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Case Report

Off Pump Release of a Symptomatic Muscular Bridge of Right Coronary Artery with Anomalous Origin

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Abstract

Background: Symptomatic Right Coronary Artery (RCA) anomalies are often life-threatening, especially in younger patients. Therapeutical approaches include Percutaneous Intervention (PCI) with stent placement or surgical procedures such as repositioning of the RCA ostium on the aorta or a bypass graft on the RCA. However, there is currently no standard treatment for such anomalies.

Case presentation: A 33-year male presented with typical angina. On investigation, an anomalous origin of the RCA with resulting stenosis was found to be the cause, both in Computed Tomography (CT) angiography and coronary angiogram. Heart-Team decision excluded PCI und a surgical approach was chosen. Surgical correction involving freeing of the inter-arterial course of the artery, freeing of kinks and the muscular bridge was performed on a beating heart off Cardiopulmonary Bypass (CPB). Post-operative CT showed no stenosis with the patient transferred to Cardiology on the 7th post operative day. At 10-month follow-up the patient was free of the previously experienced symptoms.

Conclusion: Freeing of the artery from kinks without Coronary Artery Bypass Graft (CABG) or cardiopulmonary bypass should be considered in treating such anomalies, especially in younger patients.

Keywords: Anomalous right coronary artery; Coronaries; Muscular bridge

Introduction

Anomalous origins of the right coronary artery are uncommon and have been reported in about 0.019% to 0.17% of autopsies [1] and an angiographic prevalence of about 0.060% [2]. A majority of these anomalies remain asymptomatic and are incidental findings. For the minority of the symptomatic patients, the treatment approaches include PCI with stent placement or surgical approach such as repositioning of the RCA ostium on the aorta or a bypass graft on the RCA. However, there is currently no standard treatment for such anomalies. We present the case of a young patient who presented with typical chest pain with an origin of the right coronary artery from the sino-tubular junction away from the right coronary sinus and who was treated successfully with Off Pump repositioning of the artery.

Case Presentation

A 33-year male patient was referred to our cardiac surgery department due to an anomalous origin of the right coronary artery from the left coronary sinus with a run-off between the pulmonary trunk and the ascending aorta causing ostial stenosis with persistent chest pain for 2 months, radiating to the left arm as well as dyspnea on exertion (NYHA II). The patient presented with a Body Mass Index (BMI) of 32 and has been smoking vape for 9 years. Blood pressure, heart rate, temperature was within normal range. The initial ECG showed a left axis deviation, normal sinus rhythm with a negative T-wave in III, normal cardiac enzymes and a good ventricular pump function without any regional wall motion abnormalities on transthoracic echocardiography. Due to the young age of the patient a myocardial perfusion scintigraphy was performed which showed slightly reduced vitality of the posterior wall as well as marginal ischemia. A coronary angiography was then performed which showed an anomalous origin of the right coronary artery from the left coronary sinus with a severe ostial stenosis. For further clarification and planning of treatment, a CT angiography of the coronary arteries was performed, which then showed an anomalous origin of the right coronary artery from the left coronary sinus with its course between pulmonary trunk and the ascending aorta with a resulting ostial stenosis (Figure 1). The other vessels showed no signs of calcification and stenosis with a calcium score of 0.

Additionally, cardiac magnetic resonance imaging showed a global systolic pump function of 70% and no sign of myocardial ischemia, both at rest and under stress. Owing to the anomalous position and course of the vessel and the stenosis, a conventional surgical approach was decided to be the preferred modality of treatment by the Heart-Team. The patient was then scheduled for a correction of the anomaly/stenosis. A median sternotomy followed by an exploration of the root of the ascending aorta and pulmonary trunk was performed which then showed an anomalous origin of the vessel 2 cm away from its typical position with 2 kinks in its course proximally. The vessel was freed from the surrounding structures and the kinks were released (Figure 2). To prevent further kinking and to achieve complete hemostasis absorbable hemostat (oxidized regenerated cellulose) and fibrin glue was used and the flow of the vessel was measured. The flow

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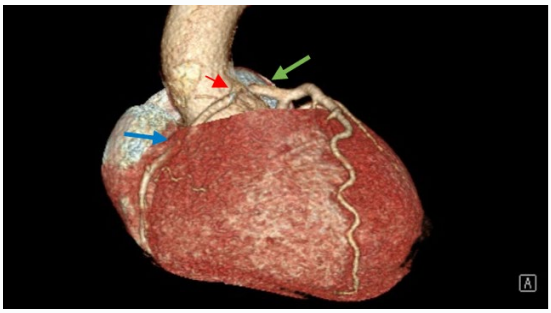


Figure 1: Pre-operative CT angiography of the heart showing the abnormal origin of the RCA from the left coronary sinus between the ascending aorta and pulmonary trunk as a red arrow; muscle bridge over the RCA (blue arrow), Left Anterior Descending (LAD) origin is shown with a green arrow.

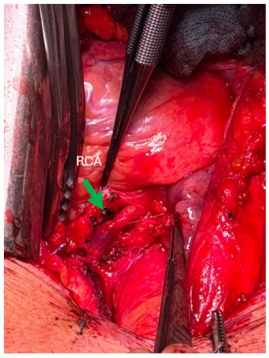


Figure 2: Intraoperative view of the RCA after being freed from the surrounding structures shown with a green arrow.

measurement showed a flow rate of 60 ml/min and a PI of 0.8. The sternotomy was closed and the patient was shifted to the intensive care unit. The patient was weaned and extubated later the same day.

A postoperative CT- angiography was performed which showed origin of the right coronary artery from the sino-tubular junction above the bridging between the right and left coronary cusps, however, with no run-off between the arteries and no evidence of stenosis (Figure 3). The rest of the hospital stay was uneventful and the patient was transferred to cardiology on the 7th postoperative day. At 6-month follow-up, the patient reported complete absence of the previously felt chest pains and dyspnea (NYHA I).

Discussion and Conclusion

Origin of the right coronary artery from the left coronary sinus, left anterior descending artery or circumflex, sinus of Valsalva and rarely from the ascending aorta or pulmonary trunk have been reported. Most of these patients become symptomatic due to the smaller ostia, acute angles at take-off from the origin, intraarterial and transmural course of the arteries causing compression of the artery and ischemia. Incidence of myocardial ischemia and sudden cardiac death was found to be high among young patients where the abnormality was associated with a course between the ascending aorta and pulmonary artery [3]. In comparison muscular bridges are more often found causing arrhythmias and symptoms of ischemia. However, unlike in our patient, they are more in over the left anterior descending artery [4].

The kinking of the artery in its course between the ascending aorta und pulmonary trunk and the muscular bridge causing compression of the artery and thereby obstruction of the blood flow to the distal part of the coronary artery appear to have been the cause of symptoms in our patient. In many of such patients, with timely diagnosis, an aortocoronary bypass, unroofing of the intramural portion of the artery or re-implantation into the right coronary sinus or ascending aorta has been the choice of repair [5-7].

Angioplasty is performed rarely owing to the technical difficulties in such patients. In addition, CABG in younger patients is not preferred due to higher rate of re-do surgery at an older age due to atherosclerosis and graft failure.



Figure 3: Post-operative CT angiography showing a freed RCA with a blue arrow in relation with the origin of the LAD shown with a green arrow. RCA has been freed from the muscle bridge and has a nonobstructive course.

We chose not to perform any ostial repositioning to prevent any risk of injury to the ostium, the aorta and to prevent stretching of the anastomotic site due to inadequate length of the artery during repositioning.

CABG has the potential risk of competitive blood flow with consecutive occlusion of a bypass graft when the stenosis in the coronary is minor.

With visual inspection and non-invasive flow measurement combined with a post-operative CT Angiography, preservation of the native vessel was achieved and many of possible complications and adverse effects of CPB could be avoided.

While many surgical techniques and methods in this aspect are still evolving, techniques that do not involve CPB and a bypass graft, such as repositioning the arterial course on a beating heart, which lead to a faster recovery, as in our patient, are recommended.

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