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Inferior ST-segment Elevation Myocardial Infarction due to a Proximal “Wrap around” Left Anterior Descending Coronary Artery Occlusion: A Case Report

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Abstract

Inferior ST-segment myocardial infarction (STEMI) is often due to acute occlusion of the right coronary artery (RCA) or left circumflex artery (LCx). Anatomically, distal occlusion of a dominant left anterior descending artery (LAD) wrapping around the apex supplying posterior descending artery (PDA) can also lead to inferior wall MI. The occurrence of inferior MI with LAD occlusion is underappreciated. We are presenting a case of proximal LAD occlusion leading to inferior wall MI in the presence of non-occlusive right coronary artery (RCA). Physicians should keep in mind the possibility of inferior myocardial infarction with LAD occlusion and interventional cardiologists should perform a complete angiogram to identify the faulty lesion in inferior STEMI before deciding on a RCA or LCx as the culprit artery. Isolated IWMI (inferior wall myocardial infarction) from proximal occlusion of the wrapped around LAD as noted in our patient is a rare occurrence.

Keywords

acute ST segment elevation myocardial infarction; left anterior descending coronary artery; wrapped around LAD; inferior wall myocardial infarction

1. Introduction

The inferior wall is normally supplied by the posterior descending artery which may arise from the RCA (in right dominance or codominance pattern) or from the LCx (in left dominance pattern) [1]. An occlusion of these arteries proximal to PDA origin will result in inferior wall myocardial infarction (IWMI), reflected in the electrocardiogram (ECG) as ST-segment elevation (STE) in lead III and II, and ST-segment depression in leads I or aVL. [2]. Very rarely PDA can originate from hyper-dominant LAD wrapping around the apex. A distal occlusion of LAD, proximal to PDA can present as an isolated IWMI which could misguide treating physicians to consider RCA as the culprit lesion. In addition, the blood supply to the entire interventricular septum can also be derived from such hyperdominant LAD system and the occlusion of such wrap around LAD would lead to ischemia in larger areas of the right and the left ventricles that could be catastrophic [3].

2. Case Report

A 38 year-old male with a past medical history of hypertension, hyperlipidemia, and human immunodeficiency virus (HIV) infection presented to the emergency department (ED) with severe substernal chest pain, 10/10 in intensity and diaphoresis of a few hours duration. The chest pain had been intermittent for the previous one month aggravated by exercise and lifting heavy weights, non-radiating, non-pleuritic in nature, and not relieved by any specific agents. There was no history of nausea, vomiting, loss of consciousness, cough, shortness of breath, or dizziness. Family history and surgical history were not significant. He was allergic to penicillin. He denied smoking, alcohol consumption, or illicit drug/substance use. The physical examination was unremarkable. On admission his vital signs were pulse rate of 86 bpm, blood pressure 127/81 mm of Hg (left arm, on recumbent position), temperature 97.8°F, respiratory rate of 18 bpm and oxygen saturation was 98% on room air. ECG revealed ST-segment elevation in II, III, and AVF and minor ST segment depression in aVL suggestive of IWMI (Image 1).

The complete blood count did not show any abnormalities.

The troponin-I level was elevated to 0.217 ng/ml (0-0.034 ng/ml). The patient was advised hospital admission in view of STEMI and transferred to the cardiac catheterization laboratory for an emergent coronary angiogram procedure.

Diagnostic cardiac catheterization revealed LAD wrapped around the apex with 95% stenosis of proximal LAD and no significant disease on either the left main artery or the LCx (Image 2, Image 3).

There were no left ventricular global or regional wall motion abnormalities. Successful balloon angioplasty was followed by the placement of a drug eluting stent on the 95 % lesion in the proximal LAD with minimal residual stenosis (Image 4). The patient remained stable in the post-operative period and was discharged on aspirin, atorvastatin, metoprolol, enalapril, and ticagrelor.

3. Discussion

A “wrapped LAD ” is defined as a LAD coronary artery that during a coronary angiogram is found to perfuse at least one-fourth of the inferior wall of the left ventricle in the right anterior oblique projection [4]. It is vital to be aware of this variation, since the occlusion of a “wrapped LAD” could affect large areas of myocardium leading to poor outcomes [5]. Typically, a wrapped LAD presents as a combined anterior and inferior wall MI which represent a proximal occlusion of LAD. When the culprit lesion is distal, it can manifest as isolated inferior wall MI and could easily misguide physicians during the initial presentation.

Typically, IWMI results from an occlusion of the LCx or RCA. Various ST segment patterns are used to identify the culprit vessel, the discussion of which has been detailed elsewhere [6]. If the patient has a wrapped LAD and the location of the occlusion is proximal to first diagonal (D1), ST is elevated in the anterior leads and remains isoelectric in the inferior leads. If the occlusion is distal to D1, simultaneous elevation of anterior and inferior leads can be seen. [7]. If LAD continues through the interventricular groove as PDA and the occlusion distal to all diagonal branches, an unusual presentation of isolated STE II,III, aVF can be seen. However, our patient had an isolated IWMI from proximal occlusion of the wrapped around LAD. Physicians should keep in mind the possibility of inferior myocardial infarction with LAD occlusion and interventional cardiologists should perform a complete angiogram to identify the culprit lesion in inferior STEMI before making the determination that lesion involves a RCA or LCx coronary artery.

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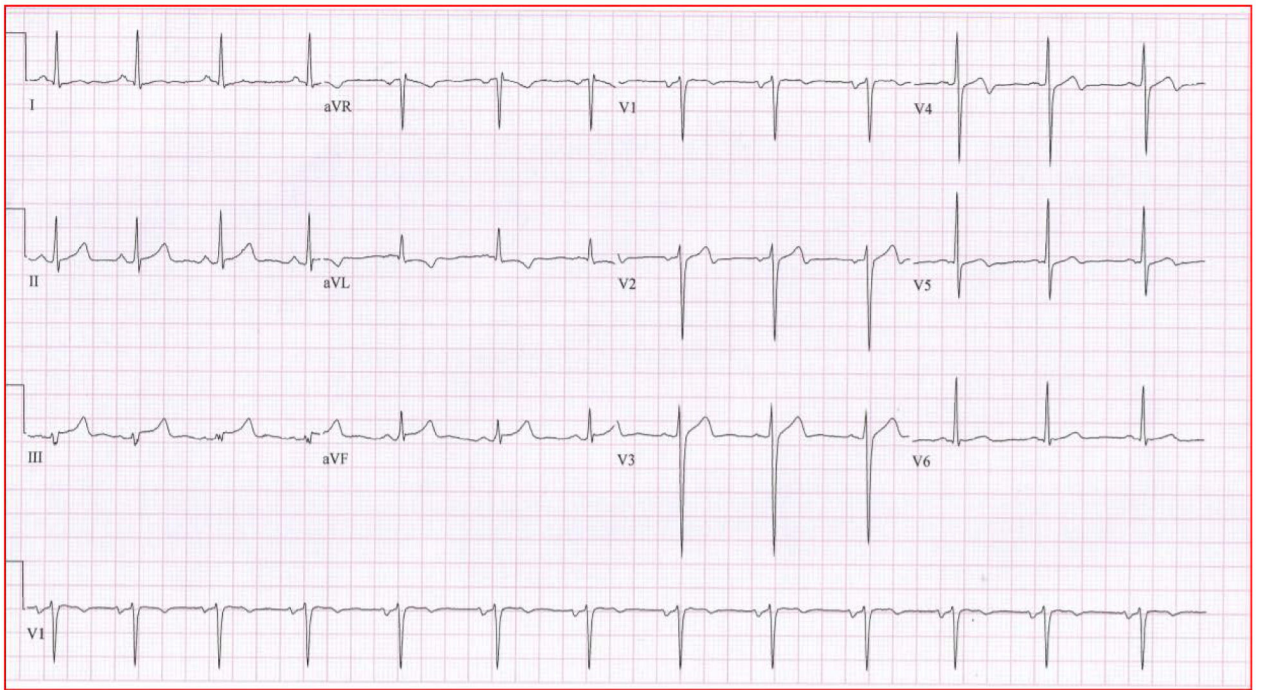


Image 1.
EKG showing normal sinus rhythm and ST segment elevation in II, III, and aVF leads

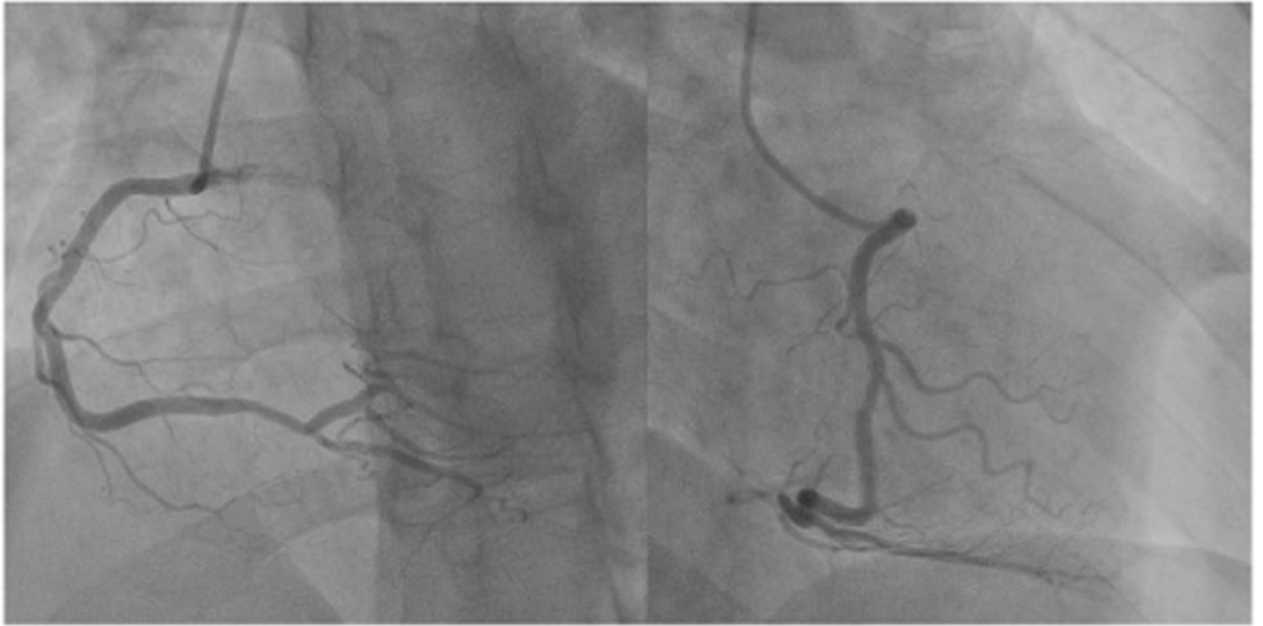


Image 2.
Coronary angiogram showing normal right coronary artery in left anterior oblique (left image) and right anterior oblique views (right image)

**Image 3.**

Coronary angiogram of the left coronary artery in right anterior oblique cranial view (left), left anterior oblique cranial view (middle), and right anterior oblique caudal view (right) showing normal left circumflex artery (white arrow) and subtotal occlusion of the proximal left anterior descending artery (red arrow)

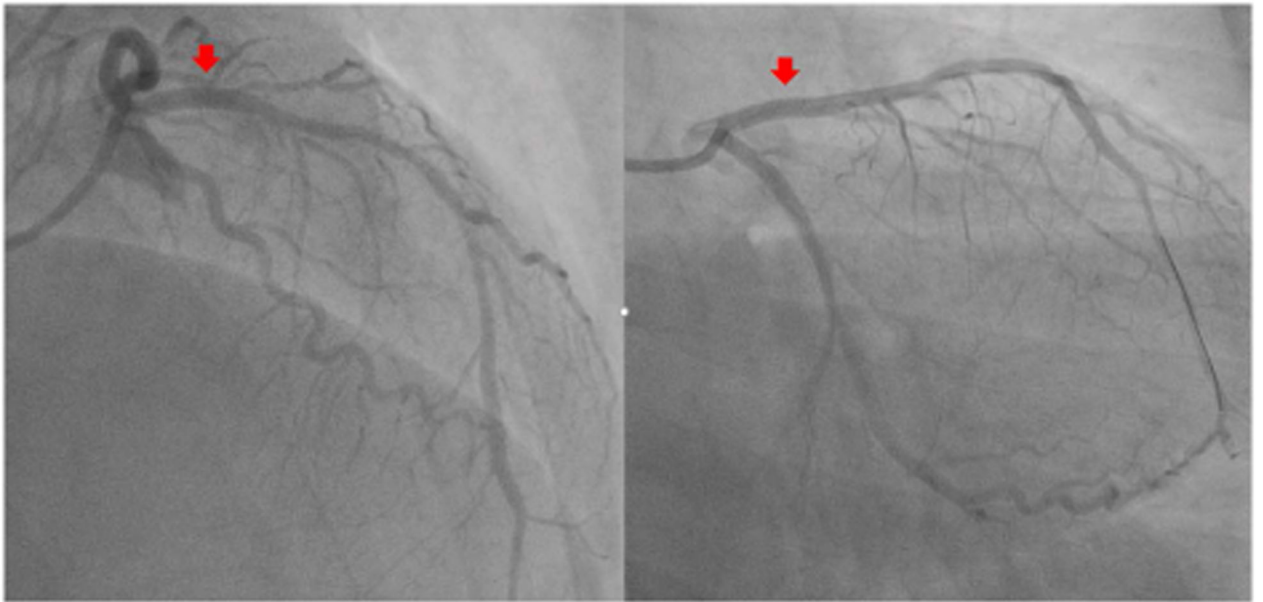


Image 4.
Coronary angiogram of the left coronary artery after successful placement of the drug eluting stent in the proximal left anterior descending artery