Myocardial infarction in pregnancy – a review article with a case report

Miokardni infarkt v nosečnosti – pregledni članek s prikazom primera

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Ključne besede:
nosečnost; disekcija koronarne arterije; antiagregacijsko zdravljenje; carski rez; anevrizma konice levega prekata

Key words:
pregnancy; coronary artery dissection; antiplatelet therapy; caesarean section; left ventricular apical aneurism

Citirajte kot/Cite as:
Zdrav Vestn. 2016; 85: 180–85

Prispelo: 5. feb. 2014,
Sprejeto: 31. mar. 2016

Izvleček

Akutni miokardni infarkt med nosečnostjo je redek dogodek. Ob staranju nosečnic se njegova pojavnost zadnja leta veča, tudi na račun več dejavnikov tveganja. Pri nosečnicah je prisotna tudi večja pojavnost spontane disekcije koronarne arterije. Glavna diagnostična preiskava je koronarna angiografija, pri kateri se poskuša doseči čimprejšnja reperfuzija, zgolj bodisi z balonsko razširitvijo, bodisi s postavitvijo žilne opornice. Porod naj se odloži za vsaj 2–3 tedne, glede na nove smernice se priporoča vaginalni porod. Predstavljamo 29-letno nosečnico, ki je utrpela subakutni miokardni infarkt. Kljub takojšnjemu in ustreznemu zdravljenju smo, ob poznem prihodu bolnice, ugotavljali apikalno anevrizmo levega prekata. Zaradi pogostih motenj ritma med opazovanjem je bil opravljen carski rez.

Abstract

Acute myocardial infarction during pregnancy is a relatively rare complication; due to the advanced age of pregnant women its incidence is increasing. Nowadays, pregnant women also have more major coronary heart disease risk factors. A higher incidence of spontaneous dissections of coronary arteries has also been described in pregnancy. The diagnostic procedure of choice is coronary angiography where immediate reperfusion should be achieved–either by balloon angioplasty alone or by coronary stent implantation. Delivery should be postponed for 2–3 weeks, and according to new guidelines vaginal delivery should be considered. We present a 29-year-old pregnant woman who sustained a myocardial infarction. Even though treatment has been optimal, we have, due to presentation, noted apical aneurysm of the left ventricle. Because of subsequent heart rhythm disturbances a caesarean delivery was performed.

Introduction

The incidence of acute myocardial infarction (AMI) has been reported to be from 3–10 cases per 100,000 pregnancies.[1,2] A retrospective research, performed in the United States of America, has shown the estimated incidence to be 6.2 per 100,000 pregnancies.[3] Even though AMI is shown to be a rare occurrence during pregnancy, it presents a serious condition as it can lead to a devastating outcome for the mother as well as for the foetus. Due to earlier recognition of AMI and advances in percutaneous coronary interventions (PCI) the mortality has dropped from a former estimate of 21–37% to around 5%.[3,4] There are no clinical trials on management of myocardial infarction in pregnant women, just case reports.[5-7]

Pregnancy itself does not pose a risk for AMI, but is associated with increased metabolic requirements of the mother to meet the demands of the developing foetus. Hemodynamic changes, i.e. a higher total volume of blood in the circulation, heart rate and heart muscle contractility occur, and additionally, concentrations of estrogens and progesterone are significantly elevated.[8] It is known that oral estrogens and gestagens are related with a higher risk for increased blood clotting and cardio-vascular morbidity.[9] An additional cause for higher incidence of AMI during pregnancy could also be the aging of pregnant women, which are found to have more major coronary heart disease risk factors (i.e. smoking, hypetension, hyperlipidemia, diabetes mellitus, …).[10] A higher incidence of spontaneous coronary artery dissection has also been reported in pregnant women. It is presumed to be the consequence of higher levels of progesterone and its impact on the collagen structure of the vessel wall.[2]

The diagnosis of AMI during pregnancy is based on the patient's history, significant changes in electrocardiogram (ECG), echocardiography and the level of serum troponin. The examination of choice in AMI is coronary angiography due to the possibility of an immediate intervention after identifying a possible culprit lesion. The main drawback of the investigation is foetal exposure to irradiation, dosage of which can be significantly reduced by appropriate shielding of the abdomen of a pregnant woman.[11] The most important approach to treatment is to establish myocardial reperfusion as soon as possible, either by balloon dilatation alone or by coronary stent implantation. With the latter, a thorough consideration is required, as a drug-eluting stent implantation requires a year of double antiplatelet therapy; a bare-metal stent (BMS) requires only one month of double antiplatelet therapy, which is followed by lifelong therapy with acetylsalicylic acid.[12] Due to the higher number of caesarean sections in pregnant women with AMI, contraindications for epidural anaesthesia in double antiplatelet therapy and a higher risk for important haemorrhage, the use of bare metal stents is advised.[13-15] Thrombolytic therapy, due to a higher risk of haemorrhage, is used only when coronary angiography is unavailable.[15] Immediate need for surgical revascularization is rare. It is performed in pregnant women, where primary coronary intervention was not successful or it led to a coronary artery dissection that could not be solved percutaneously.[14,15]

According to general guidelines for the management of acute myocardial infarction, drug treatment should be started immediately after AMI, i.e. ACE inhibitors, beta-adrenergic receptor blockers, calcium channel inhibitors, statins and antiplatelet therapy.[12] But in pregnant women, due to their teratogenic effects on foetus, many drugs are contraindicated, especially ACE inhibitors and statins. They should be added to therapy only after the delivery. Acetylsalicylic acid and thyenopiridines, especially clopidogrel, have shown to be relatively safe drugs during pregnancy, even though randomised studies have not been performed.[16] Due to excretion of these drugs with milk, lactation is discouraged.[16,17]

Delivery is advised only 2–3 weeks after the event. The method of labour is chosen after careful consideration by a team of cardiologist, perinatologist and obstetrician, taking the pregnant woman's health condition in account. Caesarean section has been a suggested method of labour for some time.[18] New guidelines however suggest vaginal labour due to lower blood loss and lower risk for infection. Caesarean section is also as-

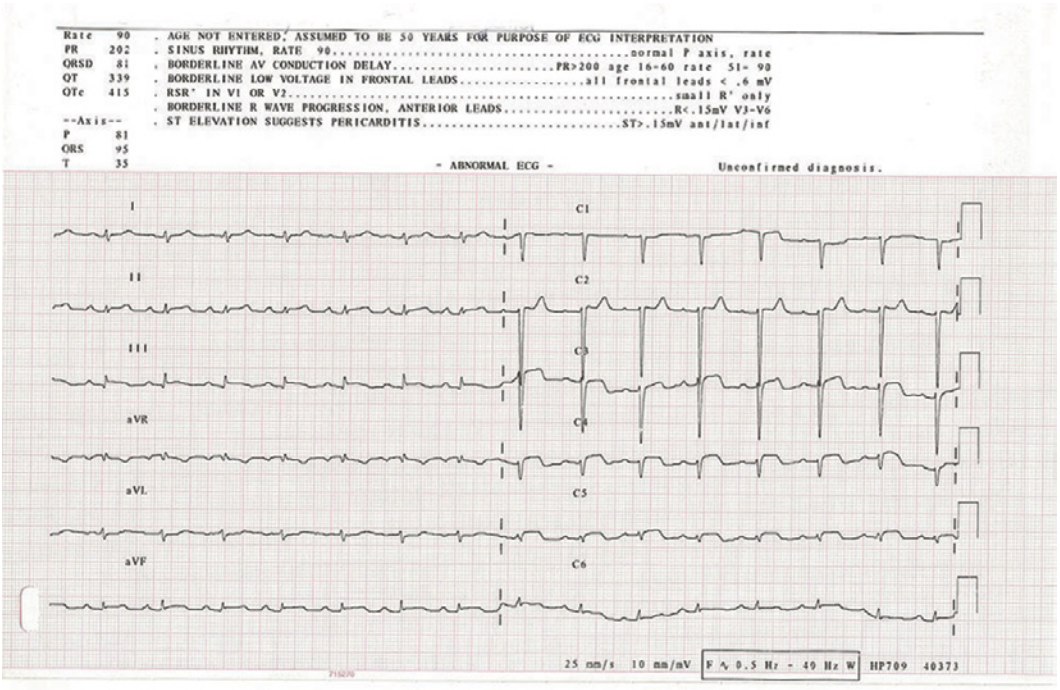


Figure 1: Electrocardiogram showed an elevation of the ST segment in the inferior (II, III, aVF), part of anterior (V3, 4) and lateral wall (V5) leads.

sociated with greater risk for deep venous thrombosis and thrombembolism.[19] In order to decrease pain during vaginal labour and subsequent blood pressure and heart rate variations, adequate analgesia should be considered. Misoprostol, dinoproston and oxytocin for labour induction should be avoided, as they may lead to coronary artery spasms and heart rhythm disturbances; hypotension is possible as well.[15,19,20]

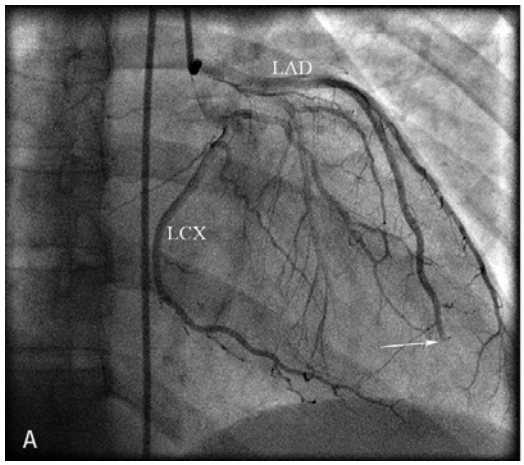
We present a case of a 29-year-old pregnant woman, who suffered from acute transmural myocardial infarction in 32nd week of gestation.

A case report

A 29-year-old pregnant woman in the 32nd week of gestation, healthy until the event, acknowledged pain in her left upper limb during moderate exercise a day prior to hospitalization. She felt nausea, soon after which she reported pain in between her shoulder blades. In the night she was awoken again by pain, she has tried to diminish it with paracetamol, which did not help. In the morning hours she became dyspneic, pain has increased to almost unbearable level, so she visited the emergency department. Up until the event she was healthy with no medical therapy. Two pregnancies in the past have ended with spontaneous abortion; no specific cause has been dianosed, antiphosholipid syndrome has been ruled out. The current pregnancy was regularly followed and uneventful.

Upon physical examination she suffered from pain, was tachypnoic and hypotensive (blood pressure of 80/50 mmHg), otherwise no pathological findings, taking in consideration the 32nd week of gestation, were noted. ECG has shown ST segment elevation in the inferior, anterior and lateral leads (Figure 1). Serum Troponin I Ultra levels were markedly elevated, with peak of 23.8 µg/L, which is approximately 300-times higher than in healthy individuals (normal range is below 0.1 µg/L) .

Immediately after admission she received standard heparin and acetylsalicylic acid intravenously. In the first hour after hospitalisation urgent coronary angiography was performed with appropriate anti-radiation protection of the pregnant woman's abdomen. The inve-



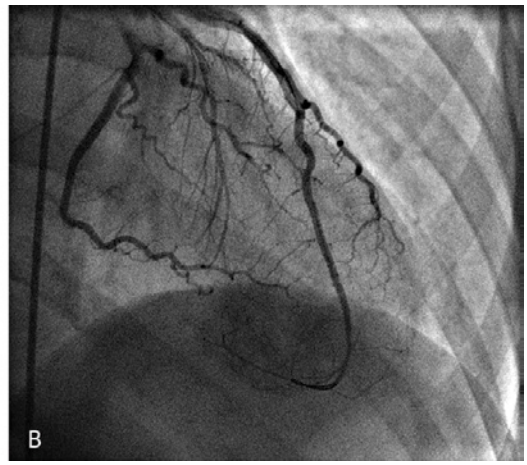


Figure 2a: During angiography a most probable thrombotic occlusion of the left anterior descending coronary artery was visible. LAD – left anterior descending coronary artery, LCX – left circumflex artery, arrow – location of a thrombotic occlusion on LAD.

Figure 2b: After successful percutaneous coronary intervention with placement of two bare-metal stents, no angiographically visible stenosis was noted.

stigation has shown a probable thrombotic occlusion of the distal third of the left anterior descending (LAD) coronary artery (Figure 2a). After aspiration of white thrombus, a balloon dilatation of LAD has been performed. After the procedure, a residual stenosis and a minor dissection of the coronary artery were noted. The interventional cardiologist treated them successfully with two BMS. Angiography showed a fast flow through the stented site, without signs for residual stenosis afterwards (Figure 2b).

The day after admission, the patient has already been asymptomatic, she began her rehabilitation after myocardial infarction. Echocardiography showed hypokinesia of the apical part of the left ventricle, interventricular septum and anterior wall, due to which the left ventricle ejection function was decreased to 45%. There were no heart valve and pericardium disorders.

Clopidogrel and beta adrenergic receptor blocker were added to the therapy that she was already receiving (acetylsalicylic acid). During hospitalization she was receiving low molecular weight heparin at a prophylactic dose.

Due to our suspicion of coagulation disorders, tests for thrombophilia were performed, but showed only a slightly elevated titre of s-ANA (serum antinuclear antibodies), which is not significant during pregnancy. Paradoxical embolism could theoretically also be possible. Foetal status was regularly checked by perinatologists, and no unusual findings were reported.

Further echocardiographic examinations showed major improvement in left ventricle ejection fraction to 65%, but we noted aneurysmatic transformation of the left ventricular apex (Figure 3).

Our patient was constantly monitored, and high occurrence of ventricular ectopic beats was observed, often in form of bigeminus, once also in a salve of four ventricular premature beats.

Twenty-eight days after the myocardial infarction clopidogrel was discontinued and five days later gynaecologists performed elective caesarean section under general anaesthesia, without complications. A healthy girl was delivered (body weight 2850 g, length 48 cm, Apgar score 9, 10). Due to left ventricular apical aneurysm formation and heart rhythm disturbances caesarean section was chosen as method of delivery.

After delivery, clopidogrel, statin, ACE inhibitor and spironolactone were added to the therapy which she had already been receiving (acetylsalicylic acid, beta adrenergic receptor blocker). Four weeks after delivery, transesophageal echocardiography was performed and interatrial septal defect or patent foramen ovale were ruled out.

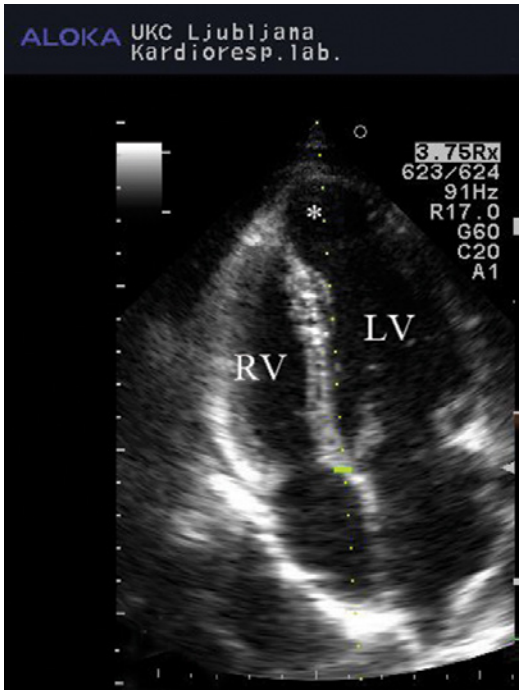


Figure 3: Echocardiographic examination, apical four-chamber view shows aneurysmatic transformation of the left ventricular apex. *– aneurysm of the apex, LV – left ventricle, RV – right ventricle.

The patient did not present with heart failure during the treatment (NT pro-BNP (N-terminal pro-B-type natriuretic peptide) value was 388 ng/L). The patient and newborn were discharged home two weeks after caesarean section and six weeks after AMI in a good condition. Due to possible excretion of drugs into milk lactation was discouraged.

Twelve weeks after discharge the patient was free of heart failure, chest pain and arrhythmias. The echocardiography did not show any increase in apical aneurysm and the left ventricular ejection fraction remained within normal limits. The tests for trombophilia and s-ANA values three months after delivery are within normal limits. Up-to-date, the early follow-up of the patient is uneventful and no further procedures have been indicated.

Conclusion

Acute myocardial infarction during pregnancy is a rare disorder and consequently it is inadequately recognized. The reason for AMI in pregnancy is often related to higher age of pregnant women, who also have more coronary artery disease risk factors. The incidence of spontaneous coronary artery dissection due to the impact of higher levels of progesterone on the vessel wall is also significantly higher in pregnant women.

The treatment of AMI in pregnant women is similar to that in general population; reperfusion should be achieved as soon as possible; transfer to a center with 24-hour access to coronary angiography should be performed immediately. During coronarography, additional shielding of the pregnant woman's abdomen is advised. Bare-metal stent implantation should be considered due to the need for only 4-week double antiplatelet therapy.

After AMI, medical treatment according to the guidelines should be started, i.e. beta blockers and antiagregation therapy. Acetylsalicylic acid and clopidogrel have been shown to be safe throughout pregnancy. ACE inhibitors, mineralocorticoid inhibitors and statins can be introduced only after delivery. Due to excretion of drugs in milk, lactation should be discouraged. New guidelines recommend vaginal delivery as the preferred method of delivery.

As we have shown in our case report, the patients often present too late, which leads to a greater damage of the heart muscle. In spite of immediate PCI intervention on the LAD artery, the aneurysm of the left ventricular apex developed. The implantation of BMS has definitely been a good decision which enabled us to discontinue double antiplatelet therapy during delivery. The exact aetiology of myocardial infarction has not been identified. Our patient was young, without any risk factors for atherosclerosis. Blood coagulation disorders have been ruled out. The patent foramen ovale and atrial septal defect as a mechanism of paradoxical embolism have been ruled out, too. We could come closer with intraco-

ronary ultrasound during PCI, but we did not decide to perform it in the acute phase as the treatment would not have been changed. Because of the left ventricular apical aneurysm and heart rhythm disorders we decided for caesarean delivery instead of proposed vaginal delivery.

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