Hybrid Approach to Closure of an Acquired Coronary-Cameral Fistula

Imthiaz Manoly, MRCS, Vaikom S. Mahadevan, MD, FRCP, and J. Andreas Hoschtitzky, MS, FRCSEd-CTh

Adult Congenital Heart Disease Unit, Central Manchester University Hospitals Foundation Trust, Manchester, United Kingdom

Coronary-cameral fistula is an abnormal fistulous communication between a coronary artery and a cardiac chamber. Significant fistulae require closure either percutaneously or surgically to avoid any complications. We describe the case of a 19-year-old male patient with tetralogy of Fallot, who presented with a complex coronary-cameral fistula, which precluded percutaneous occlusion. By means of a hybrid approach, the fistula was easily located and closed surgically. Where surgical correction of such fistulae is warranted in the setting of other cardiac defects, a hybrid approach to isolate the fistula followed by surgical intervention will reduce operative time, thereby potentially lowering perioperative complications.

© 2014 by The Society of Thoracic Surgeons

A coronary artery fistula is a communication existing between a coronary artery and a cardiac chamber or systemic vein. Most commonly, the implicating artery is the right coronary artery in 52% or left anterior descending coronary artery (LAD) in 32% of cases, with drainage into the right side of the heart in over 90% [1]. The estimated incidence of coronary artery fistulae varies between 0.1% and 0.2% [2]. While usually of congenital origin (an estimated prevalence of 0.25% to 0.4% of all congenital cardiac anomalies) [3], more common secondary or acquired causes include complications from operations including septal myectomy and tetralogy of Fallot repair, chest trauma, coronary angioplasty [4, 5], and repeated endomyocardial biopsy postcardiac transplantation [6]. There are reports on acquired coronary artery fistula occurring after congenital cardiac surgery involving the ventricular septum [7]. Significant fistulae generally require closure to prevent complications. We describe the management of a patient who had a fistula between the LAD and right ventricle (RV) with a history of previous cardiac surgery, which necessitated a hybrid approach.

A 19-year-old male patient who had undergone complete repair of his tetralogy of Fallot, presented with shortness of breath and decrease in exercise tolerance. A transthoracic echocardiogram demonstrated severe pulmonary regurgitation with RV dilatation. A coronary angiogram elicited a coronary artery fistula from the distal LAD emptying into the RV cavity near the RV apex (Fig 1A; B). The fistula was presumed to be secondary to surgical repair of his tetralogy of Fallot at the proximal site of the transannular patch. The ratio of pulmonary blood flow to systemic blood flow (shunting) during the catheter was less than 1.5:1. After discussion in the multidisciplinary meeting, it was decided that he should undergo surgical repair of the residual lesions, including pulmonary valve replacement and repair of coronary-cameral fistula.

After routine induction of anesthesia in the catheterization laboratory, the patient was intubated and routine central venous access and arterial access were obtained. Both the femoral areas were prepped and draped if required for cardiopulmonary bypass. An arterial sheath was placed in the left femoral artery. The patient was partially heparinized. A coronary guide wire was passed through the arterial sheath retrogradely through the aorta

Accepted for publication May 27, 2014.

Address correspondence to Dr Manoly, Manchester Heart Centre, Central Manchester University Hospitals Foundation Trust, Manchester, UK; e-mail: imthiazmanoly@gmail.com.
into the LAD, and then through the fistulous communication into the RV cavity. He was then transferred into the operating room. Once the dissection of the heart and major vessels was performed uneventfully, the patient was fully heparinized thereafter. After cannulating the patient, 2 stay sutures were placed at the base of the RV outflow tract (RVOT) for retraction. The RVOT was incised longitudinally, but despite 3 separate field suction catheters, visualization was not possible due to the torrential flow. The aorta was cross-clamped and the heart cardiopleged. The coronary wire was localized in the RVOT (Fig 2A) and cut short. The remaining redundant wire was then removed through the femoral arterial sheath. Closure of the LAD to RV coronary fistula was executed from within the RV cavity by placing a mattress transfixion suture through the opening of the coronary artery fistula. The heart was then “deaired” and the aortic cross-clamp removed. The RV was inspected and there was no residual flow from the fistula (Fig 2B).

A pulmonary valve replacement was then performed with a 21-mm Edwards Perimount Magna Ease tissue valve (Edwards Lifesciences, Irvine, California). The infundibular incision was closed and the main pulmonary artery portion was closed with a small porcine pericardial patch. The patient made an uneventful recovery and is alive and functionally in CCS Class I without symptoms of angina 42 months after surgery. A transthoracic echo performed after surgery demonstrated no communication between the LAD and the RV (Fig 2C).

Comment
If the abnormal fistulous communication is between a coronary artery and cardiac chamber, it is called a coronary-cameral fistula. Coronary-cameral fistulae are not infrequently seen on intraoperative transesophageal echocardiography after repair of congenital heart disease, septal myectomy, and other operations involving significant incision in the ventricular septum, and are generally benign. The pathophysiology of a coronary artery fistula depends mainly on the etiology. The coronary artery fistula may result in coronary steal with reduction in coronary blood flow to distal myocardium with the risk of cardiac ischemia. Although the coronary vessel attempts to compensate by progressive enlargement of the ostia and feeding artery, this itself can lead to frank aneurysmal formation. Thrombosis within the fistula may lead to ischemic changes or arrhythmias. Additionally, fistulae draining to the right side of the heart can gradually lead to increase in volume overload and heart failure. Thus, closure of significant fistulae is required if any complications are anticipated. The treatment options for coronary arterial fistulae include surgery or catheter closure. Although catheter closure of fistulae is now considered to be an effective and safe alternative to surgery, some fistulae are unsuitable for such an approach and preferably addressed surgically [8]. This may include fistulae with multiple connections, circuitous routes, and acute angulations, which increase the technical demands of such a procedure. Surgery involves internal closure of the fistula within the receiving chamber or vessel. Surgery is associated with a low morbidity and mortality rate ranging from 0% to 6%. Myocardial infarction has been shown to occur in 3% of these cases. Complete occlusion of the fistula is achieved in greater than 95% of cases after surgery.

In our case, given the size of the coronary vessel and the area of myocardium subtended being very large, it was felt that if there were thrombus extending proximal to the coil occlusion point it would potentially extend into the left main coronary artery, resulting in a life threatening situation. However, guidance of the wire in the coronary artery fistula made it easy for us to locate the exit point into the RV chamber, which otherwise would have been difficult to find in the trabeculations. We demonstrated that a hybrid approach of catheter isolation of the fistula followed by cardiac surgery results in a
relatively straightforward procedure with excellent outcome.

References