgical dissection was carried

out to demonstrate this rare anatomic variation. The left coronary artery originates from the left aortic sinus, runs for 11.76 mm, and, then, bifurcates into the left anterior descending artery and the LCx. Above 26.17 mm, the LCx bifurcates into two vessels of similar diameters. One of them descends under the coronary sinus towards the posterior interventricular sulcus, while the other one whose total length is 15.5 cm ascends on the left atrium between the left inferior pulmonary vein and the left atrial appendix (Figure 1). The anastomotic artery traverses the anterior surface of both atria (within the posterior wall of the pericardial sinus) and, then, passes superiorly to the right atrial appendix, traversing to the posterior surface of the right atrium which wraps the superior vena cava (SVC) (Figure 2). The main importance of the discovered fistula is that it gives few small branches to the posterior circumflex of the SVC

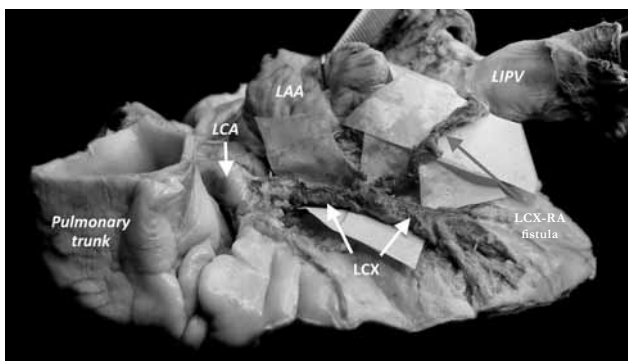


Figure 1. An image of the heart specimen. The course of the anastomotic artery is visible.

LAA: Left atrial appendage; LCA: Left coronary artery; LCx: Left-circumflex artery; LIPV: Left inferior pulmonary vein; RA: Right atrium.

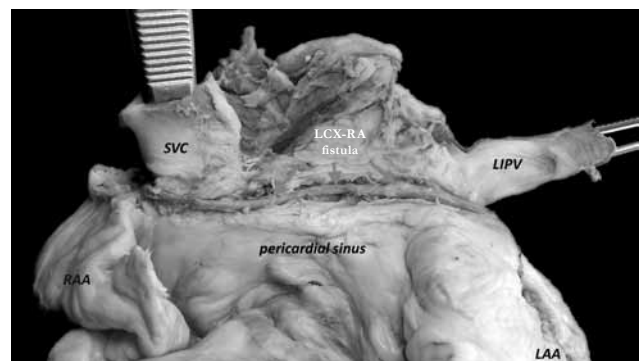


Figure 2. An image of the heart specimen. View on the pericardial sinus. The course of the fistula is visible.

SVC: Superior vena cava; LCx: Left-circumflex artery; RA: Right atrium; LIPV: Left inferior pulmonary vein; RAA: Right atrial appendage; LAA: Left atrial appendage.



Available online at
www.tgkdc.dergisi.org
doi: 10.5606/tgkdc.dergisi.2016.11665
QR (Quick Response) Code

Received: February 27, 2015 Accepted: May 04, 2015

Correspondence: Mateusz Holda. Department of Anatomy, Jagiellonian University Medical College, 31-034 Cracow, Poland.

Tel: +48124229511 e-mail: mkh@onet.eu

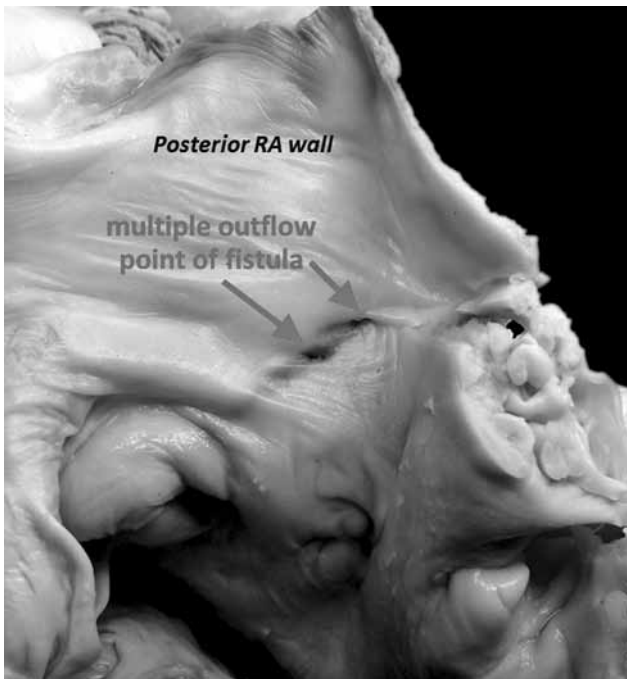


Figure 3. An image of the heart specimen. View on the interior surface of the posterior wall of the right atrium, the multiple outflow points of the fistula are visible. RA: Right atrium.

ostium (the place where anatomically sinoatrial node is located). The artery finally forms the fistula to the right atrium with multiple outflow points (Figure 3). The fistula described gives numerous branches to the wall of the both atria and becomes thinner on its course. The right coronary artery in the specimen was present with a normal course.

Coronary artery fistulas (CAFs) are infrequent (present in 0.002% of the overall population) congenital anomalies, described as a direct connection between a coronary artery and one of the cardiac chambers or vascular structures.^[1] Currently, there is a limited data on the development of the CAFs. One of the explanations is that the fistulas arise as a persistence of sinusoidal connections between the lumens of the primitive tubular heart which supply myocardial blood flow in the early embryologic period and occur in the absence of any outflow obstruction.^[2] Another theory is connected with incorrect development of distal branches of the coronary artery vascular network.^[3] In our case, the anastomotic artery branched into the right atrial wall near the posterior surface of SVC ostium, which is the anatomical location of the sinoatrial node. In general, the sinoatrial node may receive a blood supply from the sinoatrial nodal branch of the right coronary artery tree in 63% of cases and from the left coronary artery tree in 37% of cases (in 95% arising

from the proximal portion of LCx).^[4] In addition, it has been reported that arteries could have an extremely long course, before they reach the sinoatrial node.^[5] It is suggested that the total course of the sinoatrial nodal branch arising from the left coronary artery is rather longer than the course from the right coronary artery.^[5] Based on our dissection technique and available literature data, we conclude that the described anastomotic artery provides an oxygenated blood supply to the sinoatrial node.

Furthermore, the coronary arterial system of the heart is variable which should be taken into consideration when cardiac surgery, as well as invasive cardiac diagnostic and treatment procedures, are planned and performed. Surgical repair of CAFs is effective and usually postoperative period is uneventful.^[6,7] The aim of this work is to emphasize that such anastomosis can be the cause of serious arrhythmias and some could even be life-threatening. The surgical closure of such a fistula may have adverse effects on sinoatrial node ischemia, which can be also fatal. In our case, there were two abnormalities: the abnormal vascularization of the sinoatrial node occurred in original (by the extremely long LCx branch) and also that the fistula to the right atrium was established.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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