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Case Report

Management of Left Internal Mammary Artery Pseudo Aneurysm: An Early Postoperative Finding and a Modified Algorithm

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Abstract

Pseudoaneurysms of the internal mammary arteries (IMAs) and their branches are seldom seen. Several cases were reported with different cause of pseudoaneurysm various from traumatic chest injuries, post CABG or post none CABG cardiac surgeries due to injuries of LIMA or its branches during sternal closure.

Typically, they are asymptomatic and usually presented as an accidentally finding during imaging. However, it could be associated with serious complication of rupture and hemodynamic instability. Management may differ according to the cause and timing of presentation. Urgent intervention either surgical correction or interventional shall be can be the considered soon after diagnosis, they are suitable choices.

This article presents a case of a 65-year-old gentleman with a left IMA branch pseudo aneurysm, early postoperative after CABG surgery. We discuss the decision- making process, recommend a management algorithm, and detail the successful surgical repair.

Keywords: *CABG Complication; Pseudoaneurysm; Internal Mammary Artery Injury*

Introduction

Pseudoaneurysms of the IMAs branches are extremely uncommon. Despite being typically small in size and asymptomatic, they have an increased risk of rupture which can be life-threatening [1]. Other possible complications include hemothorax, thromboembolism, compression of adjacent structures, myocardial infarction, and possible death.

The presence of a parasternal mass after sternotomy should raise suspicions of a false aneurysm or arterio-venous fistula of an IMA [3]. Even if the most frequent causes of pseudoaneurysm are iatrogenic [4], a spontaneous false aneurysm of IMA has been reported once [5]. Pseudoaneurysms of the IMAs or one of its branches are typically found incidentally on cardiac imaging or angiography. Characteristically, growing slowly and silently, making this a highly underdiagnosed disease process [2].

The left IMA (LIMA) is the vessel used most to bypass a significant stenosis of the left anterior descending (LAD) artery [3]. Advantages of using the LIMA over a saphenous vein graph are long-term patency and survival rates greater than 90% beyond 10 years and decreased postoperative mortality [4].

IMA pseudo aneurysm can be traumatic or iatrogenic in origin, caused by progressive atherosclerosis, or due to connective tissue disorders such as Marfan, Loeys-Dietz, and Ehlers-Danlos syndromes [5].

In this case, we present an elderly male who was accidently discovered to have a rapid growing pseudo aneurysm located in a branch of LIMA to LAD artery graft following a coronary bypass procedure 6 days prior.

Case History

A 65-year-old male with a past medical history of coronary artery disease, hypertension, hyperlipidemia, chronic kidney disease, renal transplantation, recurrent multiple strokes with no residuals, presented to a local emergency department with complaints of symptoms that were suggestive of unstable angina turned to be non-ST elevation myocardial infarction. Patient was referred to our hospital for further management.

Interventional cardiology team was consulted and a left heart catheterization was performed. The left main had mild diffuse plaquing. The LAD was of good caliber, and in the mid long stenotic lesion. A large diagonal branch with long proximal lesion starting from the ostium isolated from LAD, which had about 70% and 90%, respectively. The left circumflex artery was small in caliber, with subtotal occlusion after giving the first OM. The ostium of the first obtuse marginal branch had 80% stenosis. The right coronary artery was large caliber giving 2 branches PDA was free and PL with mid segment focal lesion. Finally, the left internal mammary artery was widely patent. Coronary angiography showed multi-vessel disease, and heart team consciences was for CABG.

The patient underwent a four-vessel CABG, LIMA to LAD, SVG to OM and PL sequentially, SVG to DI. Surgery went uneventful apart of soft plaque that was discovered at the site of sequential vein proximal anastomosis. So, we deiced to perform the DI proximal anastomosis as proximal as we can in ascending aorta.

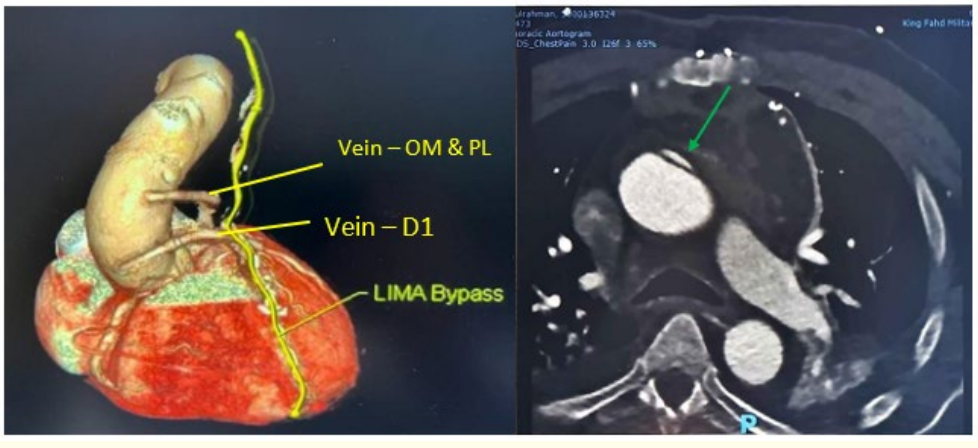

Figure 1: *(A) 3D CT angiogram reconstruction showing the site of proximal anastomosis. (B) Follow up CT- scan findings Localized segment (Limited dissection about 3 cm) in the distal ascending aorta.*

In the CICU: Patient was transferred in a stable condition. No inotropic support. Day after surgery patient was extubated and HD stable. 1st day postoperative, patient was HD stable and successfully extubated. Few hours after extubation, the patient started to be hypotensive, HB drop 1 - 2 gm, minimal drainage and well-functioning drains. We start to consider exploration for bleeding. Routine workup was done.

Bedside echo: no cardiac tamponade. Bleeding profile: no significant abnormalities and fluid resuscitation and blood product was efficient for stabilizing the patient.

No exploration was done. However, chest x-ray showed progressive wide mediastinum. At this point, however there was no significant CLINICAL finding, we were eager to disclose more details. We start to discuss CT with contrast with understanding the available risks, history of renal transplant and borderline kidney function, serum Cr 200 umol/L.

CT finding showed, localized segment (Limited aortic dissection) (about 3 cm) in the distal ascending aorta, not extending to the grafts, and no evidence of active extravasation. Heart Team discussion, available expertise on duty. External consultation from different centers. Finally, we decided, follow up with serial CT to be done after 2 days and before discharge. Proper hydration for the patient and repeat the CT.

Frist follow up CT, 3rd postoperative day, stable in size, no change in size, no extension, no evidence of active extravasation. However, new finding was observed, small vascular MASS (pseudo-aneurysm) mostly related to LIMA-LAD graft.

Second follow up CT, 8th postoperative day and 1 day before the planned discharge, stable size limited aortic dissection. Comparing the size with pervious study, there was interval rapid increase in size of the pseudo-aneurysm mass from 3 x 4 mm to 8 x 10 mm in 5 days.

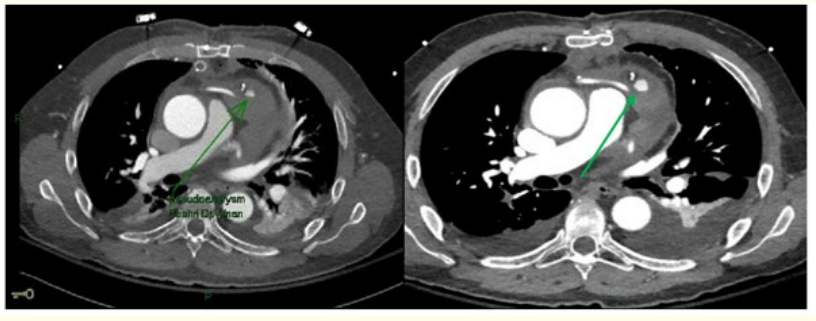

Figure 2: *IMA branch pseudoaneurysm (A) CT-scan findings of vascular mass. (B) Follow up CT-scan findings rapid growing vascular mass suggestive pseudoaneurysm of IMA branch.*

3D re-construction with was requested. Coronary angiography was done, to define the relation of the mass with LIMA, delineate the boundaries of the mass and confirming patency of the anastomosis.

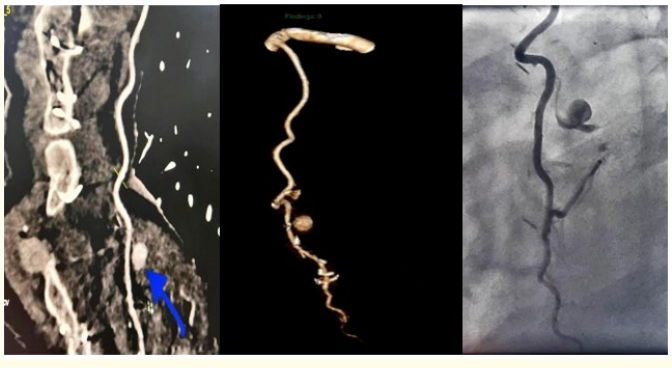

Figure 3: *IMA branch pseudoaneurysm (A) CT-scan findings of vascular mass. (B) 3D CT angiogram reconstruction of the pseudoaneurysm arising from IMA branch. (C) Coronary angiography showing feeding branch of pseudoaneurysm IMA internal mammary artery.*

The increase in size of the pseudo-aneurysm mass favors the rapid intervention to control the risk of rupture. Different options were discussed: coil closure, covered stent, and surgical management.

We finally went to surgical management; A well-organized concealed hematoma was identified and remove. Patient was extubated 3 hours after transfer to the CICU. 2 days ICU stay and 4 days in the ward and the patient was discharged. discharge plane: Regular surgery clinic visits. CT angiography was planned after 6 weeks.

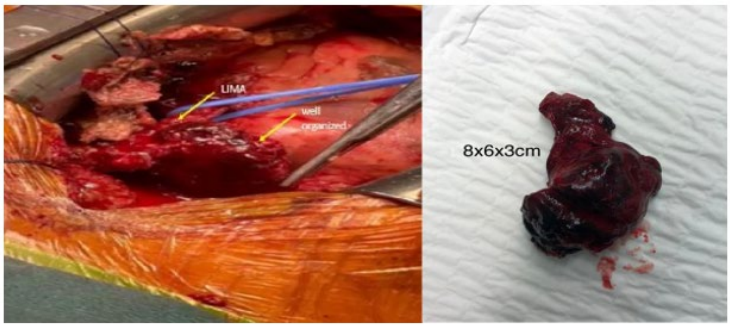

Figure 4.

After 6 weeks' patient's CT angiography was done, there was no evidence of remnant of LIMA pseudoaneurysm after repair. Stable small intimal flap at the distal ascending aorta. No evidence of active extravasation.

Discussion

The IMA is one of the arteries that branches from the subclavian artery, runs behind the sternum, and has a normal diameter of approximately 2 mm. An IMA aneurysm is rarely seen without a reason such as physical trauma, hereditary diseases, or iatrogenic problems [6]. From a pathologic viewpoint, an IMA aneurysm is most commonly caused by atherosclerosis and either degeneration of the tunica media or arterial fibromuscular dysplasia [7]. Our patient had most probably a bleeding branch from LIMA discovered few days after CABG procedure, which was a comparatively early stage.

Coronary CT angiography with 3D reconstruction and ECG gating is the most definitive test for confirming and finding complications especially related to post CABG surgery. With an increase in the aging population and advancement in the techniques used in coronary artery bypass grafting, it is likely that the rate of recorded occurrence of aneurysms and pseudoaneurysms will increase [3,8]. Endovascular repair is currently the most favored treatment modality as mentioned and done by Lawani., *et al*. in their case few months' post CABG [8].

But in our case the consensus was surgical repair of LIMA aneurysm that was done few days post-CABG surgery (Figure 6).

Multiple treatment options are described in the literature (open surgical repair, stent deployment, and coil embolization) [9,10].

Despite the lack of long-term results, an endovascular approach by coil embolization or stent deployment has become the treatment option of choice because of its minor invasiveness [10,11] (Figure 5). However, open surgical repair is recommended in selected cases like our case with large hematoma and increasing pseudoaneurysm early post CABG operation.

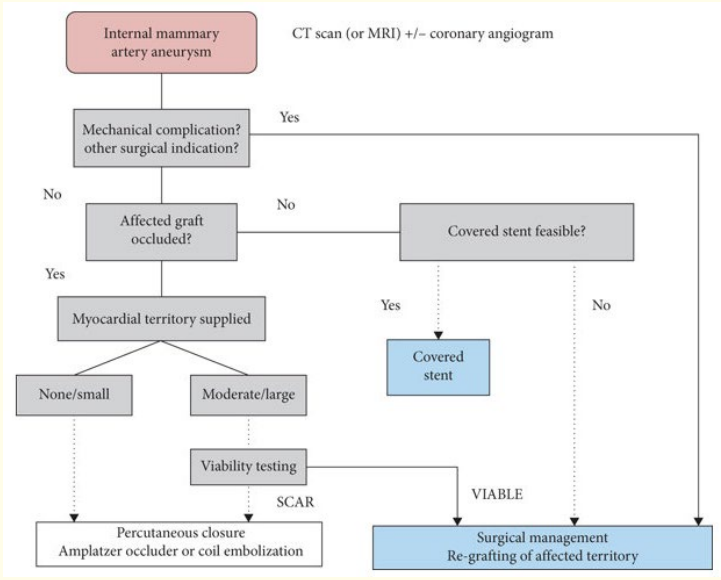

Figure 5: *Algorithm for assessment and treatment of an internal mammary artery aneurysm done by O. Lawani., et al. 2021 [8].*

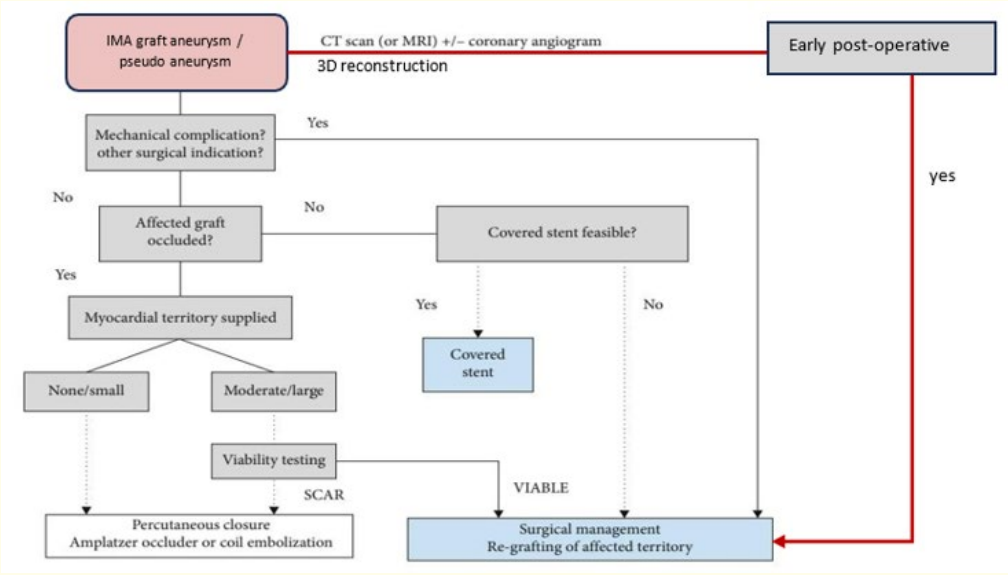

Figure 6: *Our Suggested modification of the algorithm for assessment and treatment of an internal mammary artery aneurysm. CT: Computed Tomography; MRI: Magnetic Resonance Imaging.*

Conclusion

We conclude that IMA pseudo aneurysms following CABG represent a very rare complication. High potential for morbidity and mortality, and the risk will likely increase with the increase of size. Early diagnosis and together with increasing the awareness of disease process will hopefully facilitate the management. CT angiography with 3D reconstruction is a gold standard for the diagnosis. Surgical management for early postoperative diagnosis may represents the treatment of choice. Endovascular treatment remains a good option for delayed presentation. Following algorithm for assessment and treatment may provide a road map towards a convenient management plan.

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