



## Case Report

### Abstract

### Where is the culprit? A case of infero-posterior STEMI due to occlusion of a dominant circumflex artery of anomalous origin.

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Coronary artery anomalies are observed in approximately 1% of individuals in angiographic series. Of these, anomalous origin of the circumflex artery from the right sinus of Valsalva is common. Although technically more demanding, successful percutaneous coronary intervention (PCI) has been performed in such anomalous vessels, both in the acute setting and as elective procedures. We report a case of successful primary PCI in a dominant anomalous circumflex artery originating from the right sinus of Valsalva.

### Introduction

Anomalous origin of the circumflex artery from the right sinus of Valsalva or right coronary artery is one of the commonest coronary artery anomalies. It may be missed on the coronary angiogram unless carefully looked for, bearing in mind the clinical profile of the patient. In performing coronary angioplasty in such a vessel, numerous technical obstacles may need to be overcome to achieve a successful result.

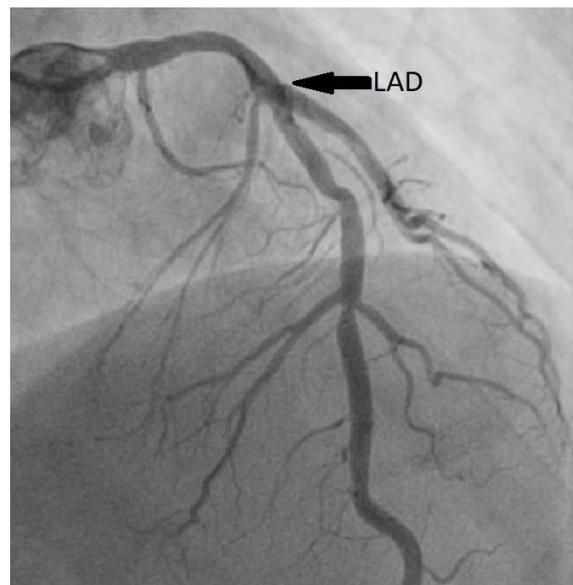
### Case report

A previously-healthy, 36 year old male was admitted to our unit with ischaemic chest pain of three hours duration. He was a current smoker with a history of 12 pack years. There were no other conventional cardio-vascular risk factors. The patient was a soldier attached to the armed forces. Examination revealed a pulse rate of 68 beats per minute with a regular rhythm and a blood pressure of 110/70 mmHg. The jugular venous pressure was not elevated. Pre-cordial auscultation did not reveal any cardiac murmurs and the lung bases were clear. The patient was able to maintain his arterial oxygen saturation without the need for supplemental oxygen.

The electrocardiogram (ECG) revealed ST segment elevation in leads II, III and aVF accompanied by horizontal, deep ST segment depressions and a positive R wave in leads V1- V3. A diagnosis of acute inferior ST-elevation myocardial infarction (STEMI) with posterior extension was made and the patient was immediately transferred to the cardiac catheterization laboratory for primary

percutaneous coronary intervention (PCI).

The coronary angiogram revealed a single vessel originating from the left sinus of Valsalva (LSV), corresponding to the anatomical distribution of the left anterior descending artery (Figure 1).



**Figure- 1:** LAD arising from the left Sinus of Valsalva. LCX is not identified

There was no significant plaque disease in this vessel and its major branches. The left circumflex artery was not identified despite multiple contrast injections in the LSV.

Contrast injection in the right sinus of Valsalva (RSV), revealed the right coronary artery, interestingly, to be non-dominant with no significant plaque disease (figure 2a).



These angiographic findings were not compatible with the patient's diagnosis. Therefore a meticulous search for the culprit artery was carried out with multiple contrast injections and various catheter positions. Ultimately, another vessel was observed originating from the RSV and coursing towards the left. It was occluded proximally with an acute thrombus (Figure 2b).

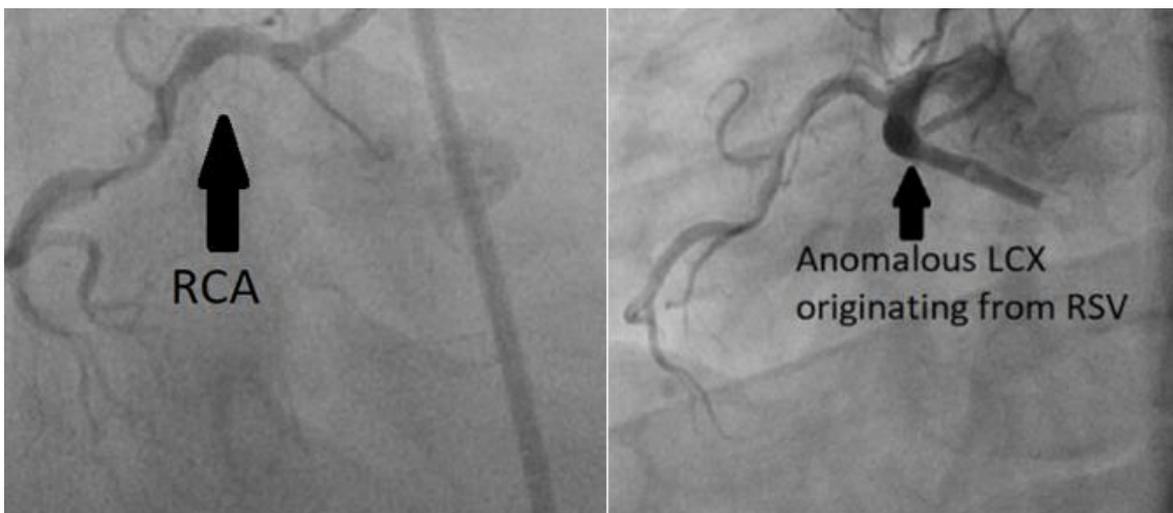
After multiple attempts, the ostium of this vessel was engaged with a Judkins right 3.5 guiding catheter and wired with a 0.0014" Balanced Middle Weight guide wire. A repeat contrast injection after wiring showed a large calibre, dominant vessel corresponding to the anatomical distribution of the left circumflex artery. There was a severe stenotic plaque lesion proximally, at the site of the thrombotic occlusion. At this point, a diagnosis of acute inferior-posterior STEMI due to thrombotic occlusion of the dominant circumflex artery of anomalous origin was made.

The lesion was pre-dilated with a 2.5 x 14 mm Mozec PTCA balloon (Cordis) at 8 atmospheres and stented with a 3.5 x 18 mm Multi-Link Vision bare metal stent (Abbott Vascular), deployed at 9 atmospheres. Excellent angiographic results were achieved with TIMI III flow in the entire vessel and its branches (Figure 3).

Post-procedure, the patient's chest pain disappeared and the ECG normalized. Echocardiogram showed only mild septal hypokinesia with preserved biventricular systolic function. The patient was discharged on the third day with no residual angina and stable haemodynamic parameters. Three months after the acute event, the patient remained asymptomatic and well.



**Figure-3:**Final angiogram.



**Figure-2a(left):** Non-dominant RCA **Figure-2b(right):** Anomalous origin circumflex artery with acute occlusion



## Discussion

The circumflex artery is the artery that runs in the left atrio-ventricular groove, giving off at least one obtuse marginal branch and it supplies blood to the free wall of the left ventricle and the obtuse margin of the heart[1-3]. The posterior descending artery (PDA) is the artery that runs in the posterior interventricular groove, giving off septal perforators[1] It supplies blood to the inferior wall and the inferior one-third of the interventricular septum[3].

The coronary dominance is determined by the artery that gives off the PDA and posterolateral branch[3]. Around 70% of individuals demonstrate left dominance while 20% exhibit co-dominance and 10% exhibit right dominance[4]. The incidence of coronary artery anomalies has a wide variation in angiographic studies. In the largest study reported in the literature, in which more than 125000 coronary angiograms were studied, coronary artery anomalies were identified in 1.3% of cases[5]. The commonest anomaly was the separate origin of left anterior descending artery and left circumflex in the left sinus of Valsalva (0.41%) followed by the origin of circumflex artery from the right sinus of Valsalva or RCA (0.37%)[5].

The incidence of a dominant circumflex artery arising from the RSV is not widely addressed in the literature, probably due to the rarity of such an anomaly. A circumflex artery originating from the right side invariably crosses behind the root of the aorta to reach left atrioventricular groove. Some studies suggest that such an artery has an increased likelihood of developing earlier and more severe atherosclerotic disease[6].

Several cases of percutaneous coronary intervention (PCI) of the circumflex artery with anomalous origin have been reported. The procedure is likely to be more technically demanding than a routine procedure due to various factors. These include difficulty in visualization of the artery during angiography, difficulty in achieving co-axial engagement of the guiding catheter during the procedure, poor catheter support and difficulty in advancing the balloons and stent/s to the target segment.

Cases of primary PCI in the setting of acute STEMI where the infarct-related artery was

identified as the anomalous circumflex are much less common [7-9]. Primary PCI in a dominant such artery has not been reported previously in the literature.

## Conclusion

Coronary artery anomalies, although rare, can have clinically significant implications for the patient. Failure to identify such an anomaly in the setting of an acute coronary event can have disastrous consequences. Therefore, it is important to actively seek such anomalies if the clinical scenario and the angiographic findings are not compatible with each other, as timely intervention is likely to result in short-term as well as long-term favourable outcome.

**Potential conflicts of interest:** None

**Consent:** Written, informed consent was obtained from the patient for disclosure of clinical information exclusively for dissemination and advancement of medical education.

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