CASE REPORT

Coronary Sinus Aneurysm: Incidental Discovery during Coronary Artery Bypass Grafting

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ABSTRACT

The case of a 68-year-old man with symptomatic coronary artery disease undergoing coronary artery bypass grafting was incidentally found to have a coronary sinus (CS) aneurysm at the time of surgery. The aneurysm itself did not impact the operation but raised questions about associated anomalies and whether there was a need for operative management. This report describes the details of the case as well as reviews the information known to date regarding CS aneurysms.

Key words: Aneurysm, coronary, venous

INTRODUCTION

Coronary venous development and its variants are topics of interest for the anatomist, embryologist, and pathologist. In contrast to coronary arterial pathology, coronary venous abnormalities are less clinically relevant. However, on occasion, the incidental or deliberate discovery of a coronary venous anomaly may represent a direct problem or indicate a possible association with another condition. In addition, the presence of a coronary venous aneurysm may pose technical problems in certain procedures. The cardiothoracic surgical literature is limited with respect to coronary venous pathologies, particularly in the adult. We report the case of a 68-year-old man who was found to have a coronary venous aneurysm at the confluence of the great cardiac vein (GCV) and coronary sinus (CS) during coronary artery bypass grafting (CABG).

CASE REPORT

A 68-year-old man with a medical history significant for coronary artery disease (CAD), hypertension, hyperlipidemia, and myocardial infarction with previous percutaneous coronary intervention presented to the cardiology clinic with exertional chest pain. Additional non-cardiovascular conditions included emphysema, asthma, and gastroesophageal reflux disease with erosive esophagitis, hypothyroidism, and occasional dizziness/lightheadedness with falls. There was no history of arrhythmia or congenital abnormalities. The social history included a 75-pack-year smoking, daily marijuana use, no alcohol use, and worked as a heavy machine operator. Home medications were aspirin, clopidogrel, carvedilol, fenofibrate, isosorbide mononitrate, losartan, escitalopram, and levothyroxine. He was referred for ischemic evaluation through the left heart catheterization.

Catheterization showed in-stent stenosis of the left anterior descending coronary artery (LAD) with total occlusion of the first obtuse marginal branch of the left circumflex artery. Echocardiography showed normal left and right ventricular size and function with some hypokinesis of the inferior wall. There was no valvular pathology or congenital anomalies. The electrocardiogram showed a normal sinus rhythm with a left anterior fascicular block. He was referred to cardiothoracic surgery for CABG consideration.

The CABG procedure was conducted through a median sternotomy utilizing a pump-assisted beating heart technique

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under normothermic conditions. Standard aortic and right atrial cannulation was utilized. Inspection of the heart revealed a large coronary venous aneurysm [Figure 1] on the inferior wall corresponding to the confluence of the GCV and the CS in the territory of the posterior descending artery (PDA). The aneurysm measured approximately 5 cm×4 cm×4 cm. Fortunately, the PDA did not require bypass grafting since the aneurysm obscured most its view. The surgery continued with a saphenous vein graft to the obtuse marginal branch of the left circumflex artery and a left internal mammary bypass to the LAD. While the case was taking place, a literature search for coronary venous aneurysms encountered during cardiac surgery was conducted - limited information was found. As such, the anomaly was left alone. The procedure was completed without complication. The post-operative course was unremarkable, and the patient discharged in stable condition.

DISCUSSION

The coronary venous system is an elaborate array of vascular tributaries that ultimately drain into the CS [Figure 2]. The high degree of coronary venous branch variability has occasionally created problems and obstacles for the clinician, particularly those in which certain procedures depend on specific anatomic considerations (e.g., left ventricular [LV] electrode placement for biventricular pacing and CS cardioplegia catheter placement for myocardial protection during open-heart surgery). In 2005, Singh *et al*., in an effort to facilitate electrophysiologic procedures, published a thorough description of the coronary venous system.[1] Together with cardiac imaging, the authors provided a systematic and segmental classification of coronary venous anatomy. Notably absent were coronary venous aneurysms.

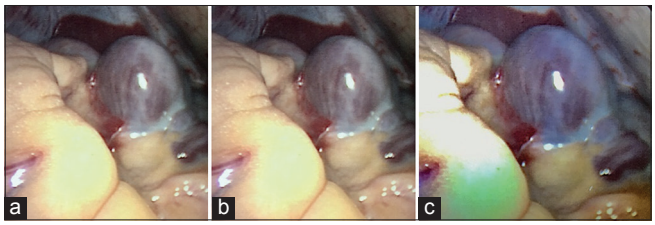

Figure 1: (a-c) Coronary sinus aneurysm - intraoperative photograph

An extensive review of coronary veins along with an anatomic classification based on computed tomographic (CT) and magnetic resonance imaging was provided by Saremi *et al*., in 2015.[2] This publication provided excellent illustrations and imaging of coronary venous anatomy and pathology, offering great details on normal and variants of the coronary venous system. In addition, a discussion of the clinical associations of coronary venous pathology was provided, highlighting conduction system abnormalities as well as noting the importance of imaging for electrophysiologic interventions.

Clinically, relevant reports of coronary venous aneurysms have been mostly associated with ventricular arrhythmia and the concern for sudden cardiac death. In 1988, Ho *et al*. reported the fourth case of a coronary venous aneurysm associated with an accessory pathway.[3] In this report, a 12-year-old girl with a history of neonatal arrhythmia died suddenly. Histologic examination of the necropsy heart showed myocardial abnormalities that likely contributed to aberrant conduction predisposing to a lethal arrhythmia.

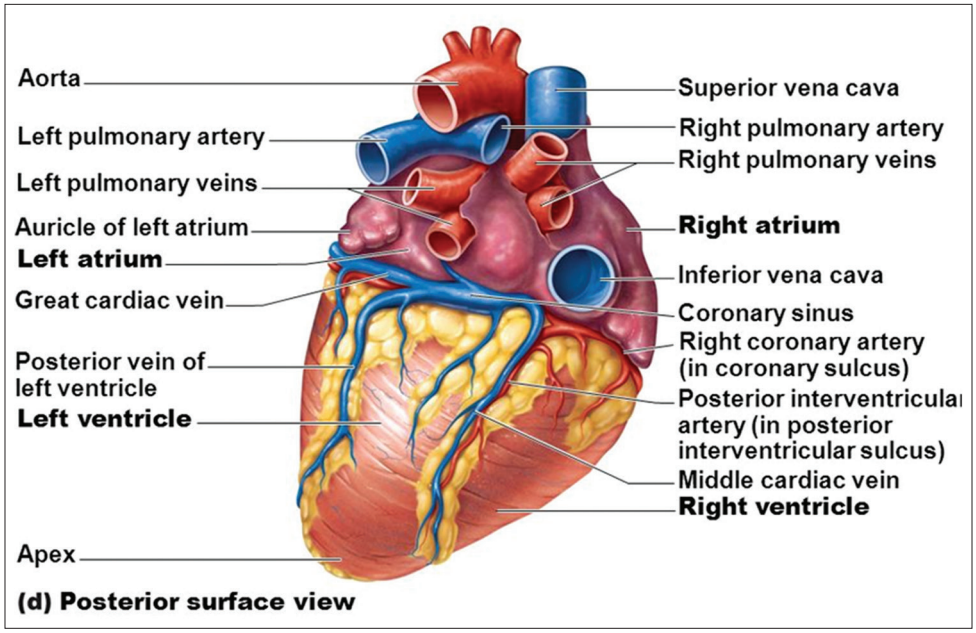

Figure 2: Coronary venous anatomy

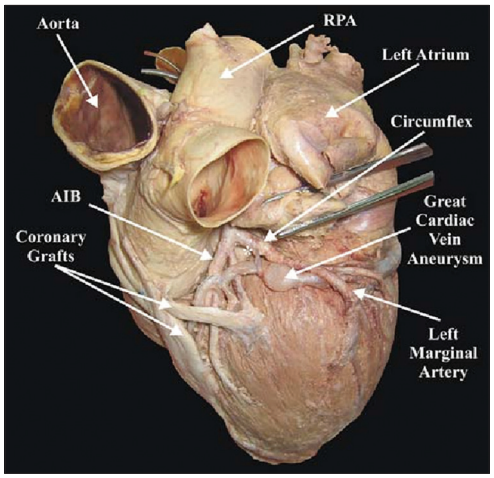

Figure 3: Aneurysm of the great cardiac vein. From: Loukas M, Tubbs RS, Jordan R. Aneurysm of the great cardiac vein. Surg Radiol Anat 2007;29:169-72.

These findings -and review of the three cases preceding this one - lead the authors to express their concern that CS or venous aneurysm may not be as benign as previously thought.

In adults, the literature related to coronary venous aneurysms is scant. In 2007, Loukas *et al*. reported an aneurysm of the GCV in an 87-year-old man [Figure 3]. This anomaly appeared to be due to a possible distal constriction of the GCV by a small muscular branch of the circumflex branch and a possible proximal constriction by the left marginal artery.[4] In 2010, a retrospective study of 187 adult patients undergoing CT angiography for CAD was undertaken with the aim of determining the prevalence of coronary venous aneurysms with no history of cardiac arrhythmias.[5] A single aneurysm was found in 19 (10%) patients. The most common location was the posterior interventricular vein near the confluence with the CS and the majority were fusiform. There were only three diverticular aneurysms and three at the junction of the GCV and CS, as was seen in our case. Finally, in 2017, Song *et al*. described the first case of three coexisting systemic vein anomalies in a 67-year-old woman undergoing CABG surgery.[6] A pre-operative chest CT scan with contrast demonstrated interruption of the left inferior vena cava, persistent left superior vena cava, and an anomalous left hepatic vein draining into a CS aneurysm. The CABG procedure confirmed the anomalies and was otherwise uneventful.

Based on cardiac imaging and anecdotal reports, several comments can be made regarding coronary venous aneurysms: (1) The incidence is at least 10% based on the report by Saremi *et al*.,[5] (2) there is an association with cardiac arrhythmia and other venous anomalies in some cases,[3,6] (3) clinicians involved with surgical or interventional procedures should be mindful of these anomalies since they may impact the ability to safely access the coronary venous system for such things as retrograde catheters to deliver cardioplegia or placement of LV epicardial leads.

In summary, this case report adds to the experience of coronary venous aneurysm in the setting of CABG surgery. Knowledge of this entity may have technical and clinical implications.

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