ISSN 2689-8268 | Volume 7

American Journal of Surgery and Clinical Case Reports

Case Report Open Access

Surgical Ostioplasty for Left Main Coronary Artery Disease, A Useful Technique: Case Report

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Received: 10 Nov 2023
Accepted: 19 Dec 2023
Published: 27 Dec 2023
J Short Name: AJSCCR

Citation:

Varela-Jaramillo S. Surgical Ostioplasty for Left Main Coronary Artery Disease, A Useful Technique: Case Report. Ame J Surg Clin Case Rep. 2023; 7(6): 1-4

Keywords:

Left Main Coronary Artery; Ostioplasty; Angioplasty; Coronary Vascular Disease; Stenosis

Abbreviation:

LMCA: Left Main Coronary Artery; CABG: Coronary Artery Bypass Grafting; GSV: Greater Saphenous Vein; IMA: Internal Mammary Artery; MI: Myocardial Infraction; PCI: Percutaneous Coronary Intervention

1. Abstract

Coronary artery disease involving the left main coronary artery [LCMA] is a highly threatening condition which requires prompt intervention. Surgical management is considered the best and most durable solution for all forms of LMCA disease. Isolated LMCA ostial lesions have been a surgical challenge that could be managed by means of coronary artery bypass grafting [CABG] or surgical ostioplasty. Higher incidence of restenosis has been observed when PCI treatment for ostial lesions vs non-ostial were offered. Isolated LMCA ostial stenosis accounts between 0.2-2.7% of all patients with coronary artery disease. Through the years multiple surgical strategies have been developed to tackle this entity being the coronary artery bypass grafting [CABG] the most common. In 1965 Sabiston and Effler described the first attempts to surgically correct LMCA with a patch angioplasty, however, due to high mortality and postoperative complication rates the procedure was left aside. Almost 20 years later, it resurged after Hitchcock reported excellent results with low restenosis rates and postoperative complications. We present the case of 66-year-old extremely obese female patient which presented an isolated LMCA ostial stenosis and was surgically managed with a pericardium patch angioplasty at our institution.

2. Introduction

Coronary artery disease involving the left main coronary artery [LCMA] is a highly threatening condition which requires prompt intervention. Surgical management is considered the best and most durable solution for all forms of LMCA [1, 2]. Isolated LMCA ostial lesions have been a surgical challenge that could be managed by means of coronary artery bypass grafting [CABG] or surgical ostioplasty. Higher incidence of restenosis has been observed when PCI treatment for ostial lesions vs non-ostial was offered [3] Isolated LMCA stenosis accounts between 0.2-2.7% of all patients with coronary artery disease [4-6]. The etiology of this entity is still unclear and can be a result of diverse pathologies such as congenital defects, fibromuscular dysplasia, inflammatory conditions like syphilitic and Takayasu´s aortitis, idiopathic non-atherosclerotic coronary ostial stenosis, iatrogenic lesions and atherosclerosis, being the latter the most common cause [7-9]. Through the years multiple surgical strategies have been developed to tackle this entity being the coronary artery bypass grafting [CABG] the most common. In 1965 Sabiston et al. and Effler and colleagues described the first attempts to surgically correct LMCA with a patch angioplasty, however due to high mortality and postoperative complication rates the procedure was left aside [10-11]. Almost 20 years later, it resurged after Hitchcock et al. reported excellent results with low restenosis rates and low postoperative complications [4]. This led to diverse surgical approaches including the anterior, posterior, transaortic and transpulmonary techniques, with equally different patch material such as bovine and autologous pericardium, greater saphenous vein [GSV] patch and pulmonary and internal mammary artery [IMA] patches. [12] Multiple advantages of patch angioplasty versus CABG have been described. Firstly, CABG may lead to total coronary ostia occlu-

sion which limits it use as an entry point for future angioplasties [8, 9, 13]. Additionally, using CABG restores a less physiological retrograde flow which can result in competitive blood flow and lead to stenosis [9]. Lastly, traditional CABG consumes potential graft materials such as IMA and GSV which could be used for future or additional revascularizations. LMCA patch angioplasty has contraindications and patients should be carefully evaluated before a surgical plan is stablished, this include the stenosis being in the distal portion of the LMCA, severe aortic calcifications and surgical inexperience as it is considered to be a highly complex procedure [8].

3. Case Report

We present the case of a 66-year-old female patient who was admitted to the emergency department with right superior abdominal quadrant pain, she was studied and found to have acute cholecystitis for which she received laparoscopic surgical treatment. Postoperatively she presented with severe chest pain, tachycardia and hypotension which oriented to a low cardiac output syndrome, a hypovolemic cause was considered and the control hemogram showed a 3-gram hemoglobin descent. An EKG was ordered which showed no evidence of myocardial ischemia although troponin levels were abnormally high [5000], a non-ST-elevation myocardial infraction [MI] was diagnosed consistent with a type II MI, the patient denied previous chest pain. She was taken to invasive stratification with coronary angiography which showed a non-restrictive deformed LMCA with a 70% stenosis in the ostia with no additional coronary lesions, no aortic pathology was found (Figure 1). Preoperative evaluation was completed with a trans thoracic echocardiography which showed preserved left ventricular contractility and no abnormal findings in the sinus portion of the aorta. The CT scan showed very small calcification in relation with the right artery ostia and ruled out calcification of the sinus portion of the aorta. The anatomy favored a surgical ostioplasty for which she was programmed by the cardiovascular surgery team. Exposure was obtained through a complete medial sternotomy; pericardial dissection was performed and a 70x15mm diamond shaped patch was obtained which we preserved in glutaraldehyde. We proceeded to dissect the aortopulmonary space and the aortic root in relation to the roof of left atrium allowing for lateral traction of the pulmonary artery. Heparinization was followed by cannulation of the ascending aorta and a two-stage venous cannulation through the right appendage with a vent through the superior right pulmonary vein. After cross clamping we inserted a cardioplegic needle through which hypothermic single dose [Custodiol] was administered for 6 minutes. Once cardiac arrest was stablished, we performed a right anterior aortotomy which was extended obliquely reaching the left coronary sinus and was continued 12mm downwards into the superior aspect of the LMCA (Figure 2). The previously obtained pericardium patch was washed with saline solution and was sewed into the LMCA vertex with a 6-0 Prolene which extended upwards bilaterally with a running suture to the aortic wall where it was tied, the suture plane was reinforced with 4cc of Tiesseel (Figure 3). Posteriorly the aortotomy was closed with 4-0 Prolene double plane running sutures started at the superior border of the patch (Figure 4). Finally, the cardioplegic needle was reinserted to de-air the ventricle and a 5-0 pledget stich was used to close the gap. The aortic clamp was removed and the patient returned to sinus rhythm with no EKG changes. Decannulation was performed and weaning of the heart-lung machine was achieved under no pharmacological support. The procedure was completed without complications with a total ischemia and perfusion time of 95 and 108 minutes. The patient was transferred to the ICU where she remained for 3 days prior to general floor transfer and hospital discharge 2 days later.

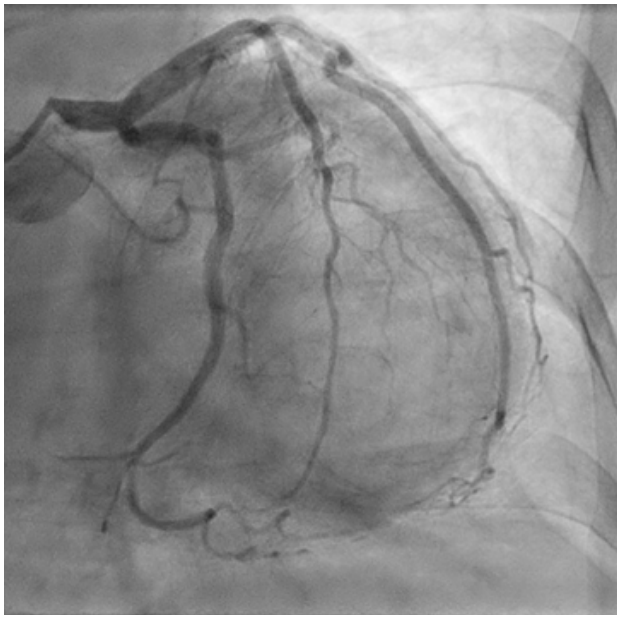

Figure 1: Coronary angiography showing a 70% occlusion of the proximal left main coronary artery with no additional coronary lesions

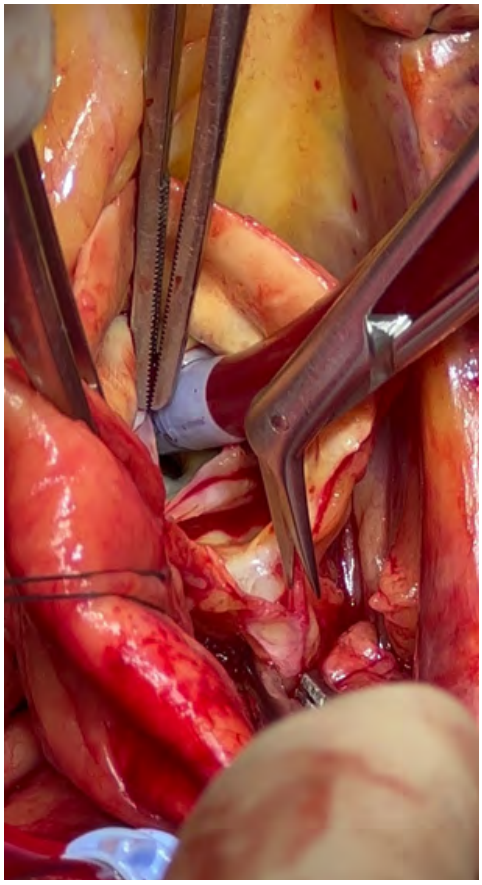

Figure 2: Aortic anterior aortotomy with oblique extension to the right side reaching the LMCA ostia and an additional 12mm opening of the LMCA.

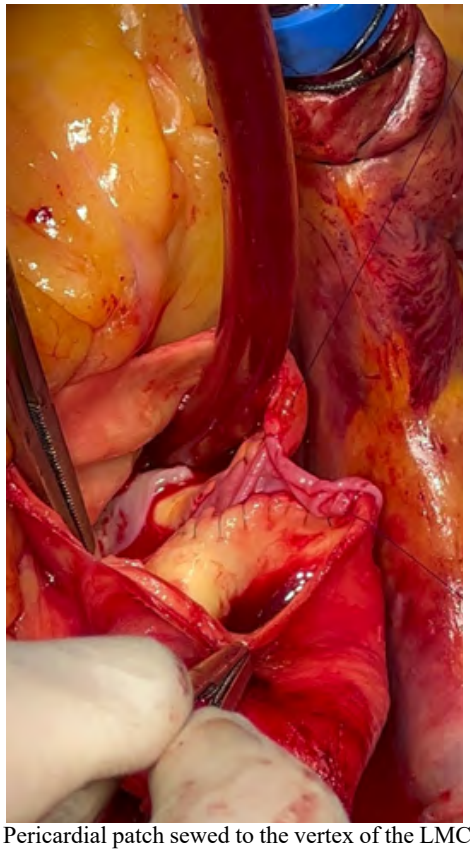

Figure 3: Pericardial patch sewed to the vertex of the LMCA incision and an ascending running suture with 6-0 Prolene from the pericardial patch to the aortic wall

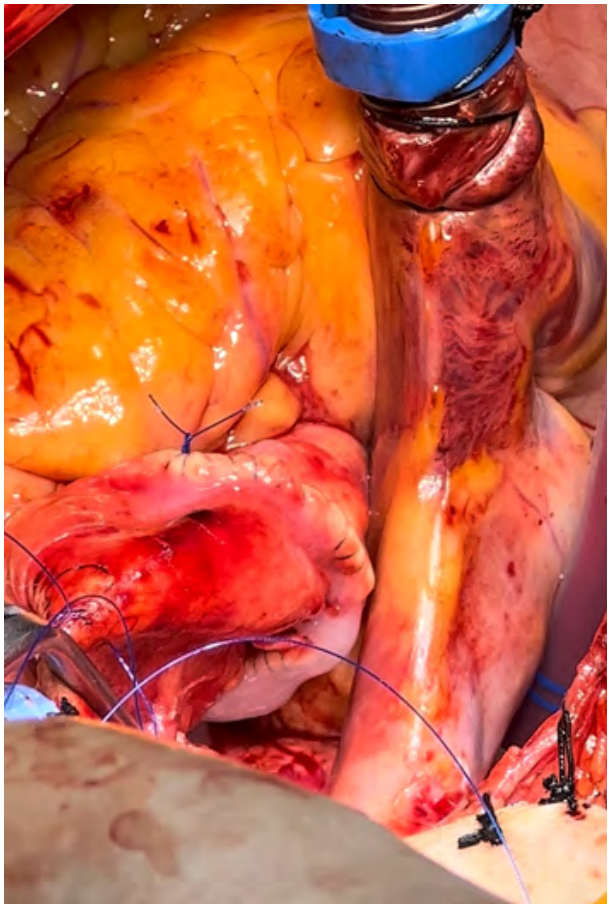

Figure 4: Aortortotmy closed with a 4-0 Prolene using double running suture from the superior vertex of the patch. Inferiorly the pericardium sutured patch can be observed directing downwards left to the LMCA ostia

4. Discussion

Classically, LMCA stenosis has been treated via CABG with IMA to the Anterior descending artery [ADA] and either venous or arterial graft to the circumflex artery, however, osteoplasty is a viable option in selected cases. Surgical ostioplasty may offers advantages over CABG. The latter may lead to total coronary ostium occlusion limiting it use as an entry point for future angioplasties, restores a less physiological retrograde flow resulting in competitive blood and possible stenosis and consumes potential graft materials which could be used for future or additional revascularizations. [8, 9, 13]. During our presurgical testing, in addition to a coronary angiography we evaluated aortic calcification with non-contrast CT which could rule out the possibility of surgical ostioplasty. Regarding the technique the primary discussion involves the surgical approach and the graft material. Theoretically a vein or arterial patch should be used as it is said to offers fibrinolytic properties, however concerns have risen from the elastic properties of GSV which could lead to dilation as reported by Matinovic, leaving an arterial patch as the optimal choice. [14-17]. In previous studies regarding pericardium and GSV graft, similar restenosis rates were reports [2.8% for GSV and 3.4% for pericardium] in addition to aneurismal dilations in the GSV group, however, in the pericardi-

um group calcification and degeneration were reported [16]. Even though there is a lack of evidence to suggest a superior surgical approach, a better exposure can be obtained from an anterior approach, we believe that a posterior approach is better as it does not involve transection of the pulmonary artery which involves additional surgical maneuvers, possible complications and prolonged operating time. We believe sufficient space is offered when the aortopulmonary space is dissected and the pulmonary artery is laterally retracted. Regarding indications we concur with previous statements that it should be only offered to patients with isolated LMCA stenosis, preferred for proximal stenosis, considered in mid portions of the and should be avoided in distal segments as adecuate exposition and reconstruction of the vessel offers greater difficulty and can have disastrous consequences. With regard to age, it is more likely that concomitant distal disease is present, leading us to believe it should carefully be evaluated in patients over 65 years, in the follow up study by Jeong 5 out of 6 patients over this age value died within 18 months [17].

5. Conclusion

LCMA stenosis is a highly threatening condition which should be managed with prompt surgical intervention. LMCA patch surgical angioplasty has contraindications and patients should be carefully evaluated before a surgical plan is stablished, this include the stenosis being in the distal portion of the LMCA, severe aortic calcifications and surgical inexperience as it is considered to be a highly complex procedure. Future evidence in the matter must be provided to objectively conclude one strategy is better than another.

6. Acknowledgement

To the Pontificia Universidad Javeriana for unconditional support. To our patients.

7. Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

8. Ethical Approval

Institutional approval by Pontificia Universidad Javeriana and Hospital Universitario San Ignacio was obtained prior to publication. Informed consent was obtained and is available upon request.

9. Statement of Conflict of Interest

There is no conflict of interest of any of the listed authors.

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