

CASE REPORT

Intraoperative Transesophageal Echocardiography in the Management of a Right Coronary Artery to Coronary Sinus Fistula

Stephen M McHugh, Stephen O Bader

ABSTRACT

Coronary artery fistulas are rare but can have significant perioperative consequences. We describe the case of a 65-year-old man found to have a coronary artery fistula from the anterior right coronary artery to the coronary sinus. We discuss the unique advantages that transesophageal echocardiography offers in the monitoring and management of coronary artery fistulas.

Keywords: Transesophageal echocardiography, Coronary artery fistula, Monitoring, Bacterial endocarditis.

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INTRODUCTION

Coronary artery fistulas are a rare cardiac condition, occurring in 0.1 to 0.2% of patients in angiographic studies.^{1,2} Patients are often asymptomatic. However, when symptoms do occur, they often include palpitations, dyspnea and chest pain.^{1,4,5} While coronary angiography has traditionally been considered the 'gold standard' for diagnosis of coronary artery fistulas, transesophageal echocardiography (TEE) has shown significant utility in the anatomical delineation of these lesions and in intraoperative monitoring of patients with this condition.^{2,6}

CASE REPORT

A 65-year-old man with a history of paroxysmal nonsustained ventricular tachycardia was admitted for evaluation of recurrent sinusitis, generalized weakness, fevers, and night sweats for the past 8 weeks. The patient's evaluation included a transthoracic echocardiogram (TTE) that showed a vegetation on the right coronary cusp of the aortic valve associated with severe aortic regurgitation. TEE was then performed to further characterize this finding. The TEE revealed a 1.4 cm vegetation involving the noncoronary and right coronary cusps of the aortic valve with evidence of valvular perforation. It also confirmed the diagnosis of severe aortic regurgitation and showed a secundum atrial septal defect approximately 0.5 cm in diameter. However, the TEE also revealed what was believed at the time to be a

small communication between the aortic root and the right atrium and mild dilation of the coronary sinus. Coronary angiography showed a dilated and tortuous circumflex coronary artery and a right coronary artery with a fistulous connection to the coronary sinus. Intracardiac left to right shunt was measured with a Qp:Qs ratio of 1.4:1.

Surgery was scheduled for the patient's diagnosis of subacute bacterial endocarditis. The planned procedure included an aortic valve replacement and an atrial septal defect closure. A Philips X7-2t TEE probe using the iE33 workstation was placed after induction of anesthesia for intraoperative monitoring of the patient. TEE examination showed a left ventricular ejection fraction of 55% with no regional wall motion abnormalities. Right ventricular function was normal and no dilation of the right or left atria were noted. The previous finding of the 1.4 cm vegetation adherent to the noncoronary and right coronary cusps with resultant severe, eccentric aortic regurgitation and the small secundum atrial septal defect with left to right flow were confirmed. Intraoperative TEE allowed further characterization of the coronary artery fistula. Notably, a dilated right coronary artery with a tortuous course from the aorta around the apical-lateral wall of the right ventricle and connecting to the coronary sinus was identified (Figs 1 to 4). Color Doppler imaging was used to confirm flow from the dilated right coronary artery directly into the coronary sinus via a fistulous connection. Upon sternotomy and pericardiotomy, direct visualization revealed the dilated right coronary artery fistula with a strongly palpable thrill (Fig. 5). Replacement of the aortic valve and repair of the atrial septal defect were performed without complication. TEE examination of the patient's cardiac function after separation from cardiopulmonary bypass showed preserved biventricular systolic function, successful closure of the atrial septal defect, and no perivalvular leaks. Importantly, there was no evidence of an increase in left to right flow through the fistula or volume overload of the right heart resulting from increases in diastolic blood pressure after correction of the patient's severe aortic regurgitation. Preoperatively, the interim decision had been made not to perform elective repair of the coronary artery fistula due to fears of incidentally ligating functional branches of the right coronary artery. Based on TEE examination showing

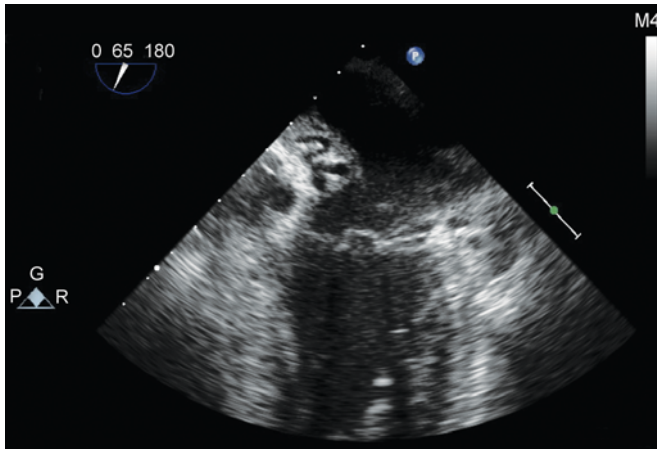


Fig. 1: Mid-commissural view showing the dilated and tortuous right coronary artery

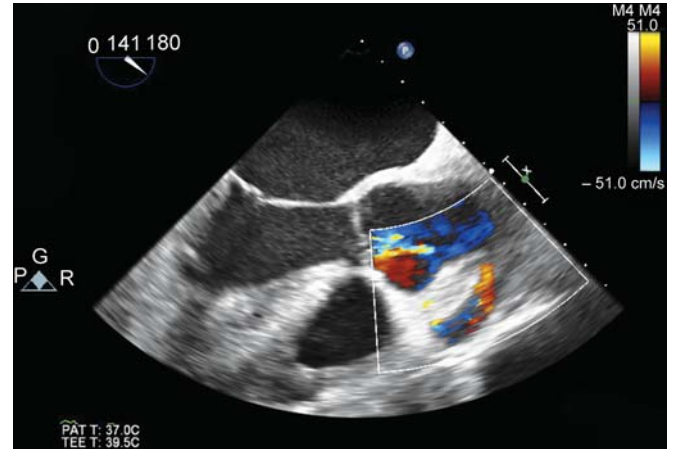


Fig. 4: Long-axis view of the aortic root showing flow through the enlarged right coronary artery

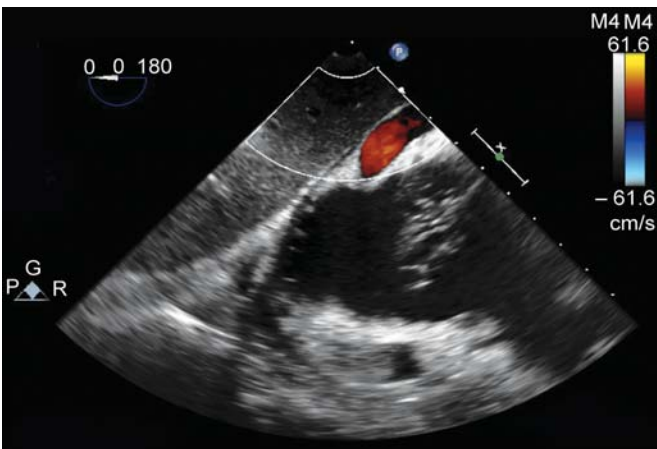


Fig. 2: Color Doppler showing flow through the dilated right coronary artery

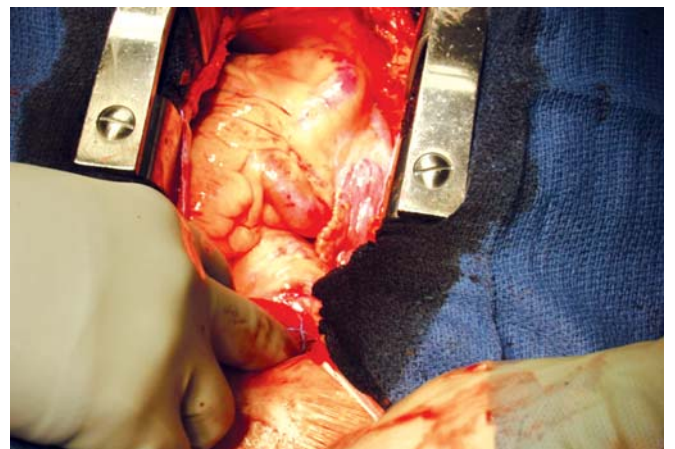


Fig. 5: View of the surgical field showing the large and tortuous right coronary artery



Fig. 3: The coronary sinus

acceptable global cardiac function after surgical repair, this decision was confirmed.

DISCUSSION

Coronary artery fistulas are most commonly congenital in origin, being present from birth and often causing no

symptoms. When they are symptomatic, findings can include palpitations, chest pain and dyspnea.^{3,4,7} While fistulas can arise from any of the coronary arteries, the right coronary artery is the proximal site in the majority of cases.^{4,8} The distal connection is almost always into a low pressure structure, such as the right atrium, right ventricle or pulmonary artery.^{4,5,9} The findings in our patient were consistent with these facts: His fistula arose from the right coronary artery and drained into the coronary sinus. Although arrhythmias are a possible symptom of coronary artery fistulas, it is unclear if this was the cause of his previous nonsustained ventricular tachycardia.

Coronary angiography has been considered the 'gold standard' imaging modality for diagnosis of coronary artery fistulas. However, angiography cannot always fully delineate the anatomical path of the fistula, especially when tortuous vessels in the same area interfere with visualization.² In these cases, TEE may provide additional utility and allow full characterization of the feeding vessel and receiving structure when not only angiography, but TTE and coronary computed tomography (CT) are insufficient.^{3,6}

In our patient, TTE showed no indication of the fistula. While the fistula was apparent on preoperative coronary angiography, TEE color Doppler imaging allowed real-time monitoring of flow through the fistula during the intraoperative course. TEE was also vital in guiding proper placement of the cannula for retrograde cardioplegia within the abnormal coronary sinus. Finally, an additional benefit of TEE in patients with coronary artery fistulas is real-time monitoring of myocardial function during surgery.^{6,10} In a similar case, TEE proved vital in the prompt diagnosis of decreased left ventricular function after clamping of a right coronary artery to coronary sinus fistula. TEE then allowed assessment of afterload reduction with sodium nitroprusside which was effective in restoring left ventricular systolic function.³ Although the coronary artery fistula was not surgically corrected in our patient, TEE was necessary for accurate evaluation of the effects of the fistula on cardiac chamber size and function both pre- and postoperatively.

CONCLUSION

TEE provides valuable diagnostic information in patients with coronary artery fistulas that is not obtainable from angiography or other imaging modalities. This ability, combined with TEE's use as an intraoperative monitor of myocardial function, makes it a powerful tool in patients presenting with coronary artery fistulas.

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ABOUT THE AUTHORS

Stephen M McHugh

Associate Chief Resident, Department of Anesthesiology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

Stephen O Bader (Corresponding Author)

Visiting Associate Professor, Department of Anesthesiology University of Pittsburgh, School of Medicine, VA Pittsburgh Healthcare System, University Drive, Pittsburgh, Pennsylvania, USA e-mail: baderso@upmc.edu