

## SURGICAL TECHNIQUE

# Surgical Management of Multiple Coronary Artery Aneurysms

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**ABSTRACT** We describe the surgical management of three distinct coronary artery aneurysms in conjunction with coronary artery bypass grafting. doi: 10.1111/jocs.12105 (*J Card Surg* 2013;28:383–385)

Coronary artery aneurysm is an uncommon disease that is defined as dilation that exceeds the diameter of the patient's largest coronary segment by 1.5 times.<sup>1</sup> The term "giant" has been used in the literature for those aneurysms of very large dimensions; however, there is no specific definition, with sizes reported in the range of 5 to 15 cm.<sup>1</sup> We present a unique case of a patient with three distinct coronary aneurysms, one of which can be characterized as giant, who was treated with coronary artery bypass graft (CABG) surgery.

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A 41-year-old male patient was admitted with symptoms of epigastric discomfort. An abdominal computed tomography (CT) done in the emergency department showed a suspicious mediastinal mass in the upper sections of the study, which prompted a formal CT of the chest with intravenous contrast. The CT showed a giant cystic or aneurysmal structure 10 cm in diameter, originating from the surface of the right atrium and right ventricle. The mass was well circumscribed, without invasion of the adjacent structures, and with areas of high attenuation, demonstrating possible thrombus or unopacified blood. Furthermore, two additional calcified cystic lesions, measuring 11 and 13 mm in diameter, respectively, were apparent on the surface of the left ventricle (Fig. 1). Due to the high level of suspicion for coronary anomalies, the patient underwent coronary CT which confirmed the presence of three distinct coronary artery aneurysms: a giant on the right coronary artery (RCA),

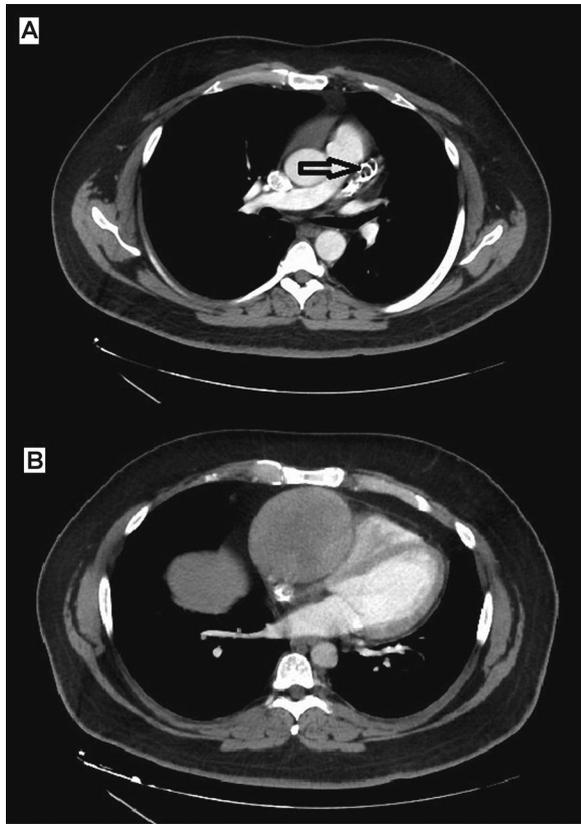
and two smaller ones in the left anterior descending (LAD) and the circumflex arteries. A heart catheterization revealed no obstructive coronary artery disease and normal left ventricular function with an ejection fraction of 60% (Fig. 2).

The patient was taken to the operating room for definitive treatment. Upon opening the pericardium, a giant aneurysm originating from the RCA was encountered, encompassing a large portion of the anterior surface of the heart (Fig. 3A). Two additional smaller aneurysms were identified, one in the LAD artery and one in the circumflex artery. The patient was placed on cardiopulmonary bypass, and after cardioplegic arrest, the RCA aneurysm was opened in its entire length and a small amount of thrombus was evacuated (Fig. 3B). The inflow and outflow portions of the aneurysm were oversewn with polypropylene suture and the majority of the aneurysmal sac was resected and sent for pathology examination and cultures. The remaining edges of the sac were oversewn with a continuous polypropylene suture. Finally, a RCA bypass was performed with reverse saphenous vein graft just distal to the aneurysm.

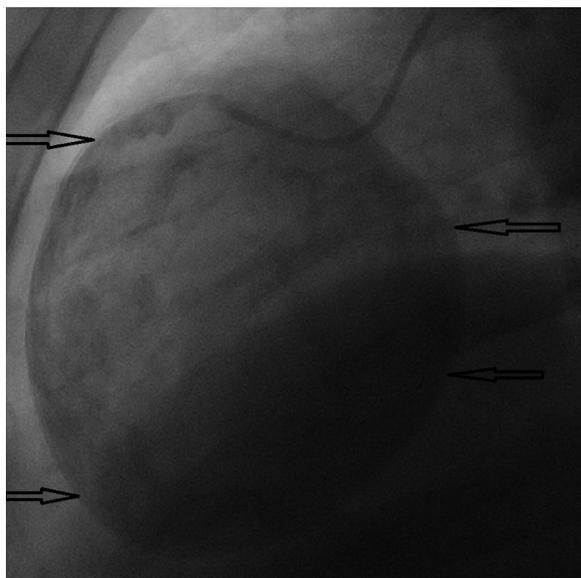
Attention was then directed towards the circumflex aneurysm, which was treated in the same fashion with inflow and outflow occlusion, resection, and distal bypass with saphenous vein. Finally, the LAD aneurysm was also oversewn and the vessel was bypassed with the internal mammary artery. After removal of the cross clamp and re-establishment of cardiac function, complete hemostasis was noted from all the suture lines. The patient tolerated the procedure well and was discharged home after a five-day recovery. Today, almost six months after the operation, he has returned completely to his prior activities and remains asymptomatic. Histologic examination of the specimen revealed diffuse atherosclerotic changes of the aneurysm wall. The patient was placed on a statin (baseline LDL was 189 mg/dL). The Institutional Review Board of our hospital gave permission for publication of this case.

**Conflict of interest:** The authors acknowledge no conflict of interest in the submission.

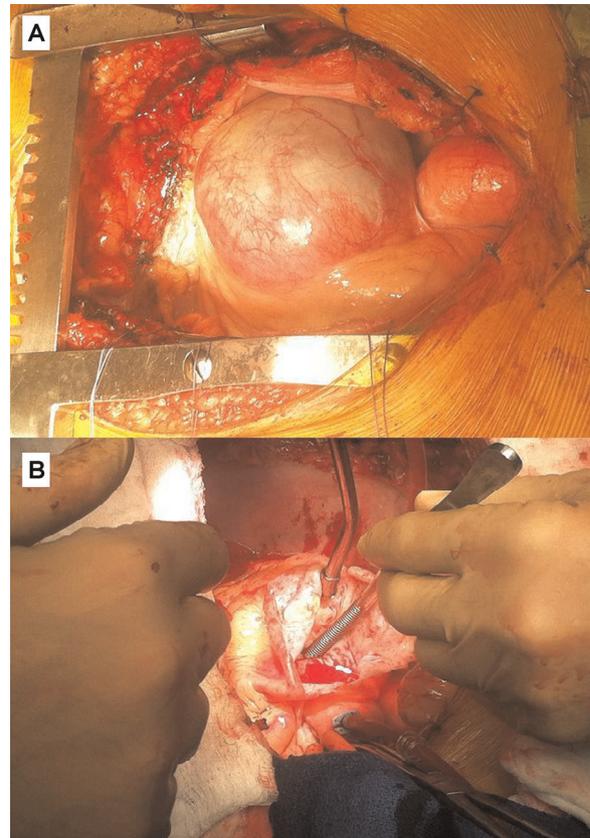
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**Figure 1.** (A) Computed tomography of the heart with intravenous contrast showing calcified aneurysmal dilation of the left anterior descending (LAD) artery (arrow). (B) Giant aneurysm of the right coronary artery (RCA) with unopacified blood.



**Figure 2.** Cardiac catheterization showing a giant right coronary artery aneurysm (arrows show the borders of the aneurysm).



**Figure 3.** (A) Intra-operative photo showing the giant RCA aneurysm on the anterior surface of the heart. (B) The RCA aneurysm is opened and its blood and thrombus have been evacuated.

## DISCUSSION

Aneurysms of the coronaries are uncommon entities, found in 1.4% of autopsies and in 1.2% to 4.9% of patients undergoing coronary angiography.<sup>2</sup> The literature contains only a few of such reports, with males being the majority of cases and with the RCA being the most commonly affected vessel.<sup>2</sup> Most patients are asymptomatic, and the most frequent symptom is myocardial ischemia, ranging from angina to myocardial infarction. Occasionally, they are associated with aneurysms in other locations, especially the aorta and the femoral arteries.<sup>3</sup>

Multiple causes have been implicated in the development of coronary artery aneurysms, such as atherosclerosis, Kawasaki disease, trauma or dissection (mainly due to cardiac catheterization), coronary angioplasty and stenting, systemic lupus erythematosus, scleroderma, and mycotic aneurysm. Of these, the most widely described is Kawasaki disease, a diffuse vasculitis that occurs in children and implicates the coronary system in about 20% of the cases.<sup>3</sup>

The size of coronary artery aneurysms ranges widely, but it is very rare to exceed 5 cm in diameter. These giant aneurysms almost exclusively arise from the RCA and may connect with a cardiac chamber through a fistula. They may cause symptoms of myocardial

ischemia, palpitations, or dyspnea.<sup>3</sup> In our case, the patient had three aneurysms involving all of the major arteries of the coronary system. It is extremely uncommon for a giant aneurysm to co-exist with other coronary aneurysms as in this case.

Coronary artery aneurysms tend to thrombose and embolize in about 75% of the cases, thus causing myocardial ischemia.<sup>3</sup> Rupture has also been described with subsequent pericardial tamponade. Baman et al. described coronary aneurysms as an independent predictor of mortality with a 71% overall five-year survival.<sup>4</sup> As a result, these patients need to be referred for definitive treatment, with observation reserved only for a small minority of stable small aneurysms. Management options range from percutaneous insertion of covered coronary stents to aggressive surgical approach. Absolute indications for surgery are myocardial infarction, rupture, and compression of nearby structures such as the ventricles or the superior vena cava.<sup>3,5</sup> The operative procedure of choice is exclusion

of the aneurysm with resection of its wall and the thrombus that it may contain, followed by oversewing of its free wall and distal coronary bypass.

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