



Variant aortic sinusal origin of the left circumflex coronary artery

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Richard P. WYETH +
Arben SANTO

The Edward Via College of Osteopathic Medicine, Virginia
Campus, Blacksburg, Virginia, USA.



+ Richard P. Wyeth, MA, PhD
2265 Kraft Drive
Blacksburg
Virginia 24060, USA.
☎ +1 (540) 231-8175
✉ rwyth@vcom.vt.edu

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Abstract

Congenital coronary artery variations are implicated in out of hospital ventricular fibrillation and in increased risk of developing coronary atherosclerosis within the unusual vessel. As ischemic heart disease remains the leading cause of loss of adult life within the growing global population, awareness of the possible variable origin and course of a coronary vessel is important. While angiographic series are valuable they may not reflect the population at large since asymptomatic patients rarely undergo coronary angiography. Anatomical studies are more representative of the prevalence of variant coronary anatomy but more difficult to obtain. Here is reported an anatomical study in continuous series of anatomical donors from the general adult population, describing a variant aortic sinusal origin of the left circumflex artery (LCX) originated from the right aortic sinus and coursing behind the aortic annulus before reaching its usual position into the left atrioventricular groove, between the left atrial appendage and the pulmonary trunk. This is the first LCX variation in a continuous series of 338 human hearts studied, a prevalence of 0.3% in this anatomical series. From a clinical standpoint, unusual origin of the LCX from an independent ostium within the right aortic sinus of Valsalva should be considered when LCX circulation cannot be visualized as a branch of the left main coronary artery.

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Key words [variant left circumflex coronary] [coronary artery variant] [anatomical series of coronary arterial distribution]

Introduction

Coronary artery variants are congenital in origin and found in approximately 1.3% of patients undergoing coronary angiography in the United States [1]. These variations are implicated in out of hospital ventricular fibrillation (sudden cardiac death) in young athletes [2, 3] and in increased risk of developing coronary atherosclerosis within the variant vessel [4] and clinical picture of ischemic heart disease (IHD). As IHD remains the leading cause of loss of adult life and continues to increase within the growing global population [5], the awareness of the possible variable origin and course of a coronary vessel needs to be considered. In this regard, angiographic series have proven valuable. The strength of these reports is the large numbers that are available. Their weakness however, is that they may not reflect the population at large as asymptomatic patients rarely undergo cardiac catheterization and coronary angiography. Conversely, anatomical studies, while more representative of the true prevalence of variant coronary anatomy within the general population, are more difficult to obtain. Nonetheless, as medical schools typically dissect the heart and its coronary arterial vasculature, such studies are possible and reportable. Here is reported such an anatomical study in a relatively large and continuous series of anatomical donors from the general adult population.

Case Report

During routine dissection of the heart in the Anatomy Laboratory of the Edward Via College of Osteopathic Medicine (VCOM), Virginia Campus, we found a variant aortic sinusal origin of the left circumflex artery (LCX) in a 65-year-old male cadaver. The specimen was photographed. There was no history of cardiac disease in the individual. In our specimen, the LCX originated from the right aortic sinus of Valsalva and coursed behind the aortic annulus before reaching its usual position into the left atrioventricular groove between the left atrial appendage and the pulmonary trunk (Figure 1), to supply the lateral and diaphragmatic aspect of the heart. The anterior descending coronary artery arose independently from the left aortic sinus. No atherosclerosis was observed in large coronary arteries. This is the first LCX variation in a continuous series of 338 human hearts studied in conjunction with the Human Anatomy Course at VCOM, a prevalence of 0.3% in this anatomical series.

Discussion

Variant origin of the LCX from the right sinus of Valsalva was first described by Antopol and Kugel in 1933 [6]. This is generally found to be the most common congenital coronary variant, with a prevalence of 0.67 to 0.80% at coronary angiography [1, 7].

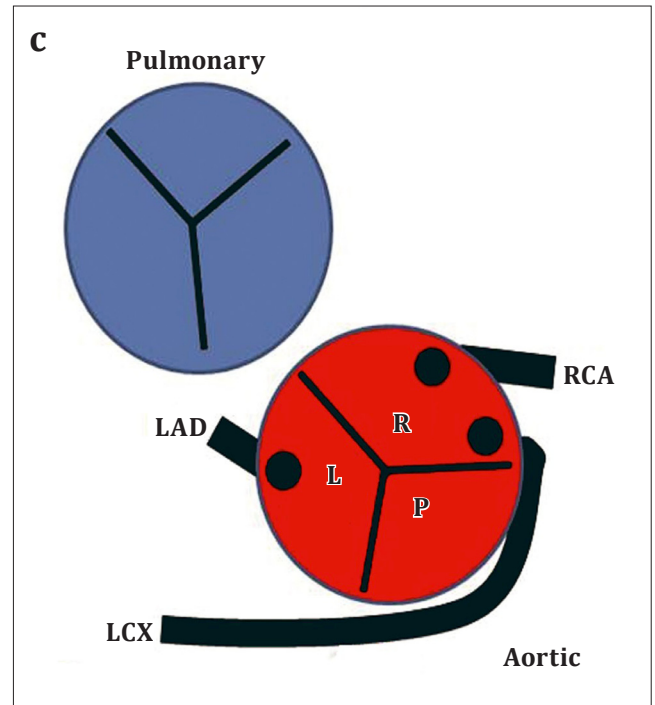
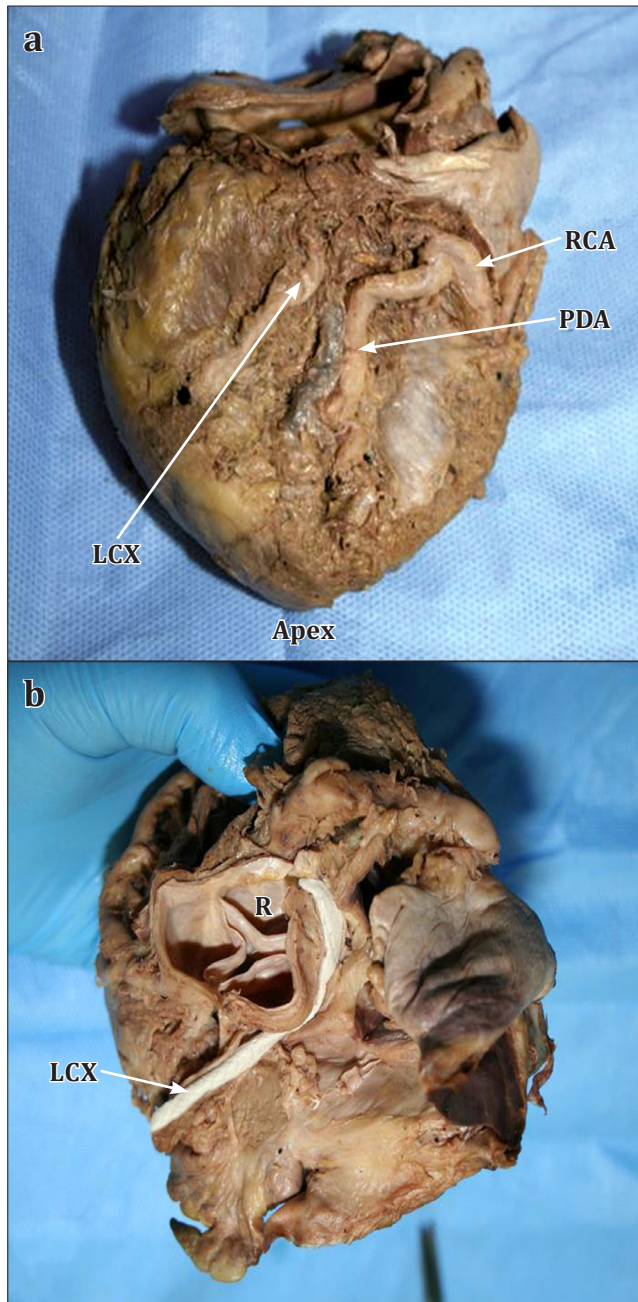


Figure 1. Images of the circumflex coronary artery variant. **a)** Superior view. Note the retroaortic course of the circumflex branch of the left coronary artery. **b)** posterioinferior (diaphragmatic) view. **c)** Schematic of the variant. (**LCX**: left circumflex artery; **RCA**: right coronary artery; **L**: left aortic cusp; **LAD**: anterior interventricular branch of the left coronary artery; **P**: posterior-non-coronary-aortic cusp; **PDA**: posterior interventricular branch of the right coronary artery; **R**: right aortic cusp)

From a clinical standpoint, variant origin of the LCX from the right aortic sinus of Valsalva is usually considered benign [4, 7, 8, 9] since it is not known to predispose individuals to sudden cardiac death or higher incidence of atherosclerotic involvement. Patients usually remain asymptomatic and this variant is usually found incidentally at autopsy. However, some investigators consider that a variant circumflex artery is more prone to develop atherosclerosis, perhaps due to the unique retroaortic position of this vessel. West et al. [10] have found significant obstructive atherosclerotic coronary

disease in most of their patients with variant origin of the LCX from the right aortic sinus of Valsalva, especially in its retroaortic portion. Samarendra et al. [11] reported three patients in whom the variant LCX was responsible for myocardial infarctions.

Angiographic recognition of origin of LCX from the right aortic sinus of Valsalva is important, especially in patients with obstructive coronary artery disease targeted for coronary bypass surgery or in patients with aortic valve disease undergoing aortic valve replacement [7, 10]. If the angiographer assumes that the vessel is occluded or congenitally absent, significant problems may arise and negligent medical care may result [1]. Similarly, surgical problems can be encountered if a variant vessel is excluded from perfusion during cardiopulmonary bypass or if the surgeon accidentally incises the variant, and hence unanticipated vessel [12]. Additionally during valve replacement surgery, the ostium of the variant vessel may be inadvertently obstructed or the variant vessel may be compressed along its course by a valvular prosthesis [13].

Conclusion

This report describes the most common variant of coronary artery anatomy identified during a postmortem dissection and illustrates the unclear relationship of variant vessel anatomy with atherosclerosis and the importance of careful angiographic identification in patients undergoing coronary percutaneous procedures or cardiothoracic surgery.

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References

- [1] Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. *Cathet Cardiovasc Diagn*. 1990; 21: 28–40.
- [2] Angelini P, Velasco JA, Flamm S. Coronary anomalies: incidence, pathophysiology, and clinical relevance. *Circulation*. 2002; 105: 2449–2454.
- [3] Angelini P. Sudden death and coronary anomalies: the importance of a detailed description. *Tex Heart Inst J*. 2011; 38: 544–546.
- [4] Eid AH, Itani Z, Al-Tannir M, Sayegh S, Samaha A. Primary congenital anomalies of the coronary arteries and relation to atherosclerosis: an angiographic study in Lebanon. *J Cardiothorac Surg*. 2009; 4: 58.
- [5] Murray CJ, Lopez AD. Measuring the global burden of disease. *N Engl J Med*. 2013; 369: 448–457.
- [6] Antopol W, Kugel MA. Anomalous origin of the left circumflex coronary artery. *Am Heart J*. 1933; 8: 802–806.
- [7] Page HL Jr, Engel HJ, Campbell WB, Thomas CS Jr. Anomalous origin of the left circumflex coronary artery. Recognition, angiographic demonstration and clinical significance. *Circulation*. 1974; 50: 768–773.
- [8] Mohsen GA, Mohsin KG, Forsberg M, Miller E, Taniuchi M, Klein AJ. Anomalous left circumflex artery from the right coronary cusp: a benign variant? *J Invasive Cardiol*. 2013; 25: 284–287.
- [9] Leberthson RR, Dinsmore RE, Bharati S, Rubenstein JJ, Caulfield J, Wheeler EO, Harthorne JW, Lev M. Aberrant coronary artery origin from the aorta: Diagnosis and clinical significance. *Circulation*. 1974; 50: 774–779.
- [10] West NE, McKenna CJ, Ormerod O, Forfar JC, Banning AP, Channon KM. Percutaneous coronary intervention with stent deployment in anomalously-arising left circumflex coronary arteries. *Catheter Cardiovasc Interv*. 2006; 68: 882–890.
- [11] Samarendra P, Kumari S, Hafeez M, Vasavada BC, Sacchi TJ. Anomalous circumflex coronary artery: benign or predisposed to selective atherosclerosis. *Angiology*. 2001; 52: 521–526.
- [12] Garg N, Tewari S, Kapoor A, Gupta DK, Sinha N. Primary congenital anomalies of the coronary arteries: a coronary: arteriographic study. *Int J Cardiol*. 2000; 74: 39–46.
- [13] de Marchena EJ, Russo CD, Wozniak PM, Kessler KM. Compression of an anomalous left circumflex coronary artery by a bioprosthetic valve ring. *J Cardiovasc Surg (Torino)*. 1990; 31: 52–54.