



Acute Myocardial Infarction Due to Dissection of the Coronary Arteries Associated with Premature Atherosclerosis in Late Postpartum: A Case Report of Maternal Death

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Abstract

Introduction: Atherosclerotic coronary artery disease is the most common form of heart disease that is associated with high rates of acute myocardial infarction (AMI) and death in young people.

Methods: Given the importance of pregnancy and the postpartum period and the fact that AMI is associated with poor maternal outcomes in postpartum, the present study reports acute myocardial infarction due to dissection of the coronary arteries associated with premature atherosclerosis in late postpartum.

Results: The case was the maternal death of a 34-year-old woman at 42 days postpartum without any history of underlying diseases or symptoms, whose autopsy report read AMI due to coronary artery dissection associated with atherosclerosis.

Conclusions: This report emphasizes the importance of postpartum care and attention to any symptoms witnessed during this period.

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INTRODUCTION

Premature Coronary Artery Disease (PCAD) is a condition that has often occurred in women under the age of 55 and as premature Myocardial Infarction (MI) in recent years [1]. Acute Myocardial Infarction (AMI) is one of the most common diseases in developing countries [2]. AMI may occur at any stage of pregnancy, as 22% of the pregnancy-related AMI cases occur during pregnancy itself, and the rest (i.e. 78%) occur from 10 to 12 weeks postpartum, with the peak incidence being during the first 2 weeks postpartum [3, 4]. The characterization of the coronary arteries after autopsy or

angiography during pregnancy and the postpartum period has shown that 40% of the patients with pregnancy-related AMI have had atherosclerosis with or without intracoronary thrombosis, while there has been no evidence of atherosclerosis in only 8% of the cases [4].

Atherosclerosis is a common phenomenon that begins in childhood and progresses to adulthood, forming a lesion that leads to CAD. This preclinical lesion is associated with CAD risk factors in young people [5, 6]. The accumulation of lipids in the walls of the arteries

leads to the formation of atherosclerotic plaques [7], which become protruding in the vascular lumen and create an stenosis, weakening the underlying media [5]. Most patients remain asymptomatic and the condition acts as a silent disease in them [8]. In some cases, however, atherosclerosis may cause dissection of the intima after plaque rupture or vasospasm [9].

The most common symptom of AMI is chest pain, which may radiate to the shoulders, arms, back, neck, or the jaw [2, 10]. More than two-thirds of the patients do not have any history of chest pain, and if any, symptoms of angina have manifested only one week before the occurrence of MI [11]. The risk factors of the development and progression of the premature atherosclerotic cardiovascular disease include hypertension, hyperlipidemia, diabetes, smoking, obesity, sedentary lifestyle, family history of premature heart disease, inflammatory systemic diseases, substance abuse, and pregnancy-related conditions [12]. Diseases such as hypothyroidism, systemic lupus erythematosus, rheumatoid arthritis, HIV that requires undergoing Highly Active Antiretroviral Therapy (HAART), especially with protease inhibitors, and homocysteinemia have also been found to be associated with accelerated atherosclerosis [13]. The diagnostic criteria for AMI in pregnant or postpartum women are generally the same as in non-pregnant patients and primarily include symptoms, electrocardiographic changes, and increased cardiac biomarkers. The evidence-based treatment of these patients is difficult due to the insufficient data available from randomized controlled trials [14].

Pregnancy is a stressful experience, and pregnancy-related complications such as gestational diabetes, high blood pressure disorders such as gestational hypertension, pre-eclampsia and eclampsia, placental abruption, and premature labor are prognostic factors of premature atherosclerotic cardiovascular disease in the future [15, 16]. Some studies have also proposed that factors such as mental health, sleep quality, and socioeconomic status are associated with the early onset of atherosclerotic cardiovascular disease [17-19].

Young people, especially young women, may not be aware of their CVD risk factors and are less likely to discuss modifying their lifestyle or primary prevention with healthcare providers [20, 21]. Pregnancy and maternal mortality are considered important due to the complications of this period, but the postpartum period should not be neglected either. Statistics in 2018 show that about 69% of all maternal deaths have occurred in the postpartum period and only 23% of these deaths have occurred during the pregnancy [22]. Given the importance of the postpartum period and the need to reduce maternal deaths, it is crucial that mothers' health be carefully monitored during this period. This is a report on a case of maternal death in the postpartum period due to AMI caused by coronary artery dissection

with premature atherosclerosis that emphasize the importance of postpartum care for reducing maternal deaths.

METHODS

The patient was a 34-year-old female G2P2L2, resident of Kashan, Iran, who was in day 42 postpartum. The termination of pregnancy had been performed at week 39 of gestation with the vaginal delivery of a boy weighing 3600 g without any complications. The first delivery had been a vaginal delivery four years before, resulting in a healthy girl. The first pregnancy hadn't history of preeclampsia, GDM, GHTN. During the present pregnancy, the patient had received care measures nine times in the private sector by a gynecologist, and she had also received full prenatal care at a comprehensive health service center. After the delivery, she had received care only once at a healthcare center. The mother was 178 cm tall, weighed 76.5 kg, and had no risk factors for atherosclerosis, trauma, heart disease and vascular collagen disease and had not used hormonal contraception. Her lipid profile had not been checked before or after the pregnancy. During the pregnancy, her systolic blood pressure was 100/60 mmHg. She had no history of high blood pressure in her pregnancy records. At the first postpartum visit on day 10, her blood pressure had been 120.85 mmHg. No other problems were recorded in her electronic health file. She had a history of hypothyroidism before the pregnancy but she has not been treated, and during the 8th week of gestation, her TSH was 4.16, for which she was administered 50 microgram levothyroxine per day. Her TSH was checked again at week 16 of gestation, and it had reached 1.95. TSH was not checked after childbirth and Levothyroxine was discontinued. Her blood platelet levels had gradually decreased during the pregnancy (from 155,000 to 136,000). There was no history of premature coronary artery disease or sudden death in her family. Surveying her family revealed that she had reported pain in her hand for only one day about one week before her death, which was not checked with a physician, and she never received her third postpartum visit.

On the day that she died, the patient had been alone at home with her children, and after she had fallen down unconscious on the floor, her daughter had informed a neighbor. Emergency services arrived about four minutes after they were called up on the phone. With the diagnosis of cardiorespiratory arrest by the emergency team, resuscitation was performed for half an hour. The patient was in asystole and was also cyanotic. She received two defibrillation shocks along with resuscitation, cardiac massage, and artificial respiration at home.

CPR continued for her in the ambulance during her transfer to the hospital. After the transfer, CPR

continued by an emergency medicine specialist, but she remained in asystole. Patient hadn't an electrocardiogram during resuscitation. CPR continued by the injection of adrenaline, amiodarone, magnesium, and bicarbonate, and artificial respiration continued with a bag valve mask, cardiac massage, and intubation. Three defibrillation shocks were given due to Pulseless Ventricular Tachycardia (VT). Finally, after CPR failed, the patient was died. The autopsy results were as follows: Left Anterior Descending artery (LAD) was relatively wiry and its walls had dissected into two layers and there was an atheromatous plaque between the two layers up to the terminal parts. Dissection extended to the aortic root.

RESULTS

In young people (less than 40 to 45 years old), Coronary Artery Disease (CAD) is described in two ways: (i) A limited vascular disease with a favorable outcome, or (ii) a widespread vascular involvement with faster progression of atherosclerosis (8). Autopsies have shown that about 50% of young people with MI have atherosclerosis. Atherosclerosis is a common phenomenon with different prevalence rates in different ethnicities. It begins in childhood and progresses in adulthood, causing lesions leading to CAD, including AMI and ischemic heart disease [23]. The dissection of the coronary artery could be secondary to atherosclerosis after plaque rupture or vasospasm [24]. Dissection usually occurs in the tunica intima in the coronary arteries. Blood penetrates the ruptured area and leads to intramuscular hematoma inside the false lumen in the tunica media and separation of the arterial wall. The compression of the true lumen leads to ischemia, decreased blood flow, and myocardial infarction [25, 26]. Although spontaneous coronary dissection can occur in the absence of common risk factors of atherosclerosis, it most commonly occurs in the presence of atherosclerotic plaque or in patients with hypertension due to the increased risk of damage to the arterial wall [27, 28].

In the case reported in this study, dissection occurred in LAD in the presence of atherosclerotic plaque, followed by AMI on day 42 postpartum. Celik et al. (2001) reported in their review study that some features of spontaneous primary coronary artery dissection are: 75% of the cases are female; women in the peripartum period account for a third of the affected population; the disease is one affecting young people, with an average age of onset of 35 years; clinical manifestations are related to the extent and location of arterial dissection; and dissection can occur in any coronary artery, although it is more prevalent in LAD in women, and the mortality rate is also higher in this group [29]. Coronary atherosclerosis appears to be more prevalent in the left coronary artery system, especially in the proximal

portions, compared to the right side. Histopathological data of the heart have reported hypersensitivity of the Left Coronary Artery (LCA), especially the LAD, to atherosclerosis [30].

There was no symptom of CAD or AMI incidence in the reported case. A study by Vaideeswar et al. (2019) in India on 14 patients under the age of 30 years found that all the patients had atherosclerosis in their LAD. There were two cases similar to the reported case, who had sudden death without any previous symptoms; the rest of the cases had reported chest pain [31].

DISCUSSION

The risk factors of CAD and atherosclerosis in middle-aged and older adults include diabetes mellitus, hypertension, smoking, and hypercholesterolemia, but these factors are less prevalent among young people, and factors such as insulin resistance, metabolic syndrome, psychosocial factors like stress, connective tissue disorders, and HIV infection may be more common in this age group [32-34]. None of these risk factors were found in the reported case, and her only known factor was hypothyroidism, which has been suggested to be associated with accelerated atherosclerosis in some studies. Arterial compliance reduces in hypothyroidism, resulting in increased systemic vascular resistance and increased diastolic blood pressure. Low levels of the thyroid hormone are accompanied by reduced LDL receptors in the liver, leading to their impaired secretion and hypercholesterolemia. Dyslipidemia and diastolic blood pressure make patients with hypothyroidism prone to accelerated atherosclerosis and CAD [35, 36]. The reported case had received only one postpartum visit, in which her blood pressure had slightly increased compared to during the pregnancy.

CONCLUSION

AMI due to atherosclerosis can occur at any time during pregnancy, labor, and postpartum, with poor maternal outcomes and high mortality rates. Given the cases mentioned in the current case report and since the disease has no symptoms in most cases, ignoring any symptoms, such as hand pain in this case, and neglecting postpartum visits, can be detrimental. The WHO has set a global goal to reduce maternal mortality by removing preventable deaths and has proposed that many countries should reduce their index figures by two-thirds by 2030 compared to 2010. According to the definition of the maternal mortality index, which includes pregnancy and the postpartum period, it is not enough to just pay attention to pregnancy and the symptoms that occur during this period; rather, reducing this mortality rate requires paying attention to the postpartum period and any symptoms emerging at this time too. Health personnel including midwife, nurse are thus recommended to further emphasize postpartum

care visits and the importance of following up on them and provide mothers with training on the importance of the postpartum period and postpartum care so as to prevent similar cases. Nurses and midwives involved in postpartum care should be aware of the illnesses that the person had during pregnancy and train the person to repeat the tests in the postpartum period so that treatment can continue if needed. Also, paying attention to changes in a woman's vital signs during this period can help nurses and midwives to identify danger cases earlier and include the necessary training to improve women's lifestyles in their care plan and training signs and symptoms of myocardial hypoxia including neck pain, shoulder or arm pain, a fast heartbeat, shortness of breath during activity, nausea and vomiting, sweating and fatigue.

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AUTHORS' CONTRIBUTIONS

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Contributed data or analysis tools: H.RM, A.M

Wrote the paper and editing: F. V, H.RM, S.N, A.M, F.F.

ETHICAL CONSIDERATION

This study has ethical approval from the ethics committee of Kashan University of medical sciences: IR.KAUMS.REC.1399.013

CONFLICT OF INTERESTS

Authors have no conflict of interests.

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