

Pulmonary Artery Division for Total Excision and Bypass of Left Main Coronary Artery Aneurysm

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1. Abstract

We report a case of left main coronary artery aneurysm repair by excision with bypass of the origins of the left circumflex artery and left anterior descending artery. Currently there is a lack of clear guidelines on how to surgically treat this type of aneurysm. Here we discuss our surgical approach and offer insight on why we believe repair must be done once recognized.

2. Introduction

Aneurysms of the left main coronary artery are rare, noted in only 0.1% of coronary angiograms. [1] In western countries, coronary artery aneurysms (CAAs) are most frequently associated with atherosclerosis, followed by congenital and infectious causes. [2] The management of left main coronary artery aneurysms (LMCAs) requires an individualized approach that is dependent on size, shape, and location factoring in potential complications of aneurysms such as thrombosis, embolization, dissection, mechanical obstruction, and erosion into surrounding structures with fistula formation. [3] Currently, there are no clear guidelines on how to surgically treat these aneurysms. Some advocate exclusion of the aneurysm and bypass, however, retrograde filling and growth of the aneurysm can occur. Others advocate bypass with proximal ligation of the circumflex and left anterior descending (LAD) arteries. This approach may sacrifice important collaterals or septal perforators; thus, we feel it is not the optimal approach. We believe

excision is necessary with bypass to the origins of the circumflex and LAD arteries. This will provide good antegrade flow to the main vessels and branches.

3. Case Report

African American female initially suffered ST elevation myocardial infarction one-month post-partum at age 25 (Figure 1A). At that time, she was treated at an outside facility with coronary artery bypass grafting using left internal mammary artery (LIMA) to the LAD coronary artery. Ten years later, at age 35, she was found to have occlusion of the LIMA to LAD bypass graft with tandem stenosis of LAD and a 30 mm left main coronary artery aneurysm (Figure 1B). We performed redo sternotomy, excision of the left main coronary artery, and coronary artery bypass grafting to the circumflex and LAD origins with a vein graft segment. Exposure was facilitated by division of the main trunk of the pulmonary artery. The aorta was divided at the level of the left main and primarily repaired as an end-to-end anastomosis. The aortic cross clamp was removed and the vein graft coming from the circumflex and LAD was brought posterior and to the right of the aorta and anastomosed to the anterior surface of the ascending aorta using a GETINGE 4.3 mm HEARTSTRING III Proximal Seal System. The LAD was bypassed using the left radial artery from the "hood" of the vein graft to the mid LAD (as seen in Figure 2). The patient remained hemodynamically stable, in normal sinus rhythm, and was discharged home on post op day 6.

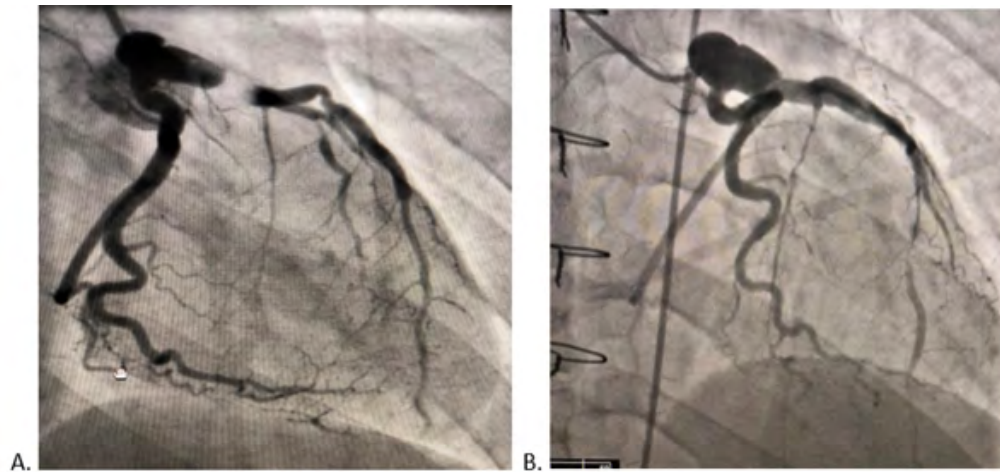


Figure 1: (A) initial presentation at age 25, coronary angiogram from outside facility demonstrating fusiform aneurysm of the left main coronary artery with proximal occlusion of the LAD. (B) 10 years later at age 35, repeat coronary angiogram from this facility demonstrating interval enlargement of the left main aneurysm with new flow-limiting mid-LAD stenosis. The LIMA was occluded.

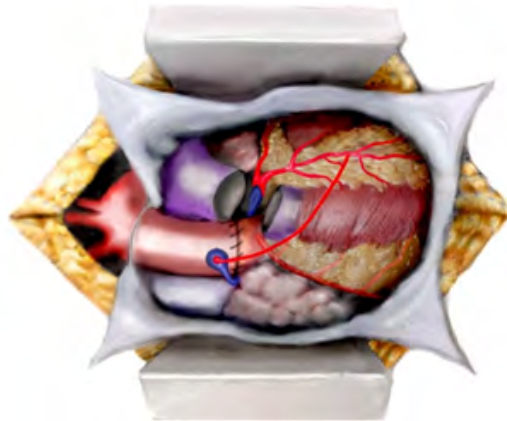


Figure 2: A Surgeon's View of the heart post resection of a left main coronary aneurysm with retroaortic SVG bypass (blue) to the origin of the circumflex and LAD. From the hood of the SVG, a radial artery graft (red) to mid LAD was performed to bypass the LAD stenosis and replace the thrombosed LIMA. Note the division of the pulmonary trunk required to expose and repair the aneurysm.

4. Comment

There has been a long-standing controversy among surgeons regarding the most optimal approach for repair of left main coronary artery aneurysms. We believe there is evidence to support repair should be done by excision of the aneurysm paired with bypass to the origins of the circumflex and LAD arteries. An approach of exclusion, rather than excision, as it occurred in this case where the patient had LIMA to LAD bypass without aneurysm repair at age 25, can lead to retrograde filling and growth of the aneurysm. Considering the longevity of the LIMA placed to the LAD exceeds 90% at 10 years [4] we also believe the growth of the aneurysm contributed to the failure of her LIMA to LAD bypass graft 10 years later, which may have worsened a chronic dissection of the LAD. Another important consideration is the selection of most appropriate conduit for bypass. In one case report the patient was

managed with an interposition graft fashioned from the lateral femoral circumflex artery [1]. In our experience this artery varies greatly in caliber and length making it unlikely to be a suitable conduit in all situations. Analysis of current data suggests for patients aged less than 70 years, the optimal grafting strategy is using either the radial artery (RA) or right internal thoracic artery (RITA) as a preferred second bypass graft conduit during CABG [5]. Considering this patient had redo sternotomy with adhesions we opted for radial artery harvest. Recent findings also suggest the RA is preferable over RITA in right-sided or distal circumflex artery targets with high-degree stenosis and in patients at higher risk for deep sternal wound infection (DSWI), whereas it is not recommended to graft vessels with moderate stenosis and in cases of insufficient collateralization from the ulnar artery or previous transradial procedures [6]. (Figure 3) demonstrates the pre op and post op CT angiogram (CTA).

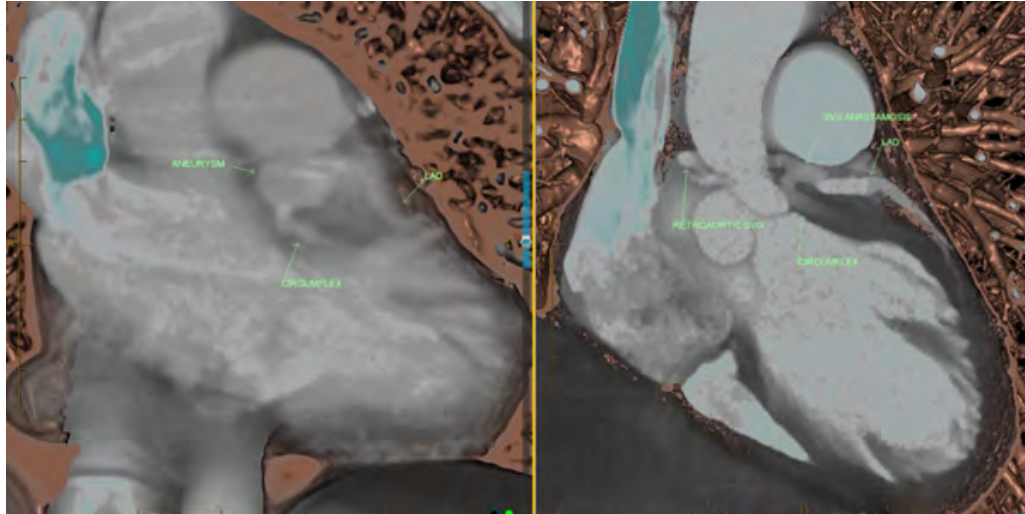


Figure 3: Left/Right) CTA images before and after. (Left) Preoperative non-gated CT depicting a 3.0 cm fusiform left main aneurysm giving rise to the LAD and circumflex branches. No definitive thrombus or intimal flap per non-gated resolution. (Right) Post left main aneurysm resection with widely patent saphenous vein graft (SVG) anastomosis and preserved flow through the visualized circumflex and LAD branches. Note the retroaortic course of the SVG which was anastomosed to the anterior aorta (not shown).

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