Case Report

Successful Surgical Osteoplasty of the Left Main Coronary Artery with Concomitant Mitral Valve Replacement and Tricuspid Annuloplasty

Abstract

A 50-year-old woman with rheumatic heart disease, mitral stenosis, and critical isolated left main ostial stenosis was successfully treated by mitral valve replacement, tricuspid annuloplasty, and surgery of left main osteoplasty and is reported for its rarity. Notable clinical findings included an intermittently irregular pulse, blood pressure of 100/70 mmHg, cardiomegaly, a diastolic precordial thrill, a mid-diastolic murmur without presystolic accentuation that was loudest at the mitral area. Chest radiograph revealed cardiomegaly with a cardiothoracic ratio of 0.7 due to enlarged right atrium, right ventricle with a straightened left heart border and evidence of pulmonary hypertension. The investigation shows that surgical reconstruction of the left main coronary artery is safe and effective for the treatment.

Keywords: *Coronary ostial stenosis, left main coronary artery, patch angioplasty, pericardial patch*

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Introduction

The hemodynamic characteristics restored after angioplasty of a stenotic left main coronary artery (LMCA) are superior to those obtained after conventional aortocoronary bypass to the major branches of the left coronary arterial tree.[1,2] Because ideal conditions are rarely fulfilled and the repair in technically demanding, surgical angioplasty of the LMCA is not widely used.[1-3] Isolated stenosis of LMCA accounts for only 0.7%–2.7% of the cohort of patients operated on for coronary artery disease.[4,5] True incidence of isolated left main coronary ostial stenosis in a patient with rheumatic heart disease and mitral stenosis is unknown.

The Study

A 50-year-old woman was referred to our institute with progressively increasing symptoms of dyspnea (New York Heart Association Functional Class IV) of 2 years' duration. There was no anginal pain or syncope. Notable clinical findings included an intermittently irregular pulse, blood pressure of 100/70 mmHg, cardiomegaly, a diastolic precordial thrill, a mid-diastolic murmur without presystolic accentuation that was loudest at the mitral area, a loud first heart sound and pulmonic component of the second heart sound, and tender hepatic enlargement. Chest radiograph revealed cardiomegaly with a cardiothoracic ratio of 0.7 due to enlarged right atrium, right ventricle with a straightened left heart border and evidence of pulmonary hypertension. Electrocardiography showed atrial fibrillation, right axis deviation, biatrial enlargement, and right ventricular hypertrophy. With use of a Hewlett-Packard Sonos 5500® echocardiography system with a 3.5 MHz transducer (Hewlett-Packard Company; Palo Atto, California, USA), transthoracic, two-dimensional color-flow, and Doppler echocardiography revealed the right ventricle and right atrial enlargement, normal-sized left ventricle, a severely stenosed mitral valve with severe subvalvular fusion, and an left ventricular ejection fraction of 0.50. Selective coronary arteriography showed isolated 90% ostial stenosis of the LMCA which was not relieved with nitrates, with normal left anterior descending (LAD), and left circumflex arteries. The right coronary artery was normal. Computerized angiography revealed 90% occlusion of the LMCA with an eccentric calcific plaque. The LAD and left circumflex arterial systems were normal [Figure 1].

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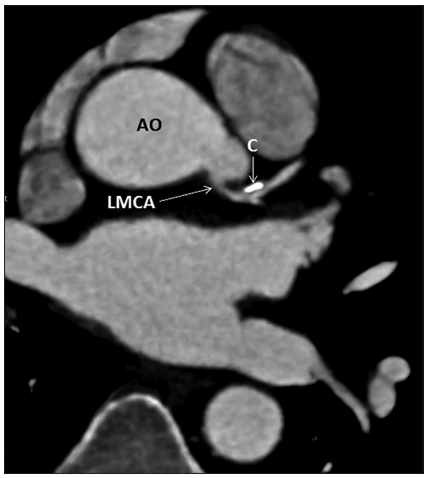

Figure 1: Preoperative computed tomographic coronary angiogram showing 90% localized stenosis in the left coronary ostium with an eccentric calcific plaque. The left anterior descending and left circumflex arteries were normal (AO: Aorta, LMCA: Left main coronary artery, C: Calcified atheroma)

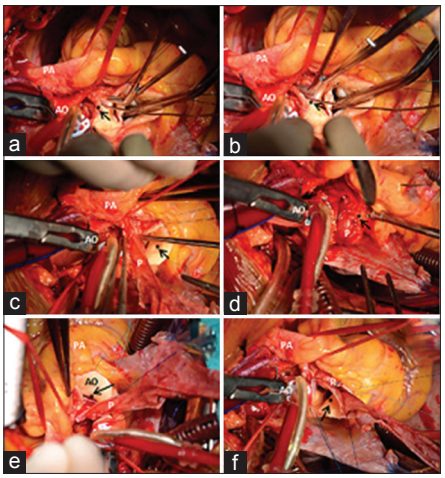

Figure 2: (a-f) Surgical photograph of the techniques used for the left main coronary angioplasty. (a and b) anterior approach to the left main coronary artery. The main pulmonary artery is retracted away from the aorta. The overlying pericardial fat is carefully removed over left main coronary artery. A clear exposure of the left main coronary artery up to its distal bifurcation between the left anterior descending and left circumflex arteries is obtained. An oblique aortic incision about 10–12 mm long is made from the anterolateral wall of the juxta-ostial aorta to the ostium of the left main coronary. Insertion of a coronary probe into the left main coronary artery facilitated this step. The oblique aortotomy is away from the commissure between the left coronary cusp and the right coronary cusp. (c-f) Step-by-step demonstration of the placement of a rhombic-shaped pericardium as onlay patch. The patch is carefully sewn into the left main coronary artery, using a 7-0 prolene suture and onto the aorta as a gusset using a 6-0 continuous prolene suture. Note the increased size of the left main coronary artery and the adjacent aortic wall without waisting/kinking or bulging (PA: Pulmonary artery, AO: Aorta, P: Pericardial patch, *Left main coronary artery)

In Brief

Intraoperative transesophageal echocardiography was performed using a Hewlett-Packard Sonos 5500 Ultrasound System (Hewlett-Packard Co., Andover, MA, USA). The operation was performed under moderately hypothermic cardiopulmonary bypass through aortobicaval cannulation. The ascending aorta was dissected free from the main and right pulmonary arteries [Figure 2a-f]. An umbilical tape was passed around the ascending aorta, main, and right pulmonary arteries. Two slings around the main pulmonary artery – one at the level of origin and another at the level of bifurcation and aortic traction provided excellent exposure of the LMCA.

The aorta was cross-clamped, the root cardioplegia was given, and the left atrial was incised posterior to interatrial groove for venting as well. The LMCA was opened in between stay sutures on a coronary probe. The incision in LMCA was extended distally to a point just proximal to its bifurcation. A rhombic-shaped patch of native pericardium about 30 mm wide and 25 mm long was carefully sewn into the LMCA from the point just proximal to the bifurcation of the LMCA across the ostium and for a distance of 2.5–3 cm across the aorta where it was sutured into the aortotomy.

Subsequently, the mitral valve was replaced using a 29 mm porcine mitral bioprosthesis (Epic™ Valve, St. Jude Medical Inc., St. Paul, MN). Tricuspid commissurotomy and Kay's bicuspidization tricuspid annuloplasty were done after releasing the aortic cross-clamp on a perfused and beating heart. Transesophageal imaging clearly demonstrated widely patent, funnel-shaped LMCA with an ostial diameter around 6 mm and normal flow by pulsed wave Doppler.

Postoperatively, she was in sinus rhythm and had stable hemodynamics with moderate doses of inotropic support (dopamine, dobutamine, epinephrine, and milrinone) with a normally functioning bioprosthetic valve (2–3 mm gradient across the bioprosthesis) and a mean right atrial pressure between 10–15 mmHg.

At 40-month follow-up, the patient was asymptomatic, in stable sinus rhythm and receiving digoxin, low dose warfarin and aspirin (100 mg/day). Doppler echocardiogram revealed normal biventricular function. The postoperative coronary angiogram by computed tomography at 40 months showed that the ostium has increased in diameter by 10 mm and was funnel shaped with normally flowing LAD and left circumflex arteries. There was no aneurysmal dilatation or restenosis [Figure 3a and b].

Conventional coronary artery bypass grafting may lead to certain undesirable consequences, such as pressure loss retrograde to the anastomotic site,[4,5] definitive occlusion of LMCA,[1,2] restoration of only a retrograde perfusion to a rather extensive myocardial area, resulting in competitive flow, accelerated vein graft atherosclerosis due to aortic systolic pressure wave exposure, and consumes bypass material.[1-5]

Encouraged by our preliminary results of coronary ostial reconstruction using autogenous pulmonary arterial flaps in 5 patients of ostial noncalcified LMCA stenosis aged <60 years and in patients with anomalous origin of left coronary artery from pulmonary artery,[6] we

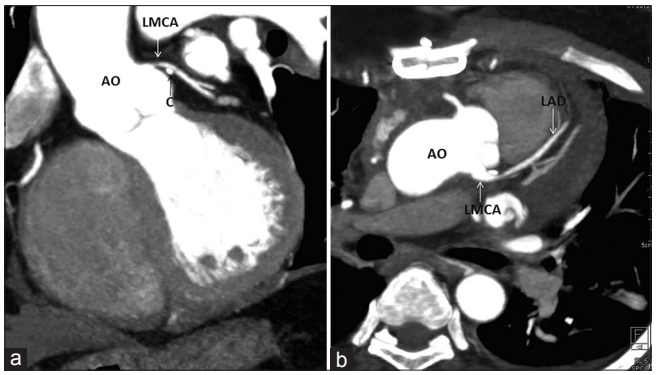

Figure 3: (a and b) Postoperative computed tomographic coronary arteriogram showing the funnel shaped widely enlarged left coronary ostium with no distal obstruction (AO: Aorta, LMCA: Left main coronary artery, LAD: Left anterior descending coronary artery, C: Calcified atheroma)

gradually broadened our indication applying the technique in this patient requiring LMCA ostial reconstruction, concomitant mitral valve replacement (MVR), and tricuspid annuloplasty. For optimal exposure of this aspect of the aorta and LMCA, various ingenious approaches have been described, namely, the posterior, anterior, transaortic, and transpulmonary approaches.[1,2,7-9]

In 1983, Hitchcock *et al*. described the first posterior approach to the LMCA using a spiral aortotomy.[4] By incising the aorta from left to right between the noncoronary and left coronary cusp and rolling the aortic root to the left, this technique improved the exposure to the LMCA. The posterior wall of the LMCA could then be incised across the stenosis and saphenous vein patch graft reconstruction performed. Dion *et al*. followed this approach early in their patient series. However, continued difficulty providing adequate access to the LMCA led to the adoption of the now almost exclusively utilized "anterior" approach.[1,2] This technique provides a direct visualization of the LMCA from the ostium to the bifurcation by retracting the pulmonary artery away from the aorta.

The ostioplasty has also been described for patients with fibromuscular dysplasia,[10] Takayasu's arteritis,[11] syphilitic aortitis, supravalvular aortic stenosis, and aortic valve replacement.[10-13] Hence, far as we are aware and thus far there have been no study reports of combined MVR with left main ostioplasty for such condition.

Conclusion

We conclude that surgical reconstruction of the LMCA is safe and effective for the treatment of selected studies of critical, isolated left main stenosis with no additional significant disease in the coronary arterial tree. Technically, the anterior approach is least invasive and provides excellent exposure of the left main stem up to the bifurcation. The use of fresh autologous pericardium as an onlay patch appears to be safe and not associated with postoperative aneurysmal dilatation, restenosis, or calcification. This operation deserves a place in the surgical armamentarium.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

1. Dion R, Verhelst R, Matta A, Rousseau M, Goenen M, Chalant C. Surgical angioplasty of the left main coronary artery. J Thorac Cardiovasc Surg 1990;99:241-9.
2. Dion R, Elias B, El Khoury G, Noirhomme P, Verhelst R, Hanet C. Surgical angioplasty of the left main coronary artery. Eur J Cardiothorac Surg 1997;11:857-64.
3. Deuvaert FE, De Paepe J, Van Nooten G, Peperstraete B, Primo G. Transaortic saphenous patch angioplasty for left main coronary artery stenosis. An alternative to coronary artery bypass. J Cardiovasc Surg (Torino) 1988;29:610-3.
4. Hitchcock JF, Robles de Medina EO, Jambroes G. Angioplasty of the left main coronary artery for isolated left main coronary artery disease. J Thorac Cardiovasc Surg 1983;85:880-4.
5. Grooters RK, Nishida H, editors. Patching techniques for coronary artery revascularization. In: Alternative Bypass Conduits and Methods for Surgical Coronary Revascularization. Armonk: Futura; 1994. p. 229-49.
6. Chowdhury UK, Kothari SS, Patel CD, Mishra AK, Jagia P, Subramaniam GK, *et al.* An alternative technique for transfer of anomalous left coronary artery from the pulmonary trunk in children and adults using autogenous aortic and pulmonary arterial flaps. Cardiol Young 2008;18:165-76.
7. Liska J, Jönsson A, Lockowandt U, Herzfeld I, Gelinder S, Franco-Cereceda A. Arterial patch angioplasty for reconstruction of proximal coronary artery stenosis. Ann Thorac Surg 1999;68:2185-9.
8. Schmuziger M, Christenson JT. Surgical patch ostiumplasty of the left main coronary artery. Thorac Cardiovasc Surg 1996;44:27-30.
9. Villemot JP, Godenir JP, Peiffert B, Zamorano J, Chocron S, Mattei MF, *et al.* Endarterectomy of the left main coronary artery stenosis by a 'transpulmonary artery approach'. Eur J Cardiothorac Surg 1988;2:453-7.
10. Sullivan JA, Murphy DA. Surgical repair of stenotic ostial lesions of the left main coronary artery. J Thorac Cardiovasc Surg 1989;98:33-6.
11. Swahn E, Karlsson JE, Fransson SG, Lindström F, Nylander E, Ståhl E. Coronary ostial stenosis operated on by patch technique in a young woman with Takayasu's arteritis and angina pectoris. Eur Heart J 1993;14:1150-1.
12. Codecasa R, Scioti G, Baglini R, Pratali S, Milano A, Bortolotti U. Concomitant aortic valve replacement and surgical angioplasty of left main coronary ostium. Thorac Cardiovasc Surg 2000;48:105-7.
13. Inan BK, Ucak A, Gullu AU, Temizkan V, Ugur M, Yilmaz AT. Left main coronary artery and supravalvular aortic stenosis in adult: Treatment with ostial patchplasty and modified Brom procedure. J Card Surg 2009;24:299-300.