Case Report

Post-Preeclampsia Acute Myocardial Infarction during Puerperium in a Woman with Normal Coronary Vessels

Ageliki Skoura, Maria Michaelides, Athanasios Trikas

Department of Cardiology, "Helpis" General Hospital, Athens, Greece

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We describe the case of a young Iraqi woman with a clinical, electrocardiographical, and echocardiographical picture of acute myocardial infarction. After preeclampsia, a delivery by caesarean section, and without anticoagulant therapy, the patient presented with myocardial infarction, although coronary angiography was negative for coronary artery disease. The haematological exam showed the presence of the V Leiden factor, and in view of recurrent episodes of chest pain after her admission, she underwent chest computed tomography and bone mass measurement, which indicated a precocious stage of osteoporosis.

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Address:
Athanasios Trikas

52 Bizaniou St.
16673 Panorama Voulas
Athens, Greece
e-mail:
atrikas@otenet.gr

Acute myocardial infarction has been reported at any stage of pregnancy and during the puerperium period at ages between 16 and 45 years.[1] Pregnancy and the peripartum period are related to cardiovascular changes, and hypertensive disorders are the major cause of maternal and prenatal morbidity. Preeclampsia, known as gestational hypertension, pre-existing hypertension, pre-existing hypertension plus superimposed gestational hypertension with proteinuria, and antenatally unclassifiable hypertension, are the four main types of hypertension in pregnancy.[1-4] V Leiden as a thrombogenic factor has been associated with increased risk for myocardial ischaemic episodes.[5-8]

Case presentation

A young woman, 23 years old, of Iraqi origin, was admitted to our Emergency Cardiological Department with substernal chest pain over 24 hours, with reflection to the upper arms, neck and dorsum. She had also experienced sudor, a sense of weakness, dizziness, intensive headache, and profound fatigue. Her family history was positive for hyperlipidaemia.

In her personal past history, she reported an episode of loss of consciousness at the age of 8 years, with intense headache, but no pathological cause was identified. She also gave birth to a male child with Down syndrome, congenital heart disease, and thyroid disease, when she was 18 years old. At the age of 19 she reported the loss of a foetus during the sixth week of pregnancy. She also reported smoking and hyperlipidaemia.

One week before her admission to our department, she experienced intense chest pain with sudor and headache. Five days before her admission she had a caesarean section (during the 8th gestational month) because of preeclampsia. She reported blood pressure of 170/100 mmHg and she had proteinuria. Two days after the delivery she was discharged without anticoagulant therapy.

During the clinical examination the patient exhibited profound malaise, a sickly appearance, she was afebrile, with a

pathological blood pressure 230/140 mmHg, heart rate 96 beats/min, and no other abnormal finding on physical examination. The ECG showed sinus rhythm with ST elevation in the V_1-V_5 precordial leads (Figure 1). Blood tests showed abnormal elevation of cardiac enzymes (CK 605, TnI 8.98), while proteinuria (30 μg/dl) and urinary blood traces were observed.

The echocardiogram at her admission showed hypokinesis of the apex, whereas the transoesophageal ultrasound exam did not reveal pathological findings. The patient was admitted to the coronary care unit with the diagnosis of acute myocardial infarction and received complete anti-ischaemic treatment. On the third day of hospitalisation she had no symptoms, a normal ECG, and a peak troponin level of 11.57. On the eighth day, two episodes of chest pain were reported and new ECG abnormalities of ischaemia appeared in leads II, III, avF, and V_3-V_6. A new echocardiogram revealed hypokinesis of the apex, inferior and lateral wall. She underwent coronary angiography, which showed normal coronary vessels but low blood flow velocity.

The patient remained free of symptoms during the next days of her recovery. For further investigation, a complete haematological, biochemical and coagulative profile were evaluated. The results for the anti-phospholipidaemic antibody syndrome were negative.

After her discharge from our hospital the patient complained of chest pain while she was under treatment, without other pathological findings for an acute coronary syndrome. She also underwent endoscopy of the superior digestive system with normal findings, computed tomography scanning of her chest, which revealed osteoporosis (Figure 2), and bone mass measurement, which demonstrated osteoporosis with a 25% decrease of bone mass. Finally, a positive V Leiden factor was found, and all the endocrinological and metabolic diseases were excluded as causes of osteoporosis. The patient's origin, specifically her residence in a nuclear war zone from her birth until the age of 14 (Iraq-Kurdistan frontier) indicates new targets for further research.

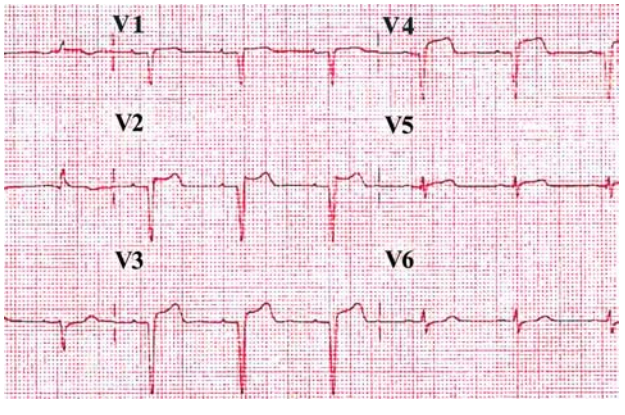

Figure 1. ST elevation in precordial leads V_1-V_5.

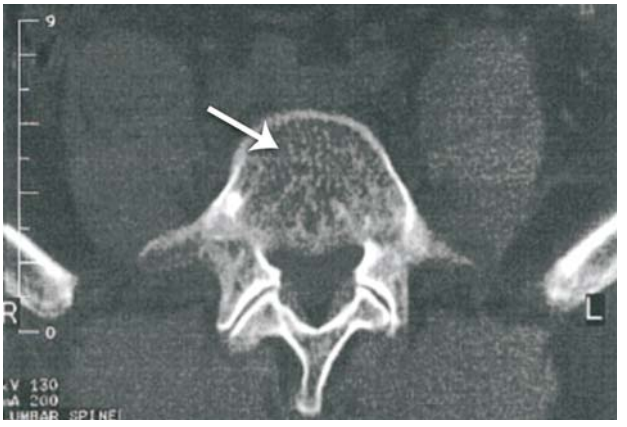

Figure 2. Osteoporosis of the 5th vertebra.

Discussion

Pregnancy is complicated by hypertension in 10% of cases. Of these, 70% present as eclampsia, and 30% as pre-existing hypertension. According to the recently published guidelines for hypertension, we can define four different forms of hypertension in pregnancy:

1. Pre-existing hypertension, which complicates 1-5% of pregnancies and is defined as blood pressure ≥140/90 mmHg that either predates pregnancy or develops before 20 weeks of gestation, usually persisting more than 42 days postpartum. It may be associated with proteinuria.
2. Gestational hypertension associated with significant proteinuria (>500 mg/24h) is known as preeclampsia. Hypertension develops after 20 weeks of gestation and, in most cases, it resolves within 42 days postpartum.
3. Pre-existing hypertension plus superimposed gestational hypertension with proteinuria. Pre-existing hypertension is associated with further worsening of blood pressure and a protein excretion rate ≥3 g/day in a 24-hour urine collection after 20 weeks of gestation. It corresponds to the previous definition of chronic hypertension with superimposed preeclampsia.
4. Antenatally unclassifiable hypertension. Hypertension with or without systemic manifestations

based on blood pressure measurements after 20 weeks of gestation with no confirmation of previous values. Under these circumstances reassessment is necessary at or after 42 days postpartum. If hypertension is resolved, the condition should be reclassified as gestational hypertension with or without proteinuria. If hypertension is not resolved, the condition should be reclassified as pre-existing hypertension.

Chronic hypertension can be complicated by preeclampsia in 15-30% of cases.[1-3] This situation is classified as gestational hypertension and is defined by an increase of systolic blood pressure by 30 mmHg and of diastolic pressure by 15 mmHg, while albuminuria and oedema appear. This is a common complication of pregnancy, with a high average of maternal, foetal, and infant morbidity and mortality. The main symptoms are hypertension, oedema, albuminuria, and excitability of the central nervous system. The presence of spastic and tonic convulsions on top of hypertension is defined as eclampsia.[2] Preeclampsia is a placental disease, with secondary functional changes in many systems and organs. It is accompanied by an abnormal response of the immune system and is characterised by the following:

- aberration of the penetration of the trophoblast in the spiral arteries, which continue to have a structure similar to the vessels of a non-pregnant woman, arteries without diastolic function;
- occlusion of many vessels by fibrinogen clots with an atheromatosis complexion;
- increased production of oxygen radicals, mainly by the lymphatic tissue of the deciduas.

In this situation vasoconstriction is observed (inactivation of the endothelial factor EDRF, activation of cyclooxygenase, inhibition of the prostacyclin PCI_2, and of the thromboxane TXA_2), as well as microvascular thrombosis (activation of the platelets and serotonin release).[1-6] Recent published data report the existence of a tyrosine kinase-like protein (sFlt-1), which binds and inactivates factors such as endothelial growth factor and placental growth factor, inhibiting both angiogenesis and renal arteriolar vasodilatation.[7] Coronary artery disease and acute myocardial infarction during pregnancy are rare, and are associated with multiple risk factors for atherosclerosis, such as smoking, diabetes mellitus, hypertension, hypercholesterolaemia, use of contraceptives, gestational toxaemia, youth (<20 years), and chronic menstrual abnormalities. The mechanisms leading to acute myocardial infarction during the puerperium include: 1) constriction or thrombosis of the coronary vessels; 2) arterial dissection, of the left anterior descending artery in 80% of cases and of the right coronary artery in the remainder; 3) collagen diseases; 4) Kawasaki disease; 5) sickle cell anaemia; and 6) phaeochromocytoma.[7-10] Acute myocardial infarction during the puerperium is accompanied by normal coronary angiographic findings.[10] The incidence of acute myocardial infarction has been determined to range from 1 in 10,000 to 1 in 30,000 pregnancies.[11]

In the present case the normal coronary findings, with a low blood flow velocity, can be explained mainly by the diffused contraction of the vessels rather than the atheromatosis condition, because of the preexisting preeclampsia and the patient's young age.

The V Leiden factor, as a phenotype of a mutant gene, expresses hereditary resistance to activated protein C and is the most common thrombogenic cause. The mutation of the V factor, probably because of thrombosis of the placental vessels, causes unexplained miscarriages and other gestational complications.[12-15] Available data suggest a large increase in the risk of preeclampsia in women carrying the factor V Leiden mutation. Dizon et al[16] found heterozygous factor V Leiden in 8.9% of women with severe preeclampsia compared with 4.2% of normotensive controls. According to a 2000 study, of 120 women with preeclampsia 18% were carriers of the mutated gene for the V Leiden factor, compared to 3% of healthy controls.[17] In our case, the V Leiden factor, preeclampsia, vasoconstriction, absence of anticoagulation therapy after delivery, as well as risk factors such as smoking and hyperlipidaemia, could have prompted the myocardial infarction.[15-18] Deficient intravascular production of prostacyclin, rather than the release of thromboxane, a platelet-derived vasoconstrictor, are observations that led to the hypothesis that antiplatelet agents, i.e. low dose aspirin (<75 mg), could be useful for primary and secondary prevention.[19] There are no clear data concerning the benefits of low molecular weight heparin in preeclampsia.[20-21]

Further investigation of the patient would be of particular interest, since this young woman was brought up in a strongly radioactively and chemically contaminated environment that could have caused the abnormalities of her first pregnancy as well as her premature osteoporosis, since she had no other pathogenic factors. It is well known that minerals such as cadmium, copper, and lead are unfortunately used in war zones and, by acting as mutational factors in dif-

ferent organs and systems, can evoke various and serious diseases, including osteoporosis. To conclude, we can cite the example of the veteran warriors who participated in the Gulf War (1991), who developed neurological, gastrointestinal, immune, hormonal, and haematological disorders collectively known as the "Gulf War Syndrome", and gave birth to children with chromosomal abnormalities.[22]

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