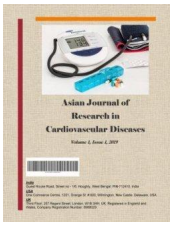

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A Silent Myocardial Infarction at Diabetic Outpatient Clinic: Tertiary Hospital Setting

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Authors' contributions

This work was carried out in collaboration among all authors. Author Febyan designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors IKSD and IMS managed the analyses of the study. Author Febyan managed the literature searches. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

A silent myocardial infarction (SMI) is a rare phenomenon. It occurs when the patient has many comorbidities, one of which is diabetes mellitus (DM). The underlying pathology is cardiac autonomic neuropathy (CAN), which is a serious and common complication of diabetes. We presented a unique case of a patient with asymptomatic myocardial infarction with bradycardia and DM on medication. We aim to emphasize the importance of diagnostic screening for diabetic patients using electrocardiography serials to provide adequate and prompt management of SMI and prevent further complications caused by myocardial infarction events.

Keywords: Myocardial infarction; diabetes mellitus; acute coronary syndrome; STEMI.

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1. INTRODUCTION

Acute coronary syndrome (ACS) is one of the leading causes of morbidity and mortality in patients with diabetes mellitus (DM) [1]. It is incidence is rising in developing countries due to the increase in cardiovascular risk factors related to the unhealthy lifestyle habits among the population of these countries [2]. According to the Registry of Acute and Intensive Cardiovascular on Outcome (RAICOM) during September 2014 until 2015, there were 1590 ACS patients in Intensive Cardiovascular Care Unit-NCCHK, and 910 patients (57.2%) were diagnosed as having ST-Elevation myocardial infarction (STEMI), 647 patients (40.6%) as non-ST-Elevation myocardial infarction (NSTEMI), and 33 patients (2.2%) as unstable angina pectoris (UAP). Those who have ACS and DM account for 38.3% of total patients [3]. Diabetes mellitus is a major risk factor for ACS and is associated with a higher incidence of myocardial infarction (MI) and sudden death [1,3,4]. Morbidity, mortality, and re-infarction rate are higher following MI in diabetic, compared to non-diabetic individuals [4]. Diabetes mellitus is present in 21% of people aged 40 and above. The peak incidence counts for 41% in the age group of 55-64 years [5]. The incidence, prevalence, and the pattern of occurrence of ACS are increasing in South Asian countries [5]. It includes a higher incidence of angina pectoris, myocardial infarction (including silent MI), which had also been reported in DM patients. Early recognition of ACS in DM patients, therefore, is important for the better management and prognostic purpose [5].

2. CASE PRESENTATION

A fifty-seven-year-old male patient came to the emergency department (ED) after being referred by the internist because the results of the examination in the diabetic outpatient clinic showed the blood pressure of 70/palpation mmHg and the heart rate of 50 beats per minute. On history taking, the patient denied any history of chest pain, shortness of breath, palpitations, cold sweating, nausea, indigestion, or any other symptoms of being unwell. He was diagnosed with type-2 DM and was on his monthly control with oral preparation of metformin 500 mg twice a day for the past two months. There was no family history of ACS or sudden cardiac deaths. Neither prior smoking habit nor alcohol consumption history was present. Physical examination revealed the patient was well and aware, blood pressure 70/palpation mmHg, heart rate 54 beats per minute, respiratory rate 24 breaths per minute, axillary temperature 36.5^{o}C, and oxygen saturation of 99% on room air. Electrocardiography (ECG) was performed, with the result showed bradycardia with STEMI in II, III, AVF leads indicating inferior wall myocardial infarction, as shown in Fig. 1, and we performed to using right sided precordial leads to evaluated V_3R – V_6R Fig. 2. Laboratories examination revealed the result of non-fasting blood glucose was 161 mg/dL, and complete blood counts were within normal limits, the cardiac enzyme such as CK was 3032 U/L, Troponon I was 11,05 ng/mL, CKMB was 740 U/L. The patient was initially treated with supplementation oxygen of 4 liter per minute, oral aspirin 320 mg, oral clopidogrel 300 mg, and a slow drip of 0.9% intravenous normal saline. After the intravenous line was inserted, the patient was given 0.5 mg atropine sulphate intravenously and 0.6 cc enoxaparin subcutaneously. A Foley catheter was inserted to monitor urine production. After gathering consent from the family, the patient was transferred to the cardiac catheterization hospital to undergo primary Percutaneous Coronary Intervention (pPCI). The result of angiography found a long occlusion (90%) at the right coronary artery, and we performed revascularization by applying a drug eluting stent (DES) Fig. 3. The serial ECGs showing the resolution of the STEMI after 1 hour pPCI Fig. 4, a few days later the patient was discharged with addition of dual anti-platelet therapy (DAPT) using aspirin and clopidogrel, and we consulted to diabetic out patient clinic to maintence for his blood glucose.

3. DISCUSSION

Silent myocardial infarction is defined as the presence of a heart attack or an acute myocardial infarction (AMI) that occurs in the absence of apparent symptoms, such as chest pain and any other typical anginal symptoms, i.e., dyspnea, palpitations, nausea, diaphoresis, etc [6]. Therefore, the establishment of diagnosis is generally based on the objective findings of ST-segment changes on ECG, reversible regional wall motion abnormalities, or perfusion defects on scintigraphy studies [6]. According to the ECG and cardiac biomarkers examination, it can be distinguished into three subtypes: (1) STEMI, (2) NSTEMI, (3) unstable angina pectoris (UAP) [7]. In a study done by Mohammed et al., found there was a case of a sixty-eight-year-old Caucasian man who presented to primary care physician for routine ECG as part of hypertension

follow-up. The result of ECG revealed an STEMI in inferior leads (II, III, AVF), even though the patient was completely well, stable and asymptomatic. He was rushed immediately to the coronary care unit to undergo an urgent coronary angiogram, showing a completely normal coronary anatomy. The patient was later diagnosed with an asymptomatic coronary artery spasm with pathological ST-segment elevation [8].

Patients with DM are more likely to experience AMI and heart failure, also are at greater risk for dying after an acute cardiac event, compared to the patients without DM [1,3,4]. These differences are related to the severity and extent of MI in diabetic patients, the extent of left ventricular remodeling, and the presence of significant ventricular dysrhythmias [1]. Some studies also reported a higher incidence of SMI among DM patients [9,10]. In low-risk DM patients, the prevalence of SMI reaches 6-23%, whereas, in high-risk DM patients, the prevalence reaches up to 60% [11]. The risk of SMI in new-onset type-2 DM patients without additional cardiovascular risk factors is found to be similar to long-established type-2 DM with prior cardiovascular risk factors [11,12]. Some studies showed that the increased risk of SMI event is associated with the presence of CAN, which is a serious and common complication of DM [10,11].

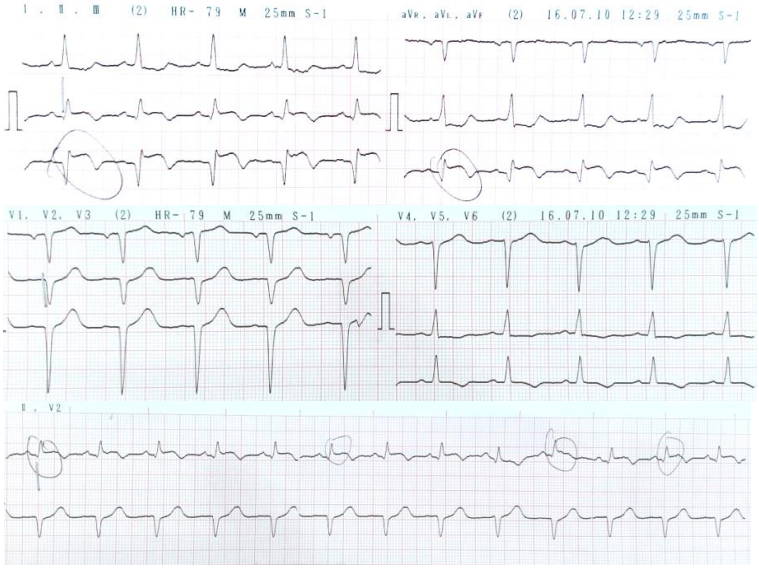

Fig. 1. Electrocardiography: STEMI Inferior

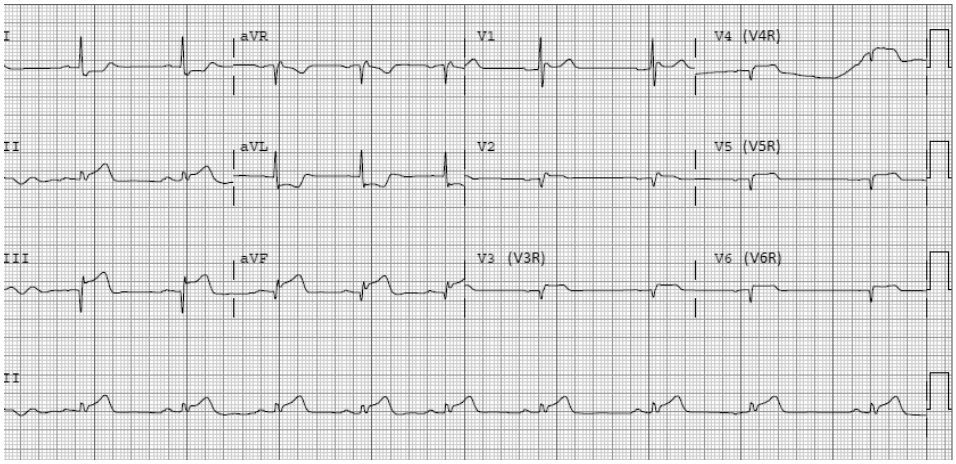

Fig. 2. The result of ECG from the same patient, we used right sided precordial leads, V_3R – V_6R, showing right ventricular myocardial infarction

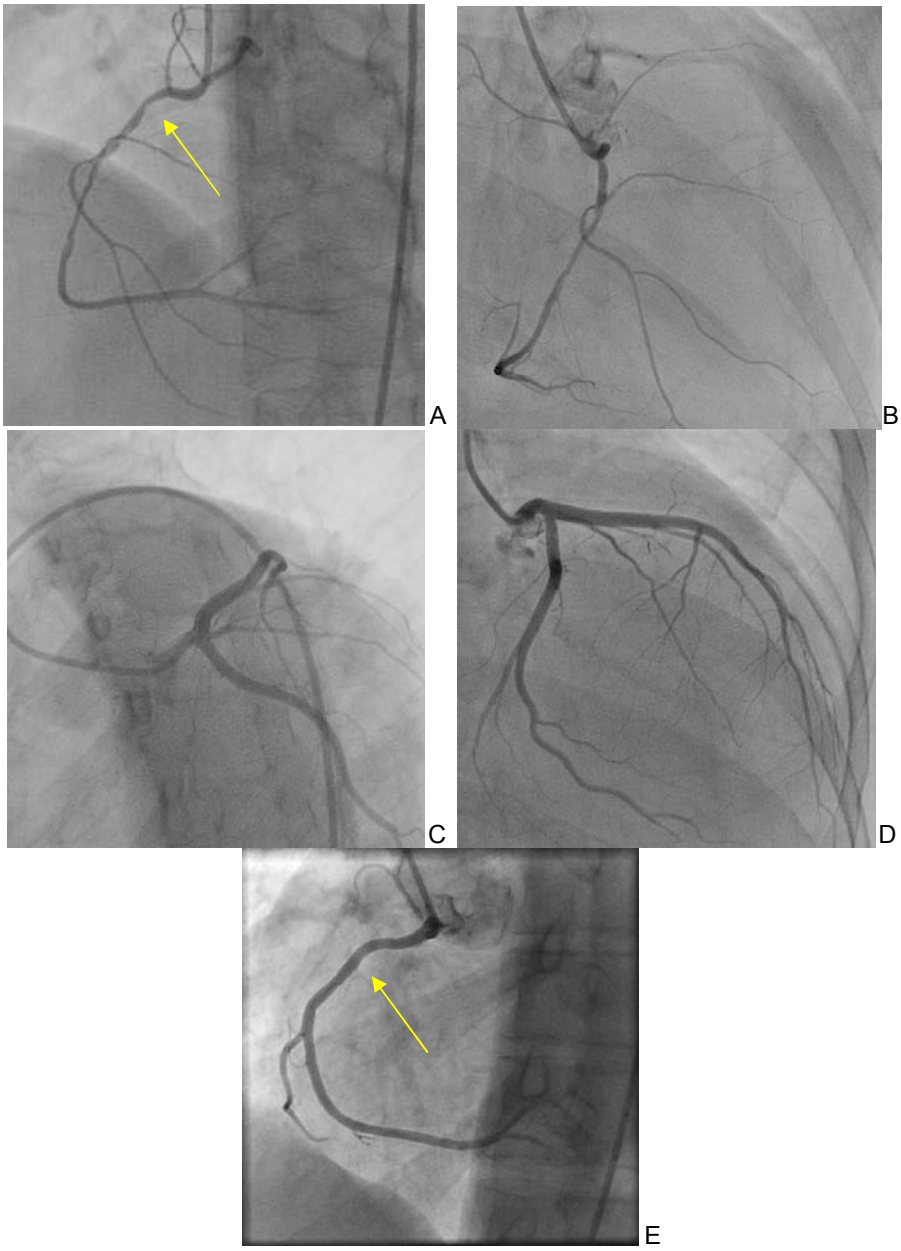

Fig. 3. (A) Coronary angiography revealed 90% long stenosis in RCA (arrow). (C & D) revealed; LCx and LAD were normal finding. (E) After inserted of stent

Our case presented a male patient who had well-Our case presented a male patient who had well-controlled DM on oral hyperglycemia drugs with no apparent symptoms of MI, but a typical finding of STEMI inferior based on ECG. As explained above, the underlying mechanism of SMI among diabetic patients may be caused by CAN, which involves pathological changes of cardiac afferent neurons [9,10]. About 20% of asymptomatic diabetic patients have abnormal CAN [13]. The risk of CAN depends on several risk factors, including the duration of DM and the degree of glycemic control [10,13]. The incidence of CAN is found to be higher in 34% of people with type-2 DM [10]. The main consequences of this pathological condition are dysfunctional heart rate control, abnormal vascular dynamics and cardiac denervation, which have become clinically overt as exercise intolerance, orthostatic hypotension, and SMI [13]. CAN

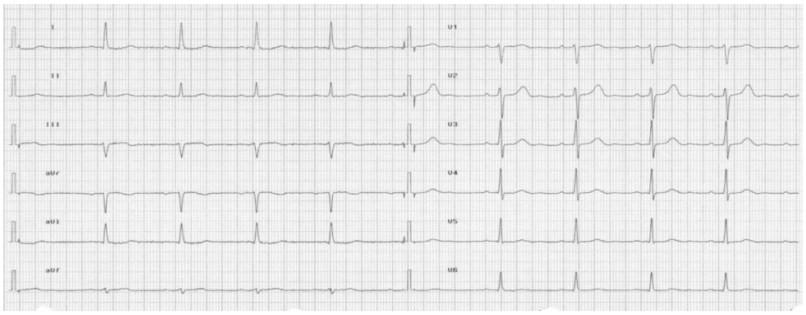

Fig. 4. The resolution of ECG Post pPCI (1 hour) from STEMI

may provoke ischemic episodes by upsetting the balance between myocardial supply and demand. Instead of typical angina, patients often complain only a benign manifestation of shortness of breath, diaphoresis, or profound fatigue. Silent ischemia delays treatment of ACS events and makes it more difficult to monitor anti-ischemic treatment or determine whether restenosis has occurred after coronary intervention [7,13]. Iqbal et al. reported that there was 6.7 times higher mortality in DM in inferior infarction group [8]. Incidentally, most of the patients in inferior infarction group presented with serious complications like cardiogenic shock, ventricular tachyarrhythmia, and left ventricular failure that probably contributed to higher mortality in diabetic patients of this group [14].

According to American Heart Association (AHA 2013) guideline for the management of STEMI, it is reported that the pPCI should be performed for those with STEMI and the symptoms indicative of ischemia of the heart muscle that began 12 hours or less before the symptom onset [15]. pPCI is preferred in the presence of an accessible and well-equipped resources and facilities [15]. Among patients with SMI, it is also found that the long-term risk of major cardiac events is reduced in PCI-intervened patients compared to anti-ischemic drug only patients [16], although the risk remains high in the presence of DM comorbidities [17]. Administration of antiplatelet therapies, such as aspirin and P2Y12 receptor inhibitor (clopidogrel), is recommended as early as possible for the patients with STEMI [15]. Enoxaparin is an anticoagulant medication, and its administration is used adjunctively prior to reperfusion therapy [15]. The cardiac troponin (cTn) assays may alter the overall diagnosis of MI. Still, the decision to undergo angiography or give thrombolytics is made based on ST-segment elevation on the ECG and is usually reached before troponins are detectable in the blood [18]. Diabetic patients frequently present with ischemic symptoms that are not typical, so it further emphasizes the role of the routine ECG for diagnosis and triage of such individuals [18].

The American Diabetes Association (ADA) recommends that all patient with DM have a screening ECG performed at their annual review visit, and this practice appears sensible [19]. Shetty et al. reported that among 11 patients of DM, there were 22 patients with MI, 18 patients (36.36%) of patients presented with atypical manifestations or silent infarction, which was detected during routine ECG recording [5]. An ECG is an inexpensive test, and although not sensitive for lesser degrees of ischemia, an abnormal finding of ECG may lead to early recognition of a SMI. Therefore, detection of a new ECG abnormality will almost certainly result in interventions that can improve prognosis [9,20]. Exercise treadmill test (ETT) and ambulatory (Holter) monitoring are frequently used tests to identify silent ischemia in clinical practice [13]. Khanal et al. reported that the early screening for asymptomatic ACS among patients with DM is recommended, especially for those who have DM of at least five years duration or have additional risk factors [21]. Considering the cost and availability, treadmill exercise ECG should be considered as an initial screening test followed by stratification with Duke Treadmill Score (DTS) [21]. The managements for STEMI asymptomatic episode is not much different as for the symptomatic STEMI [13].

4. CONCLUSION

Silent STEMI is a rare occurrence and appears more frequently in patients with DM as a result of cardiac autonomic dysfunction. The presence of asymptomatic STEMI has important implications for the patient; therefore, early detection and

management of SMI should be appropriately done to further pathological damage. Moreover, we need to consider about any other technological advances to increased diagnosis of unrecognized STEMI, especially for patient who have any other co-morbidities, to prevent further complications and sudden death.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable. Author has declared that no competing interest.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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