

Double-vessel disease of acute myocardial infarction in a 27-year-old young female: a case report

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SOUHRN

S akutním infarktem myokardu (AIM) se u mladých lidí nesetkáváme často. Kromě toho se vzhledem k obtížnému rozpoznávání symptomů, méně přesně definované „atypické“ bolesti na hrudi i vzhledem k některým normálním výsledkům angiografie uvádějí mnohem nižší počty žen s AIM. Studie provedené v nedávné době však upozornily na zvýšenou incidenci AIM s postižením jedné tepny jako nejčastějším angiografickým nálezem u mladších pacientů. Akutnímu infarktu myokardu u mladých žen se dosud věnovala menší pozornost, zvláště při postižení dvou tepen. Cílem této kazuistiky je rozšířit současné poznatky pomocí detailní analýzy případu mladé ženy, která prodělala AIM a u níž byla stanovena diagnóza postižení dvou tepen.

Sedmadvacetiletá Indonésanka byla převezena do naší nemocnice se synkopou, již předcházela akutní bolest na hrudi. Elektrokardiografický záznam prokázal elevaci segmentu ST v předních svodech (V_3 – V_6) i zadních svodech. Podle vyšetření krevních vzorků pacientka trpěla hypertriglyceridemií (262 mg/dl) a měla abnormální hodnotu glukózy v plazmě (516 mg/dl), což ukazovalo na možnou přítomnost diabetes mellitus 2. typu. Výsledky koronarografického vyšetření ukázaly uzávěry dvou tepen, 99% ve střední části r. circumflexus (RC) a 70% v proximální – střední části r. interventricularis anterior (RIA). Na RC jako nejkritičtější místo uzávěru byla provedena perkutánní koronární intervence (PCI). Přítomnost diabetu 2. typu představovala u pacientky faktor zvyšující riziko.

Pro poznání příčiny rozvoje AIM v nízkém věku je důležité odebrat rodinnou i osobní anamnézu.

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ABSTRACT

Acute myocardial infarction (AMI) is an uncommon occurrence in young people. Furthermore, females suffering from AMI reported much lower rates due to poor symptom recognition, less defined “atypical” chest pain, and some normal angiographic findings. However, recent studies have highlighted an increase in the incidence of AMI in younger patients with single-vessel disease, which is the most prevalent angiographic feature. To date, AMI in young females has received less study, especially in cases of double-vessel disease. The present case study aims to contribute to the existing body of knowledge by offering a detailed analysis of a young female patient who has experienced an AMI and has been diagnosed with double-vessel disease. A 27-year-old Indonesian female was transferred to our hospital with a syncope presentation, preceded by acute chest pain. An electrocardiogram shows ST elevation in anterior leads (V_3 – V_6) and inferior leads. From lab examination, the patient has hypertriglyceridemia (262 mg/dL) and abnormal plasma glucose (516 mg/dL), with the possibility of type 2 diabetes mellitus. Coronary angiogram results revealed double-vessel occlusions at the middle right circumflex artery (RCA) at 99% and the proximal-middle left anterior descending coronary artery (LAD) at 70%. Percutaneous coronary intervention (PCI) was conducted at RCA as the most critical occlusion site. Type 2 diabetes was the contributing risk factor for the patient. History taking of family and personal diseases is important to comprehend the cause of AMI occurrence at an early age.

Keywords:

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Introduction

Acute myocardial infarction (AMI) is the predominant cause of cardiovascular events globally, with an increasing incidence in patients under 35 years of age.^{1,2} Although infrequent, several studies indicate that the prevalence of these AMIs among the young ranges from 2% to 10% of overall AMI cases.^{3,4} The age of onset is progressively decreasing due to various risk factors, including gender, smoking habits, obesity, prior coronary artery disease, familial history of premature acute myocardial infarction (AMI), non-obstructive coronary artery disease (CAD), genetic disorders associated with blood coagulation or fibrinogen, hypertension, diabetes, elevated low-density lipoprotein cholesterol (LDL-C) levels, and increased uric acid levels.^{2,5,6}

Gender considerations significantly influence the prevalence of acute myocardial infarction across all age groups. Female experiencing acute myocardial infarction reported much lower rates.⁷ Males have a higher incidence, accounting for approximately 70% of all AMI cases and having 7 to 10 years earlier onset than females. Similar to the older age, young AMI patients aged 18–35 were characterized as males with previously mentioned risk factors.⁸ However, females experience a greater one-year mortality rate (OR 1.6).⁹ This mortality burden in women may be due to a lack of symptom recognition by clinicians and patients. The “atypical” chest pain described by women is less likely to be defined than in men, reducing timely and evidence-based interventions for AMI symptoms in women.⁷ Females with AMI also tend to present to the hospital later after symptom onset than males, which may indicate a possible lack of dangers or acute myocardial symptomology knowledge in the general population.¹⁰

Furthermore, recent reports have indicated that 20.4% of female patients with AMI exhibited angiographically normal coronary arteries.¹¹ These findings suggest that female patients may not be experiencing an acute coronary syndrome (ACS) and could be presenting with symptoms due to other underlying conditions. These findings suggest that the prevalence of acute coronary syndrome (ACS) in female patients may be underestimated, and that other underlying conditions may be responsible for the observed cases of female acute myocardial infarction.⁶ However, the same study also reported that 45.5% of female AMI cases had obstructive coronary artery disease, with single-vessel disease being the most common in the young group. Due to the chronicity of AMI, double-vessel disease (DVD) or multiple-vessel disease was rarely seen in young patients.

To date, the prevalence of acute myocardial infarction (AMI) in young females has received comparatively less attention, especially in the context of dual-vessel disease (DVD). Consequently, this paper presents a case report of AMI in a young female with DVD, accompanied by a concise literature review.

Case report

A 27-year-old female was admitted to a referring hospital following an incident of syncope. The aforementioned symptoms were characterised by cold sweat and palpita-

tion, and were preceded by acute chest pain. The patient regained consciousness within minutes of admission. The intensity of the chest pain was measured using a visual analogue scale, with a rating of 10/10, indicating severe discomfort. The patient described the sensations as pressure, tightness, heaviness, or a burning feeling. The patient reported that these symptoms were new and previously unobserved. The patient was subsequently transferred to our hospital due to the persistent mild chest pain and the ECG findings suggestive of acute myocardial infarction. A detailed history revealed that the patient does not consume tobacco or alcohol. The patient reports no previous history of similar symptoms or cardiovascular diseases. The patient is employed as a treasury employee at a small convenience store. No family history of similar symptoms or cardiovascular diseases were reported.

Despite the pain, her vital signs were normal, with a blood pressure of 90/63 mm Hg, a heart rate of 75 regular beats per minute, a body temperature of 36.5 °C, an oxygen saturation of 98% with 3 lpm nasal cannula support, and a respiratory rate of 20/min. She is fully conscious with a score of 15 on the Glasgow Coma Scale (E4V5M6). She still has mild chest pain with a visual analogue scale score of 6/10. There is nothing else wrong when we examine her body, including her skin and nervous system. The patient weighs 41 kg and is 145 cm tall, with a body surface area of 1.29 m² and a BMI of 19.5 kg/m².

A normal blood test taken one day after the chest pain started in our hospital showed higher levels of certain cells and chemicals involved in fighting infection, as well as higher levels of glucose (sugar), triglycerides,

Table 1 – Laboratory results

Parameter (unit)	Measured value	Normal value
Haemoglobin (g/dL)	11.8	12.1–15.1 (female)
White blood cells (× 10 ³ /μL)	16.05*	3.9–9.7
Platelets (× 10 ³ /μL)	333	150–450
Aspartate transaminase (AST/SGOT) (IU/L)	222*	5–37
Alanine aminotransferase (ALT/SGPT) (IU/L)	180*	6–43
Albumin (g/dL)	3.65**	3.8–5.2
Blood urea nitrogen (mg/dL)	8.9	8–21
Creatinine (mg/dL)	0.7	0.6–1
Plasma glucose (mg/dL)	516*	65–109
Low-density lipoprotein cholesterol (mg/dL)	98	70–139
Triglyceride (mg/dL)	262*	30–149
High-sensitivity troponin T (ng/L)	>14*	0–14
Sodium (Na) (mEq/L)	137	135–145
Potassium (K) (mEq/L)	3.3	3.5–5
Chloride (Cl) (mEq/L)	109	96–107
Activated partial thromboplastin time (APTT) (s)	27.1	23–36
Partial thromboplastin time (PTT) (s)	11.2	25–35

* Higher than normal value, ** lower than normal value.

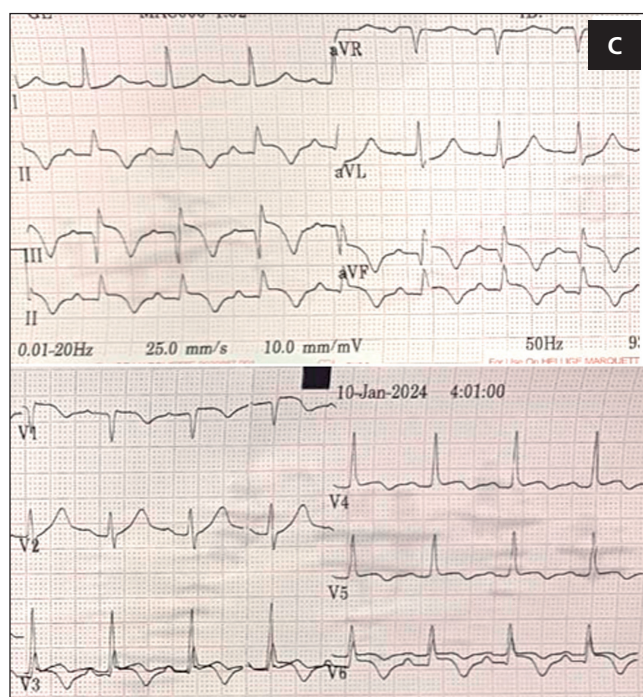
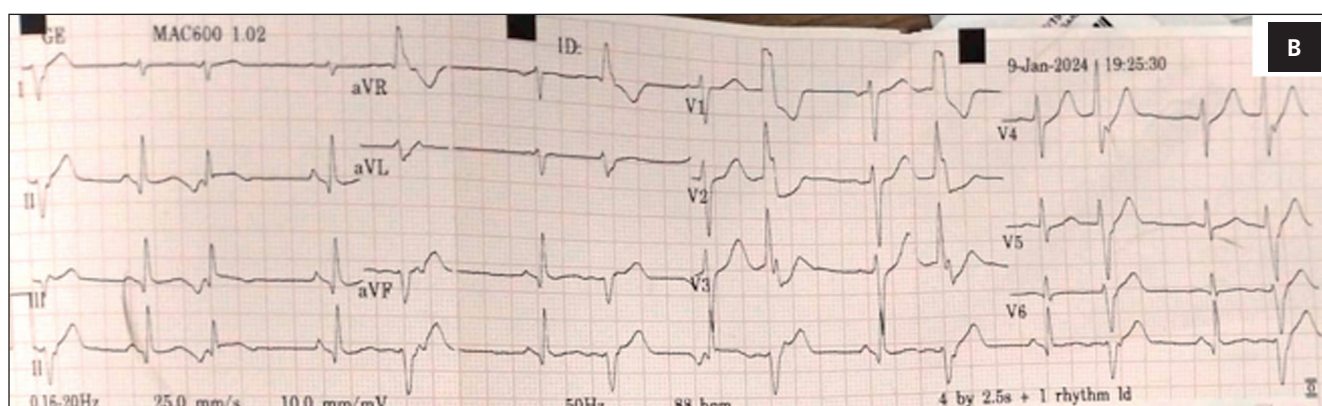
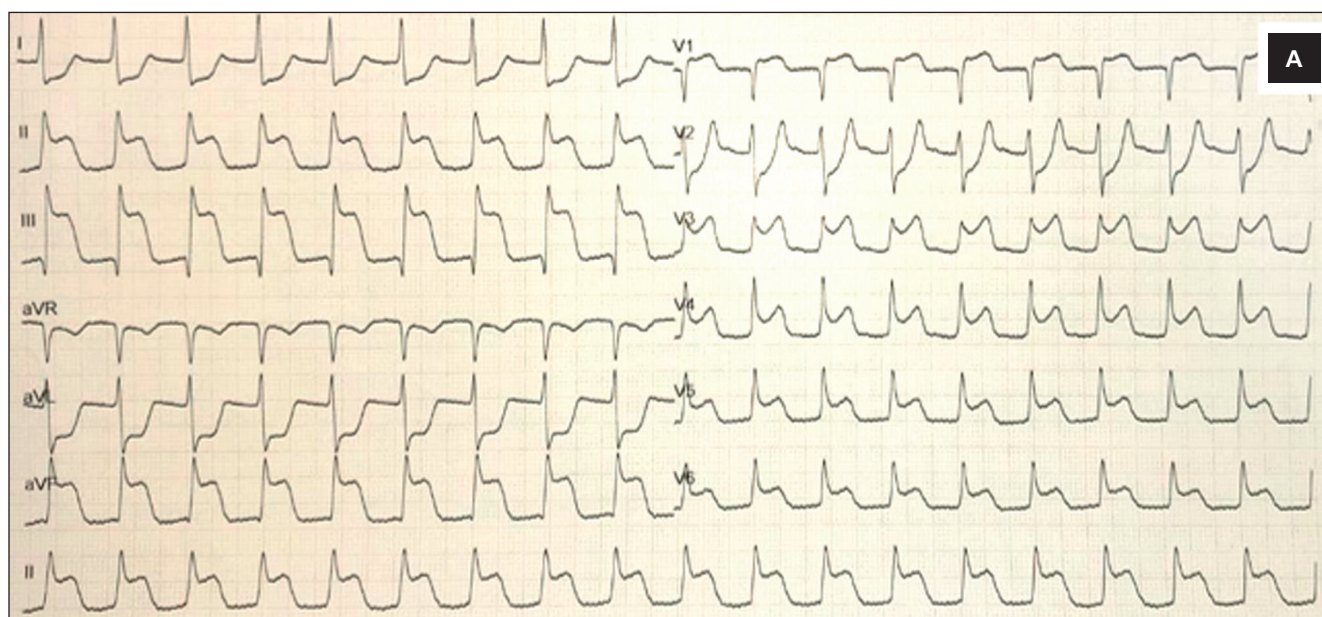


Fig. 1. ECG result. (A) A junctional rhythm at 110 regular beats/min with ST elevation in anterior leads and inferior leads from ECG result taken from referred hospital. **(B)** A serial ECG of PVC bigeminy features to pathological Q **(C)** accompanied by T inversion in similar lead taken from transferred hospital.

and a protein involved in heart damage. Albumin levels, which are often used as a marker of overall health, were lower. The results of other blood tests (see **Table 1**) were normal. The plasma glucose was exceptionally high (516 mg/dL), suggesting the patient has type 2 diabetes mellitus. An ECG result taken at a different hospital (four hours after the start of symptoms) showed a junctional rhythm at 110 regular beats per minute with ST elevation in the V_3 – V_6 and II, III, and aVF leads. A second ECG at our hospital showed signs of a more serious problem, with the ST-T segment showing an upward shift. This was from PVC bigeminy features (a type of irregular heartbeat) to pathological Q (a type of arrhythmia) with T inversion in II, III, aVF, and V_3 – V_6 (see **Fig. 1**). A chest X-ray result was normal, with a heart that takes up 47% of the chest. Transthoracic echocardiography shows the left ventricle is dilated with LVH (LVDMi 111 g/m²; RWT 0.307). A further analysis showed that the left ventricle was not working



Fig. 2 –Transthoracic echocardiography result. A dilatated and hypokinetic (inferoseptal [B-M], inferior [B-M-A]) left ventricular dimensions with eccentric LVH.

well (inferoseptal [B-M], inferior [B-M-A]) but the other parts were working normally. The left ventricle was able to pump blood at 48.1% (by TEICH), which is normal. This shows that the left ventricle is working well during diastasis (Fig. 2).

A coronary angiogram (CAG) was conducted, using the right femoral artery approach with a 6 French sheath, and it revealed occlusions at the middle right circumflex artery (RCA) of 99% and proximal-middle left anterior descending coronary artery (LAD) of 70%. No abnormal findings, such as coronary artery aneurysm, were confirmed through the CAG. We establish the diagnosis of STEMI in the anterior (70% occlusion in LAD) and inferior (99% critical occlusion in RCA) with type 2 diabetes mellitus.

Percutaneous coronary intervention (PCI) was conducted at the middle right circumflex artery to expand the stenosis through plain old balloon angioplasty. The procedure installs a third-generation drug-eluting stent (the Ultimaster 3.5 mm diameter/24 mm length sirolimus eluting coronary stent) (Fig. 3B). The duration from arrival

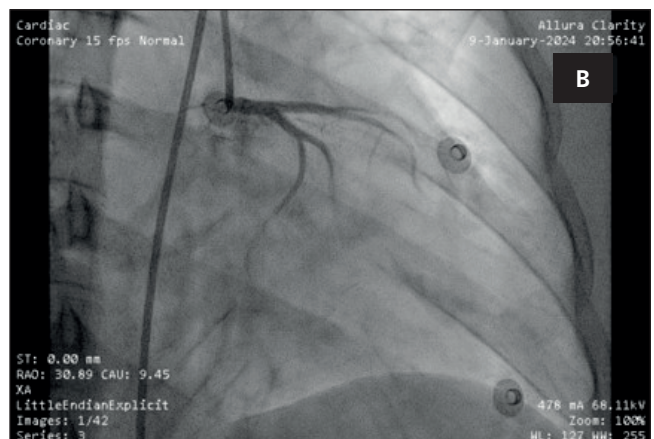
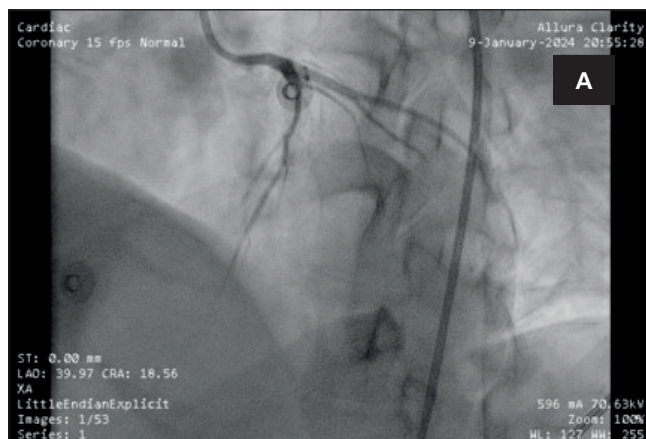
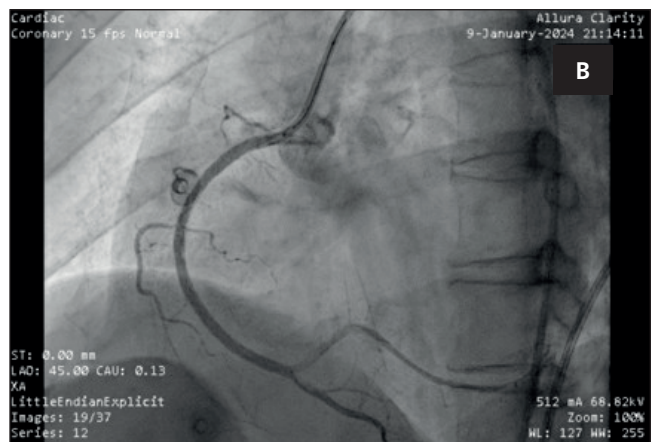
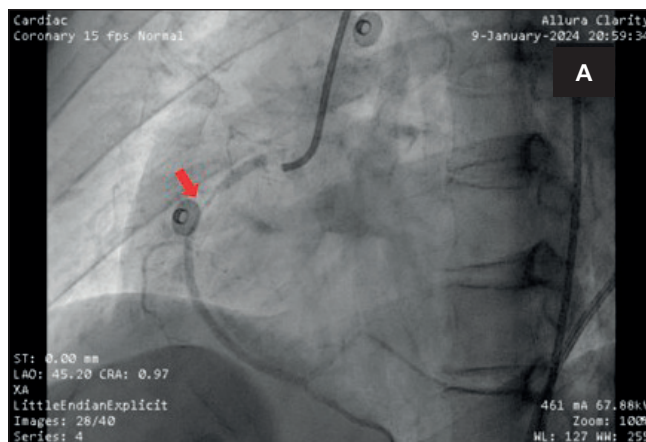


Fig. 3 – (A) An occlusion at mid RCA. Percutaneous coronary intervention (PCI) at mid RCA to expand the stenosis up to 0%. (B) Plain old balloon angioplasty procedure installed the third-generation drug eluting stent (the Ultimaster 3.5 mm diameter/24 mm length sirolimus eluting coronary stent). (C) The occlusion at prox-mid LAD was then scheduled for revascularization within 45 days after the first PCI. (D) The LCx was normal.

at our ED to coronary artery recanalization, or “door to balloon time”, was 2 h, and the duration from the onset of symptoms to coronary artery recanalization was 36 h and 50 min. The patient was stable after the procedure and started a routine of 100 mg of aspirin, 3.75 mg of prasugrel, 2.5 mg of bisoprolol fumarate, and 40 mg of atorvastatin 1 day after PCI. The patient also went to an endocrinologist for type 2 diabetes mellitus. And the patient was scheduled for revascularization of the prox-mid LAD within 45 days after the first PCI.

Discussion

We present the ST-elevation acute myocardial infarction cases in a young female with syncope presentation. Based on a large prospective study of AMI in young patients in India ($n = 1116$; maximum age of 30), 4.9% of cases were female and 2.3% reported syncope as a clinical presentation.³ A number of risk factors has been identified as being of particular importance in cases of acute myocardial infarction (AMI) in young females. Previous case reports have indicated that a combination of six risk factors is often present: obesity, hypertension, renal dysfunction, hyperuricemia, hypercholesterolemia, high LDL-C level, hypertriglyceridemia, and abnormal glucose tolerance, in addition to a family history of hypertension.² Of all the risk factors under consideration, familial hypercholesterolemia (FH) has been observed to be associated with an earlier age of onset for acute myocardial infarction (AMI).¹² Individuals diagnosed with familial hypercholesterolemia (FH) exhibit a twofold elevated risk of cardiovascular incidents in comparison to those not afflicted with this condition. The second most common and modifiable risk factor of acute myocardial infarction (AMI) in young patients is smoking.^{2,13} As indicated in other case reports of a young female patient in Indonesia, smoking was identified as a primary factor, in conjunction with a clinical history of type 2 diabetes and peripartum cardiomyopathy (PPCM).¹³ In this case report the patient has no history of FH nor diabetes, however, the patient has hypertriglyceridemia (262 mg/dL) and abnormal plasma glucose (516 mg/dL), with the possibility of type 2 diabetes mellitus.

The present literature suggests an increased risk of diabetes and hypertension in young adult females.¹⁴ In the case of CAD females, the age at which symptoms manifest is advanced relative to other demographics. Furthermore, a greater number of risk factors, including but not limited to type 2 diabetes mellitus, are present in this demographic.^{7,15} Patients diagnosed with type 2 diabetes have an increased likelihood of experiencing silent or unrecognised myocardial infarction (MI), irrespective of their sex. The presence of high fasting glucose levels, prediabetes, and type 2 diabetes has been demonstrated to enhance the probability of unrecognised MI.^{7,16} In addition to the previously mentioned poor recognition and less defined “atypical” in female chest pain,¹⁰ the challenges posed by AMI in young females in daily practice are attributable to a paucity of conducted evidence-based studies.

A coronary angiogram (CAG) showed a double-vessel occlusion at the middle right circumflex artery (RCA) and

middle left anterior descending coronary artery (LAD). Obstructive CAD presents the most common angiographic characteristic of AMI in young patients (80.6%), however, single-vessel occlusion at LAD was the most frequent condition reported (58.1%).³ Double vessel disease (DVD) presents a later chronic stage of CAD, which is rarely seen in young female patients. A previous study on angiographic characteristics in female patients shows a greater prevalence of DVD and triple-vessel disease (TVD) in the elderly group.¹¹ Previously mentioned large prospective cohort study in India stated only 6.4% of young AMI cases were double vessel, specifically in LAD and RCA as the most common location.³ We failed to gain the history of previous chest pain symptoms, however, based on these findings, there is a possibility that the patient had experienced similar symptoms before. Multiple-vessel disease increases the risk of a fall in systemic blood pressure (BP) resulting in a decrease in global cerebral blood flow, which is in line with this patient syncope presentation.¹⁷ Diabetes, obesity, and dyslipidemia were the risk factors mentioned for DVD.¹¹

Percutaneous coronary intervention (PCI) was conducted at RCA as the most critical occlusion site (99%). PCI is still the most warranted treatment for obstructive CAD with multi-vessel occlusion, as it decreases the readmission risk in AMI.⁷ The likelihood of readmission in young patients was higher for women and for patients who had a prior AMI, increased depressive symptoms, longer inpatient stay, or diabetes. Several readmission predictors were reported to be psychosocial characteristics, rather than AMI severity markers.¹⁵ percutaneous coronary intervention for the other significant lesion, in this case at proximal-mid LAD, can be done either during the index PCI or later within 45 days to achieve complete revascularization.¹⁷ Patients with a young age coronary incident have a strikingly high long-term prognosis of repeat occurrences in later life. Approximately 65% of the 165 young patients with ACS who underwent PCI at a young age and had a long-term mean follow-up of 9.1 ± 4.6 years experienced at least one endpoint of mortality or significant CV event, according to recent studies.¹⁸ One of the most important factors in preventing the young patient's subsequent CV event is early intervention, which focuses on treating hypertension, changing lifestyle habits, and receiving the best medical care possible.

As a study limitation, this case report constitutes a solitary instance of a young female patient with an uncertain clinical and family history. Consequently, the actual situation and nature of the disease may deviate from the outcomes of the literature review, owing to the presence of reporting bias. Moreover, a biopsy on the occlusion was not conducted in this particular case report.

Conclusion

We present the ST-elevation acute myocardial infarction cases with double-vessel disease in a young female. Type 2 diabetes was identified as a contributing risk factor for the patient. A comprehensive medical history, encompassing both familial and personal diseases, is imperative in order to elucidate the underlying causes of AMI in early-aged individuals.

Conflict of interest

The authors declare no competing interests.

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The authors declare that no financial resources were obtained during the preparation of this manuscript.

Ethical statement and consent to participate

The subjects provided proper informed consent to participate in the study.

Consent for publication

The patient has given informed consent for the case details and any associated medical images to be published in this case report.

Data availability

No datasets were generated or analyzed during the current study.

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