Case Reports

Multiple Left Internal Mammary Artery-to-Pulmonary Artery Fistulae

15 Years after Coronary Artery Bypass Grafting

Tushar C. Barot, MD
Angelo LaPietra, MD
Orlando Santana, MD
Nirat Beohar, MD
Joseph Lamelas, MD

Left internal mammary artery (LIMA)-to-pulmonary artery fistulae rarely develop after coronary artery bypass grafting. Fewer than 30 cases of these fistulae have been reported since 1947. Nevertheless, this entity should be considered as a cause of recurrent angina after bypass surgery, in the absence of other causes. We present the case of a 67-year-old man with cardiac symptoms in whom multiple LIMA-to-pulmonary artery fistulae were found, 15 years after he had undergone coronary artery bypass grafting. The diagnosis was confirmed by means of coronary angiography with selective catheterization of the LIMA and by computed tomographic angiography of the heart. The patient underwent reoperative 2-vessel coronary artery bypass grafting and ligation of multiple fistulae; 16 months postoperatively, he was asymptomatic and doing well. In addition to reporting this case, we discuss relevant diagnostic and treatment considerations. ***(Tex Heart Inst J 2014;41(1):94-6)***

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From: *Division of Cardiac Surgery (Drs. Barot, Lamelas, and LaPietra) and Columbia University Division of Cardiology (Drs. Beohar and Santana), Mount Sinai Heart Institute, Miami Beach, Florida 33140*

Address for reprints: *Orlando Santana, MD, Columbia University Division of Cardiology, Mount Sinai Heart Institute, 4300 Alton Rd., Miami Beach, FL 33140*

E-mail: *osantana@msmc.com*

As a bypass-graft conduit to the left anterior descending coronary artery (LAD), the left internal mammary artery (LIMA) is the vessel of choice because of its proven longevity and long-term patency. The formation of a LIMA-to-pulmonary artery (PA) fistula after coronary artery bypass grafting (CABG) is a rare complication: fewer than 30 reports have appeared in the medical literature.[1] We report a case of multiple LIMA-to-PA fistulae that we found 15 years after a patient had undergone CABG.

Case Report

A 67-year-old white man presented at our institute in 1997 with multivessel coronary artery disease. At that time, he underwent 5-vessel CABG, with the following grafts: LIMA to LAD, saphenous vein (SV) to the first diagonal artery, sequential SV to the first and 3rd obtuse marginal branches, and SV to the distal right coronary artery (RCA). The patient's recovery was uneventful. In 2006, he underwent percutaneous stenting of the native RCA. In 2012, he reported chest tightness, exertional dyspnea, and general weakness. He underwent a full cardiac examination, including coronary angiography. The chief findings were an occluded SV graft to the obtuse marginal artery and an 80% stenosis of the native RCA, distal to the previously placed stent. The LIMA-to-LAD graft was patent. However, there were multiple large fistulae from the LIMA to the left PA, with brisk contrast washout into the PA upon selective LIMA injection during cardiac catheterization (Figs. 1 and 2). A computed tomographic angiogram of the heart revealed a markedly tortuous LIMA with tangled vessels in the prevascular space of the anterior mediastinum. Multiple scattered, tortuous subsegmental branches of the anterior left PA throughout the anterior aspect of the left upper lobe appeared to connect to the anterior mediastinal vessels, confirming the diagnosis of multiple LIMA-to-left PA fistulae (Fig. 3).

The numerous small and large fistulous communications between the LIMA and the left PA were not suitable for percutaneous intervention, so the patient underwent 2-vessel CABG: a right internal mammary artery graft to the LAD, and a SV graft to the RCA. During surgery, we saw multiple fistulae that extended from the LIMA to the left PA. Smaller branches were clipped; larger branches were ligated and transected. The patient tolerated the procedure well, his postoperative course was uneventful, and

he was discharged from the hospital on postoperative day 7. Sixteen months postoperatively, he was asymptomatic and doing well.

Discussion

Fistulae from the LIMA to the PA are a rare clinical phenomenon. The first case of such fistulae was described by Burchell and Clagett[2] in 1947; since then, fewer than 30 other relevant case reports have been published. In 595 post-CABG patients, only 0.67% developed a similar fistula.[1] The average developmental time for fistulae is approximately 5 years (range, 2 mo–13 yr).[1,3,4]

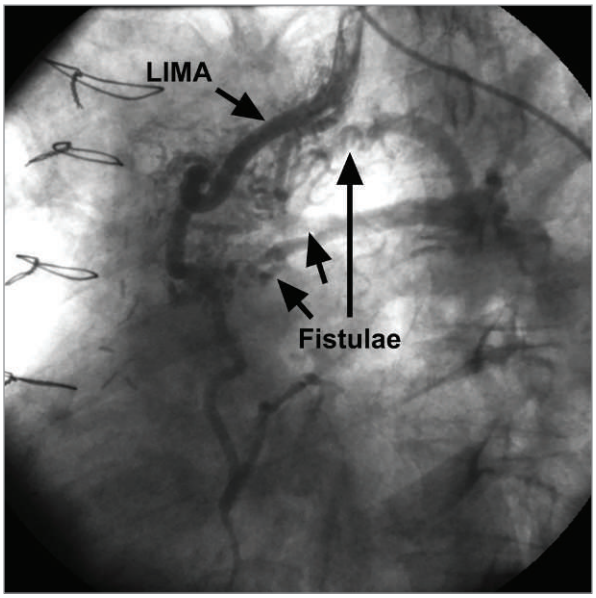

Fig. 1 *Coronary angiogram (left anterior oblique view) shows the left internal mammary artery (LIMA) graft with 3 large fistulae and multiple smaller fistulae to the pulmonary artery.*

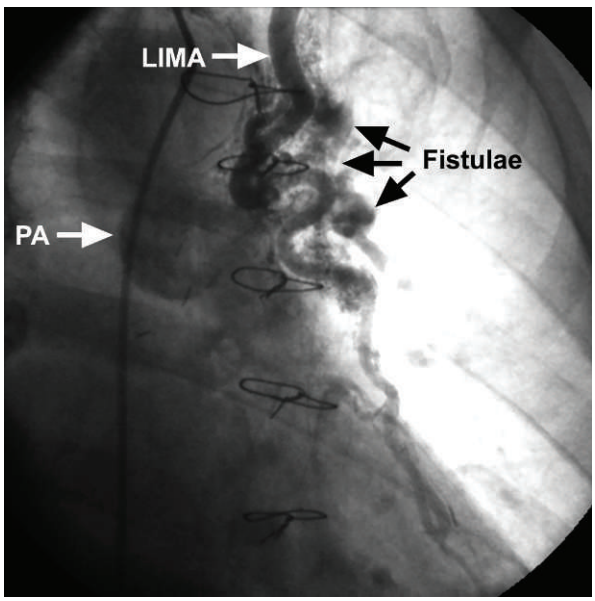

Fig. 2 *Coronary angiogram (right anterior oblique view) shows the left internal mammary artery (LIMA) graft to the left anterior descending coronary artery, and multiple fistulae to the pulmonary artery (PA).*

A LIMA-to-PA fistula can be congenital or acquired. The acquired form can be secondary to trauma, neoplasm, or inflammatory disease.[5-10] The causal mechanism is not fully understood. Predisposing factors for the development of fistulae include injury to the pleura and lung parenchyma, incomplete ligation of the intercostal branches of the LIMA, the use of electrocautery instead of ligation of side branches, infection, and inflammation leading to neovascularization.[11-18] Some authors have suggested meticulous dissection of the LIMA to avoid injury to the pleura and lung parenchyma, clipping or ligating the arterial branches instead of using electrocautery to prevent recanalization, and covering the LIMA with a pericardial flap to prevent fistula formation.[13,14,19,20]

These fistulae can result in substantial shunting of blood from the LIMA to the PA, causing myocardial ischemia.[1] The most often reported presenting symptom is recurrent angina; however, the spectrum can encompass dyspnea, congestive heart failure, and endarteritis in the presence of a continuous murmur.[12,16,21-23] The most severe complication, coronary-to-pulmonary steal, can be fatal.[19,24] Every patient who presents with any of the above symptoms after CABG should undergo a complete cardiac examination. The diagnostic test of choice for LIMA-to-PA fistula is cardiac catheterization with selective angiography.[13,21,25]

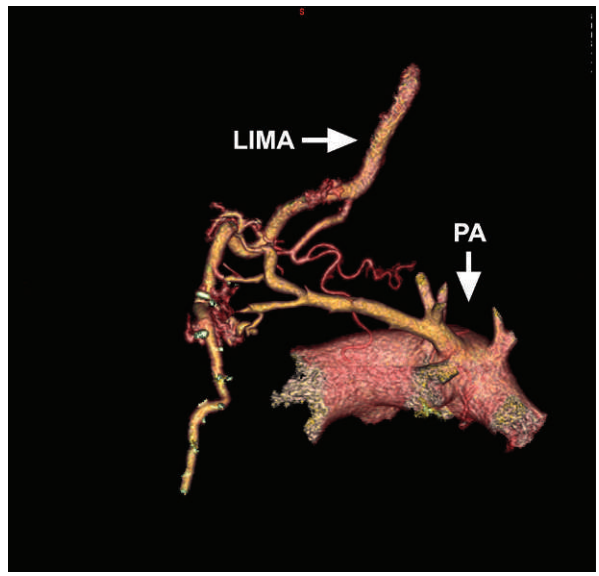

Fig. 3 *Computed tomographic angiogram (3-dimensional reconstruction) shows multiple fistulae from the left internal mammary artery (LIMA) graft to subsegmental branches of the anterior left upper lobe of the pulmonary artery (PA), draining into the PA.*

Management options for LIMA-to-PA fistulae include conservative medical therapy, coil embolization, percutaneous angioplasty with stenting, and surgical ligation.[20-23,25,26] No one treatment yields clear benefits; the management approach depends on physician and institutional experience. Some authors recommend starting with conservative management and progressing to more invasive treatment options,[23] whereas others advocate a conservative approach over invasiveness except when the fistula causes substantial symptoms or grows in size.[15] We think that the choice of treatment should be based on the patient's symptoms and the physician's experience.

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