

An Extremely Rare Anatomical Variation: Abnormal Drainage of the Anterior Interventricular Coronary Vein

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Variation of anterior interventricular vein draining into the left atrium is an extremely rare occurrence. Multidetector computed tomography (MDCT) coronary angiography has recently become the gold standard for depicting anatomical variations and anomalies of coronary arteries and veins. We herein have reported the case of a 36-year-old male whose anterior interventricular vein draining into the left atrium was demonstrated by MDCT coronary angiography.

Key Words: Angiography • Computed tomography • Coronary vein • Variation

INTRODUCTION

Several congenital anomalies have been described regarding coronary veins.¹ There is also a high degree of variability in the number of branches between the middle cardiac vein and the anterior interventricular vein (AIV). Other variations of the coronary venous anatomy include the presence of ostial valves of the cardiac veins (valve of Vieussens), inter-branch collateralization, and intramural versus epicardial course. Greater knowledge of these variations may be important, especially when planning cardiac resynchronization therapy (CRT) or the implantation of the left ventricle lead.^{2,3} Herein, we present multidetector computed tomography (MDCT) findings of a 36-year-old male patient with variation of anterior interventricular coronary vein, in the context of

previously presented data in the literature.

CASE REPORT

A 36-year-old male patient with an atypical intermittent chest pain for one month was referred to our radiology department for evaluation of the coronary arteries. However, he had no history of significant medical problems. Contrast enhanced 256-slice MDCT (SOMATOM Definition Flash, Siemens Medical Systems, Forchheim, Germany), multiplanar reconstruction and three-dimensional images were performed. Scan parameters were 120 kV, 340 mAs, 420 msec rotation time with a slice thickness of 1 mm and increments of 0.5 mm, using a detector collimation of 16 × 0.75 mm (pitch: 0.2). The heart rate was 65 beats per minute during acquisition. One hundred milliliters of non-ionic, iodinated, low-osmolar contrast medium was injected through the antecubital vein at a rate of 5 ml/sec. Subsequently, a bolus of 40 ml saline solution was administered at a rate of 2.5 ml/sec to avoid possible contrast artifacts at the right atrial entrance. MDCT imaging showed vascular structure which lied along the anterior wall of left ventricle as parallel to the left anterior descending coronary

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artery. It drained into the left atrium, which we determined to be the AIV (Figure 1, 2). The diameter of AIV was normal (approximately 4 mm). MDCT also demonstrated hypertrophic cardiomyopathy of the left ventricle. Although a stress test was performed, no abnormality was noted.

DISCUSSION

Coronary sinuses consist of the cardiac venous system in combination with each other. It drains into the right atrium through the posterior wall and courses via the posterior atrioventricular groove.

The main tributaries of coronary sinus include the AIV, lateral cardiac veins (anterolateral, midlateral, and posterolateral), posterior veins of the left ventricle (PV), middle cardiac vein, small cardiac vein, and oblique vein of the left atrium.⁴

AIV usually originates from the lower or middle third of the anterior interventricular groove. It ascends parallel to the left anterior descending coronary artery and then turns posteriorly at the atrioventricular groove and terminates into the great cardiac vein.⁵ An abnormal course of AIV may be into the superior vena cava

and large conus vein. To our knowledge, there has been only one reported case of AIV draining into the left atrium.⁶

The coronary venous system has been used as a conduit for various diagnostic and therapeutic purposes.⁷ Recent developments in CRT and trans-coronary vein ablations have played a critical role in the increasing value of imaging of the cardiac venous system (CVS).⁵ The left ventricular lead is usually placed percutaneously into a branch of the coronary venous system for biventricular pacing.⁶ Transvenous endocardial pacing through classical implantation of a pace/sensing lead in the right ventricle is strictly contraindicated in patients with a mechanical tricuspid valve. In those patients, anterior interventricular vein can be utilized. There have been numerous case reports and clinical experiences in placing CRT leads into unusual variations of the coronary venous system.⁸

The location, size, and course of major coronary veins are highly variable.⁵ The most variations have been shown on PV, and the absence of target veins (posterior and lateral) has been described with fewer variations by means of invasive coronary angiography. These variations might limit the left ventricle lead placement. Before coronary vein lead placement occurs, guide wire is placed into one of the major veins (PV, left marginal

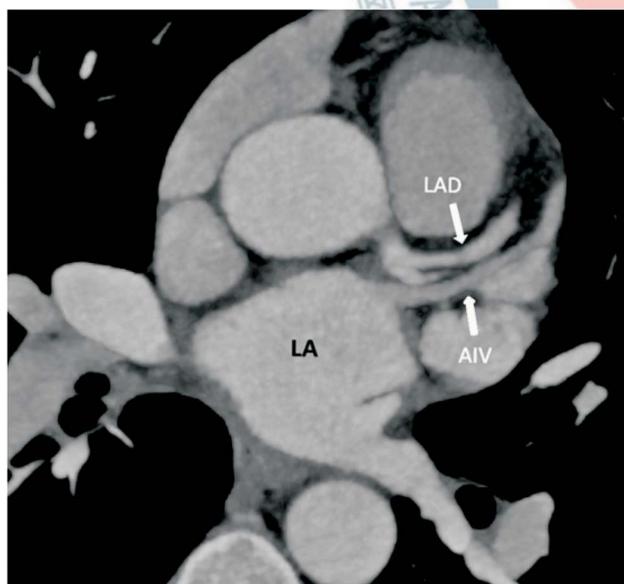


Figure 1. Axial maximum intensity image projection (MIP) shows the AIV which laid along the anterior wall of left ventricle as parallel to the LAD coronary artery (AIV, anterior interventricular coronary vein; LA, left atrium; LAD, left descending coronary artery).

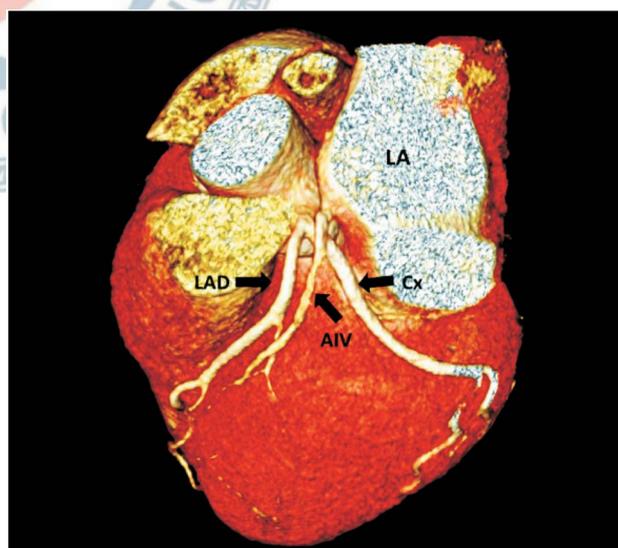


Figure 2. Three dimensional volume rendering images demonstrate AIV draining into left atrium (AIV, anterior interventricular coronary vein; Cx, circumflex coronary artery; LA, left atrium; LAD, left descending coronary artery).

vein, or AIV) and it is visualized by retrograde venography to evaluate the potential accessibility of the veins.⁹ Lateral, posterolateral and anterolateral veins are usually preferred as target veins for placement of the left ventricle electrode.⁶ AIV might be useful for some therapeutic approaches.⁹ Therefore, it is crucial that the anatomic variations of the cardiac venous circulation are accurately determined. On the other hand, implanting the electrode in a coronary vein can be difficult.⁵

MDCT has become an important imaging method for minimally invasive examination of coronary arteries and veins. The coronary venous system and its tributaries and variations may be evaluated in detail using MDCT angiography, and it allows for assessment of arteriovenous relationships. Multiplanar reconstructions, maximum intensity projection, and volume rendering technique images can be accurately and rapidly obtained by MDCT.⁶ A comprehensive CT evaluation of the coronary venous anatomy could help to determine patient suitability for transvenous LV pacing from a known venous tributary over the desired location before any invasive procedure or implantation of a cardiac resynchronization device.

Those cases with abnormal drainage into the left atrium of the anterior interventricular coronary vein may also be confused with accessory LAD, since contrast enhancement pattern of AIV is similar to a coronary artery, as in our case.

We recommend that if the radiologist suspects accessory LAD, the possibility of this variation of AIV should be considered.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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