Anomalous Right Coronary Artery Off Main Pulmonary Artery

Michael Shields DO, MS, Veronica Liang MD

Department of Surgery

Abstract

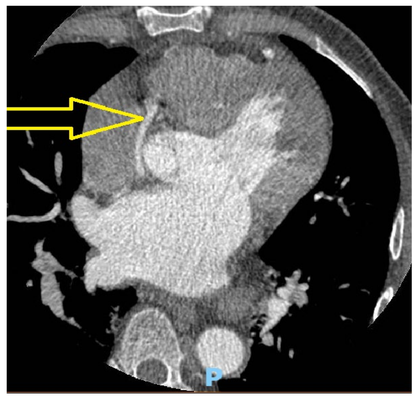
Anomalous coronary arteries were first described in the 18th century with the first scientific recognition of their relevance published in 1969 and then updated in 2000 (1,2). In general, anomalous coronary arteries originating from the main pulmonary trunk are rare. In a cohort of 126, 595 undergoing angiography 2 patients were noted to have an anomalous right coronary artery off the main pulmonary trunk (ARCAPA) (3). They are not associated with any other congenital abnormalities but they are associated with ischemia (4,5). Patients with ARCAPA can present with a range of symptoms and severity ranging from no symptoms to sudden cardiac death depending on age and the development of collateral flow. However, an anomalous left coronary artery of pulmonary origin can be rapidly fatal in >90% of patients (6)

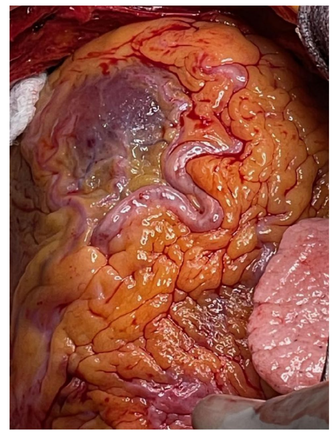
Case

74M with past medical history of bladder cancer, diastolic heart failure, mitral valve prolapse, hypertension, and polycythemia vera who presented to his cardiologist due to worsening fatigue and breathlessness. He had a cardiac catheterization and left ventriculogram which demonstrated no flow to the RCA from aorta and mild CAD. CTA of the coronaries confirmed ARCAPA(figure 1). CT chest demonstrated an ascending aortic aneurysm of 4.5cm and dilation of the main pulmonary artery. A midline sternotomy incision was made and the patient was placed on cardiopulmonary bypass. A large LAD was identified which is necessary to meet myocardial demand (figure 2). The pulmonary artery was addressed first to prevent any backflow and to prevent the right coronary bed from becoming ischemic. The orifice of the vessel was occlude by using a bovine pericardial patch. Attention was then turned to the mitral valve. A biatrial incision was performed and no obvious PFO was found but a small PFO was not excluded. The left and right atrium were entered. A Duran anchor band was place and a triangular resection of the mitral valve was performed. The incisions were then closed. The patient was rewarmed. The patient regained good hemodynamics and was weaned from cardiopulmonary bypass. Post operatively he developed atrial fibrillation with rapid ventricular response which failed rate control therapy requiring cardioversion as well as tachycardia induced systolic heart failure. A repeat TTE was performed which demonstrated resolution of his acute cardiomyopathy. He was discharged to home and continued to do well.

Discussion

Anomalous coronary arteries found in the adult population are usually incidental findings. Some publications recommend operating on anomalous right coronary arteries in patients less than 40, in older, symptomatic patients or patients with positive ischemic testing (7). When a surgical approach is not possible, non-operative management consists of avoidance of strenuous activity and beta blockade as well as percutaneous coronary intervention (8). Further research is required to determine the best strategy for treatment in certain age groups, anatomical variants and presentations. In the patient presented in the case he likely developed dyspnea on exertion and fatigue because his left anterior descending artery was no long able to provide adequate amounts of oxygenated blood to his cardiac myocytes during times of increased metabolic and oxygen demand. He developed coronary artery disease which would have further compromised blood flow causing his symptoms. Oxygenated blood could have been provided to the right side of the heart via the posterior descending artery but from documentation it appears to originate from the anomalous right coronary artery (catheterization images were not available).





References

1. Ogden JA. Congenital anomalies of the coronary arteries.**Am J Cardiol**. 1970; 25:474–479. doi: 10.1016/0002-9149(70)90016-0
2. Dodge-Khatami A, Mavroudis C, Backer CL. Congenital Heart Surgery Nomenclature and Database Project: anomalies of the coronary arteries.**Ann Thorac Surg**. 2000; 69(suppl):S270–S297. doi: 10.1016/s0003-4975(99)01248-5
3. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography.**Cathet Cardiovasc Diagn**. 1990; 21:28–40. doi: 10.1002/ccd.1810210110
4. Radke PW, Messmer BJ, Haager PK, Klues HG. Anomalous origin of the right coronary artery: preoperative and postoperative hemodynamics.**Ann Thorac Surg**. 1998; 66:1444–1449. doi: 10.1016/s0003-4975(98)00716-4
5. Guenther TM, Sherazee EA, Wisneski AD, Gustafson JD, Wozniak CJ, Raff GW. Anomalous origin of the right coronary artery from the pulmonary artery: a systematic review.**Ann Thorac Surg**. 2020; 110:1063–1071. doi: 10.1016/j.athoracsur.2020.01.082
6. Wesselhoeft H, Fawcett JS, Johnson AL. Anomalous origin of the left coronary artery from the pulmonary trunk: its clinical spectrum, pathology, and pathophysiology, based on a review of 140 cases with seven further cases.**Circulation**. 1968; 38:403–425. doi: 10.1161/01.cir.38.2.403
7. Rosseel, L., Bonnier, H., & Sonck, J. (2016). Anomalous right coronary artery in a middle-aged patient. *Medicine*, *95*(49). https://doi.org/10.1097/md.0000000000005508
8. Doorey AJ, Pasquale MJ, Lally JF, et al Six-month success of intracoronary stenting for anomalous coronary arteries associated with myocardial ischemia. Am J Cardiol 2001;86:580–2.