

**Case Report**

# Unroofing of Left Coronary Artery in a Patient with Aortic Valve Replacement

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**To cite this article:**Syed Shahabuddin, Osama Ahmed Sami, Jamal Kabeer Khan, Shahid Ahmed Sami. Unroofing of Left Coronary Artery in a Patient with Aortic Valve Replacement. *Journal of Surgery*. Vol. 6, No. 3, 2018, pp. 58-60. doi: 10.11648/j.js.20180603.11**Received:** January 11, 2018; **Accepted:** February 7, 2018; **Published:** May 7, 2018

**Abstract:** During aortic valve replacement, coronary artery obstruction is a rare but fatal complication. It may require revision of the surgical procedure including re-implantation of the valve or additional coronary revascularization. It is more common in the presence of abnormality of coronary artery like malposition or abnormal course. We report a case of 32 years old gentleman undergoing aortic valve replacement for severe aortic stenosis, having an abnormally placed left main coronary artery ostium. The risk of coronary ostial compression on seating the prosthetic valve was evident. A left main coronary artery unroofing was performed to translocate the ostium to avoid the obstruction. The patient recovered well intra and postoperatively and is doing well at nine months follow up.

**Keywords:** Aortic Valve, Coronary Unroofing, Cardiac Surgery

## 1. Introduction

Obstruction of coronary arteries after aortic valve replacement has been reported in the literature to have fatal outcome or reoperation [1, 2]. Although the exact mechanism is not known but coronary ostial obstruction in aortic valve replacements can be iatrogenic, from coronary spasm and from embolization of calcium plaque into coronary ostia leading to catastrophic events immediately or at a later stage requiring surgical or percutaneous revascularization [3, 4]. The other possible mechanisms are valve to annulus mismatch or abnormal coronary ostia or their malposition predisposing to such catastrophes. The unroofing procedure is described for intramural coronaries and for anomalous origin where they are at risk of compression leading to ischemia or sudden cardiac death [5]. The unroofing may also be performed to translocate the abnormal coronary ostia to avoid closure or compromise by seating of prosthetic valve during aortic valve replacement. We report a case where a malposition of left main coronary artery (LMCA) during aortic valve replacement was treated by

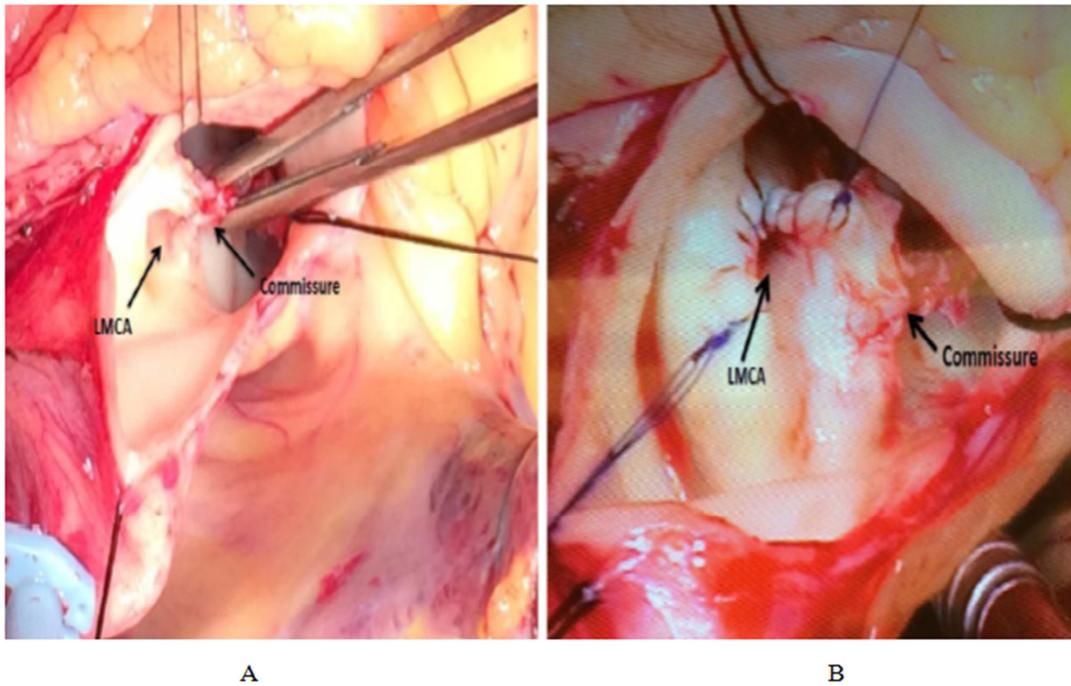
LMCA unroofing procedure.

## 2. Case Report

A 32 years old gentleman presented with increasing symptoms of shortness of breath. His clinical examination revealed an ejection systolic murmur and on subsequent echocardiography was found to have severe aortic stenosis with a peak gradient of 92 mmHg and a mean gradient of 72 mmHg. The left ventricle was hypertrophied. His CT angiograph showed heavily calcified aortic valve without coronary artery lesions. An aortic valve replacement was planned.

### *Technique*

Intraoperatively on aortotomy aortic valve was found heavily calcified and severely stenotic. An interesting finding was the malposed LMCA. Instead of arising from left coronary sinus, the LMCA origin was very close to the commissure between left coronary and non-coronary cusp (Figure 1A).



**Figure 1.** A. Abnormally placed LMCA ostium in proximity with commissure; B. After unroofing, LMCA transposed away from commissure.

After resection of leaflets and decalcification it was evident that the opening of LMCA could be compromised on seating the mechanical valve. At this stage it was decided to transpose the ostium of the LMCA away from the commissure. The LMCA unroofing was carried out by incising the ostium and carrying the incision in the long axis of left coronary artery towards the sinus. The vessel was gently probed to ascertain the direction of the artery. The cut edges of aorta and artery were stitched with prolene 5/0 continuous suture in a way that it shifted the LM ostium away from commissure while laying open the artery (Figure 1B). This procedure facilitated safe seating of a mechanical valve size 23mm without compromising LMCA ostium. The aorta was closed, and after thorough de-airing, the aortic cross clamp was removed and the heart was allowed to perfuse. Subsequently the heart was weaned off cardiopulmonary bypass in sinus rhythm with moderate dose of inotropes without any ECG abnormality. The patient was extubated on first post-operative day. His post-operative course was uncomplicated and he was discharged home on fifth post-operative day. At nine month follow up patient is well and asymptomatic with echocardiography showing regression in Left ventricle hypertrophy.

### 3. Discussion

Coronary ostial obstruction is rare but serious complication of aortic valve replacement. It may be as a result of damage secondary to cardioplegia delivery system, debris from decalcification of the heavily calcified aortic valve or due to sewing ring of the prosthetic valve completely or partially obstructing the left or right coronary ostium. Irrespective of

the cause this complication is fatal and requires recognition and correction by re-implantation of the valve or performing Coronary artery bypass (CABG) in the relevant coronary artery or percutaneous intervention and stenting as in one of the reported case where patient developed coronary compromise detected as wall motion abnormality on TOE and confirmed on angiography [6]. It is also important to note that because of various etiologies of ostial obstructions even transcatheter aortic valve replacement (TAVI) can lead to coronary artery obstruction that may be fatal [7]. The valve to annulus mismatch or abnormal coronary ostia or their malposition may predispose to such catastrophes along with heavy calcification on the valve. Saintini and colleague have reported three cases where prosthetic valve was partially obstructing the coronary ostia, they used patch plasty to enlarge the ostia with successful outcome [2]. In another report aortic valve replacement in the presence of anomalous coronary artery resulted in compression and decrease myocardial perfusion and even re-replacement with smaller valve was not helpful and the issue was resolved by performing CABG [8]. The coronary ostial anomalies including origin, intramural course and passage between aorta and pulmonary although rare but are well-known to have a greater risk of compression resulting in myocardial ischemia which can be fatal. The unroofing or direct coronary reimplantation procedure is described for such abnormal coronaries [9]. Nader et al has reported a similar sort of case where coronary unroofing and aortic valve replacement was performed in a patient found to have malposed intramural course of RCA along with aortic stenosis on investigations for symptoms of exertional angina and syncope. The same author has suggested combined approach as it is difficult clinically to

attribute symptoms to abnormal coronary or valve lesion [10]. Fareed et al have carried out a study where autopsy of all the deaths following aortic valve revealed that 3.4% of deaths were at least partly from coronary ostial compromise [11]. In this case patient undergoing aortic valve replacement, LMCA was abnormally placed. It was recognized and appreciated that seating of prosthetic valve would result in obstruction of LMCA with catastrophic complication and a LM unroofing was performed to shift the ostium to avoid obstruction and allow safe seating of the prosthetic valve without compromising the ostium.

#### 4. Conclusion

This case highlights that it is extremely important for the surgeon to be aware of the possibility of coronary ostial obstruction during aortic valve replacement that could lead to dreadful outcome, specially where the origin of coronary artery coronary is anomalous. This should be recognized promptly and dealt with accordingly. Various surgical options are available and can be considered, however in this case it was preferred to perform LM unroofing, a viable option, to allow safe seating of prosthetic valve without obstruction to LM coronary flow.

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