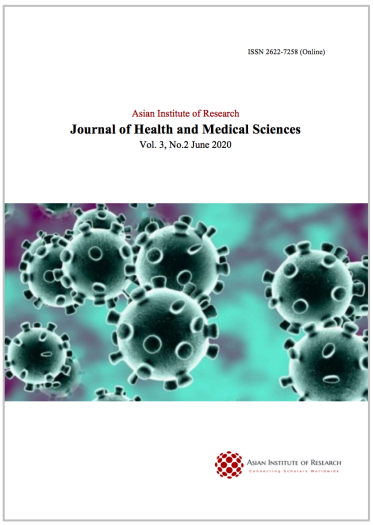

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Right Coronary Artery: Abnormal Birth and Literature Review

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Abstract
The birth defect of the right coronary artery from the aorta is an anatomical malformation characterized by the abnormal birth of the right coronary artery from the antero-left sinus. It has an abnormal initial path between the aorta and the pulmonary artery and is most often intramural in the aortic wall. It represents 0.1 to 0.3% of the population and exposes to a high risk of sudden death on exertion. The mechanism retained for sudden death is the occurrence of stress myocardial ischemia by compression of the abnormal artery between the two large vessels. The diagnosis can be confirmed by a careful echocardiographic examination. The coronarography confirms the diagnosis. Surgical treatment presents a very low risk and eliminates the risk of stress myocardial ischemia. It therefore appears necessary to look for this anatomical anomaly systematically, at least in all young adults who engage in intense sports activities.

Keywords: Right Coronary Artery, Sudden Death, Coronarography

1. Introduction

Among the various anomalies of birth and initial path of the coronary arteries, some are important to detect and correct because they expose them to a risk of sudden exertional death. These are, in particular, malformations in which a coronary artery arises from the contralateral coronary sinus and presents an initial path between the aorta and the pulmonary artery. These anomalies are not uncommon and affect 0.1 to 0.3% of the total population. Their interest is due to the fact that they are responsible for 15 to 20% of the sudden deaths observed in young athletes (Houyel & Plate. 2002).

The most frequent mode of discovery remains a sudden "recovered" death, occurring during or immediately after a very intense physical effort. Often there are warning signs before the acute episode: chest pain, syncope or abnormal exercise heart rate. More and more often, the anomaly is detected during a systematic echocardiographic assessment or carried out for another reason cardiovascular. (Taylor, Rogan & Virmani. 1992).

A careful echocardiographic examination can confirm the diagnosis, especially in children and adolescents. In adults, making the diagnosis can be more difficult and any suspicion must be confirmed by an imaging technique

(coronary angiography, CT or MRI). In asymptomatic patients, additional examinations are necessary to reveal possible effort ischemia (echocardiography or effort scintigraphy). (Brothers, Whitehead, Keller & al. 2015).

The operating indications remain discussed. It is currently recognized that all patients with an abnormality of the left coronary artery should be operated whether symptomatic or not. (Garcia-Rinaldi, Sosa & Olmedo. 2004). Several surgical techniques have been described (Vouhé. 2014). Some are aimed at removing the pulmonary

artery from the abnormal coronary artery. Others aim to open the intramural path or create a coronary neostostium at the appropriate coronary sinus.

2. Clinical observation

It was a 74-year-old patient who was referred to us for surgical treatment of aortic valve disease with a tight aortic stricture type.

In his history there was a chronic obstructive pulmonary disease, a transient ischemic attack and a bilateral treatment of varicose veins of the pelvic limbs. Her cardiovascular risk factors were hypertension and a notion of coronary inheritance.

Clinically she had grade 2 to 3/4 effort dyspnea (NYHA) and a typical breath of aortic stenosis. The doppler of the supra-aortic trunks did not show any hemodynamically significant lesion of the supra-aortic trunks intended for the brain. On coronary angiography, there were no significant lesions. The left coronary artery and its branching branches had a classic anatomical arrangement (Figure 1).

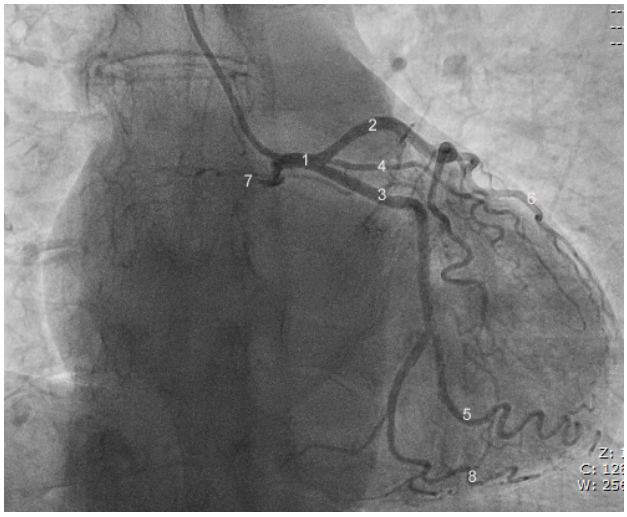

Figure 1 : **showing the left coronary artery and its branching branches on a coronarographic image**

1.trunk of the right coronary artery; 2. anterior interventricular artery; 4. bisecting artery; 5. left posterior ventricular artery (marginal); 6. Left anterior ventricular artery (diagonal); 7. Aortic sinus
In contrast, the right coronary artery originated from the antero-left sinus (Figure 2).

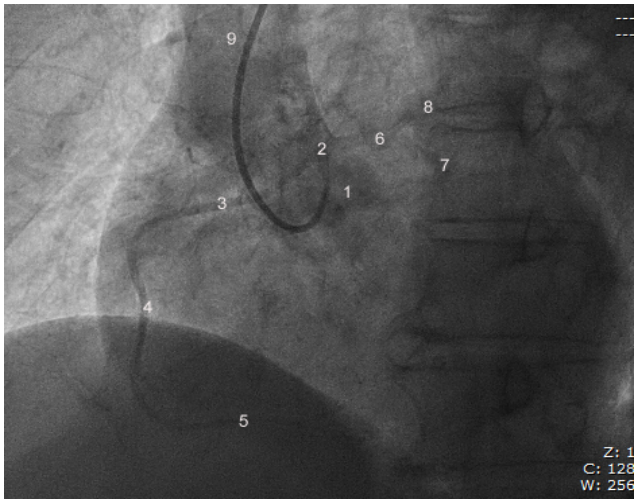

Figure 2: showing the birth of the right coronary of the antero-left sinus on a coronarographic image.

1.Aortic sinus ; 2. origin of birth of the right coronary artery in the antero-left sinus ; 3. first of the right coronary artery; 4. second segment of the right coronary artery; 5. Third segment of the right coronary artery; 6. common core of the left coronary artery; 8. anterior interventricular artery; 8. Circumflex artery; 9. Ascending aorta
The birth defect of the right coronary was clearly visible on the scanner (**Figure 3**).

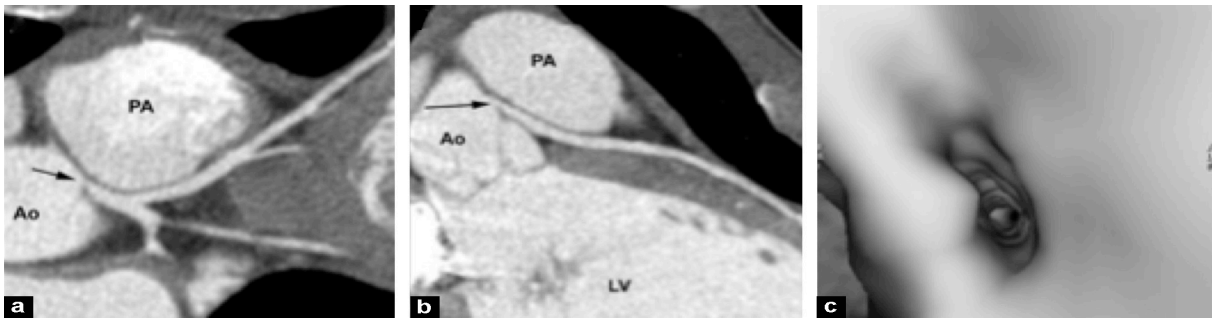

Figure 3. Birth of the left coronary of the right sinus with slit like ostium ostial stenosis and virtual angiography. Ao = ascending aorta; PA = pulmonary artery; LV = left ventricle

Functional respiratory tests were standard. Echocardiography noted an aortic stenosis with an average gradient measured at 52 mmHg, an aortic surface measured at 0.52cm² / m², a tubular aorta at 28mm, and a left ventricular function retained at 70%.

The patient's dental care was performed before surgery and she underwent aortic valve replacement with a bioprosthesis. No action has been taken on the birth anomaly of the right coronary artery due to the absence of related symptoms. On the other hand, the knowledge of its abnormal position helped us in the strategies of cardioplegia. The aftermath was simple. She left our service on D8 postoperatively.

3. Discussion

The normal coronary artery arises at the center of "its" coronary sinus. The abnormal artery arises from the same sinus (an abnormal right coronary artery arises from the antero-left sinus and vice versa). The ostium of the abnormal artery is often deformed into a slit and narrowed. The abnormal artery presents an initial path between the aorta and the pulmonary artery, most often intramural, incorporated into the aortic wall (Ou, Khraiche, Celermajer & al. 2013.) (Figure 4). This intramural segment is generally closely related to the adjacent valve commissure. The abnormal artery then resumes a normal epicardial course.

The birth defect of the right coronary artery is 5 to 6 times more frequent than that of the left coronary artery (Brothers, Whitehead, Keller M & al. 2015).

It is clearly established that the birth anomaly of the right coronary artery can be responsible for sudden death, in particular during or after intense effort (La Vecchia, Favero & Fontanelli. 2002).

Although the pathophysiology remains poorly explained, the most likely mechanism is that of an acute myocardial ischemia by compression of the abnormal artery, between the aorta and the pulmonary artery, while the large vessels dilate during effort. This dynamic compression is undoubtedly aggravated by associated anatomical factors: deformation and stenosis of the coronary ostium, anomaly of the angle of emergence of the coronary, autonomous stenosis of the intramural path, in particular with regard to the valve commissure.

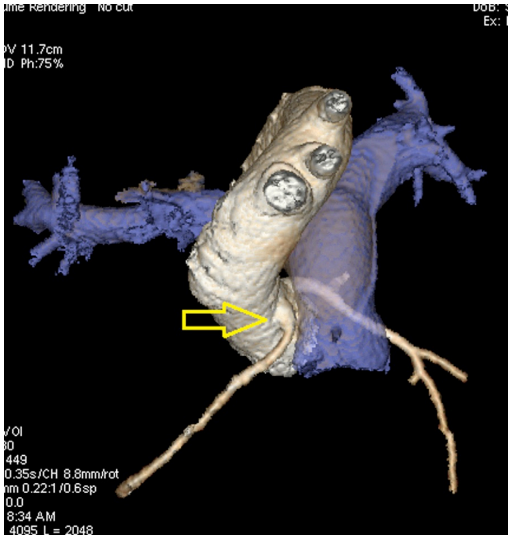

Figure 4: **Birth of the right coronary of the antero-left sinus with inter-aorto-pulmonary path.**

4. Conclusion

The presence of an aortic birth defect in a coronary artery exposes the patient to a certain risk of sudden exercise death. The diagnosis can almost always be confirmed by a careful echocardiographic examination. Surgical treatment presents a very low risk and eliminates the risk of stress myocardial ischemia. It therefore appears necessary to look for this anatomical anomaly systematically, at least in all young adults who engage in intense sports activities.

Declaration of interest links

The authors state that they have no interest links.

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