Acute Coronary Syndrome with ST-segment Elevation in Pregnancy: Anesthetic Management of Delivery

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ABSTRACT

Acute coronary syndrome (ACS) during pregnancy is rare but may be associated with high risk complications. Approximately 150 myocardial infarctions (MI) during pregnancy have been documented in literature worldwide, but we didn't find one with myocardial aneurysm. We describe 2 patients with acute MI; both with ST segment elevation (STEMI), 1 case complicated with heart failure, formation of a myocardial aneurysm and broad QRS arrhythmia; another with uncomplicated course, and their anesthetic management during delivery. Acute MI is rare in reproductive age usually developing in women with cardiovascular risk factors. There is concern about its rising incidence due to the increase of average maternal age. Our cases show that there might be some undiscovered risk factors for pregnancy related myocardial infarction.

Key words: *acute coronary syndrome, STEMI, myocardial infarction, pregnancy, delivery, anesthesia*

Introduction

Myocardial infarction (MI) during pregnancy is rare but is often associated with significant maternal mortality. Approximately 150 MI during pregnancy have been documented worldwide[1]. The reported incidence varied from 0.6 to 1 cases per 10,000 deliveries. Maternal mortality after MI vary from 5.1 to 37%. Pregnancy has been reported to increase the risk of MI by 3–4 times[2,3]. Acute MI occurs more commonly in multigravida and women older than 30 years of age. Delivery within 2 weeks of the infarct is also associated with s poorer maternal prognosis owing to the increased myocardial demand during labor or surgery.

We present 2 patients with acute coronary syndrome (ACS) during gestation, both with ST-segment elevation (STEMI), one with severe complications, another with uncomplicated course, and different anesthetic and obstetrician management of delivery according to the clinical status of a patient.

Case Report

Case 1

A 32-year-old healthy nulipara at 20 weeks of gestation presented to an outlying hospital with chest pain. She described resting substernal chest pain with weakness, shortness of breath and radiation back between shoulders. On arrival at the emergency department her electrocardiogram (ECG) showed normal sinus rhythm with ST-elevation in leads V2–V6, I and aVL; her blood pressure (BP) was 90/60 mm Hg. She had been followed up by her obstetrician and had no history of hypertension, hyperlipidemia or diabetes before or during pregnancy. She is non smoker. Her body mass index (BMI) was 23.87 kg/m² at time of this event. Her family history is free for cardiovascular diseases. She only had a partial removal of an endocervical polyp a month before presentation in an outlying clinic. Her first troponin T was positive (50.33 ng/ml; normal range is below 0.2 ng/ml). Transthoracic (TTE) and transesophageal (TEE, done with all due precautions) echocardiography excluded aortic dissection. TTE revealed hypokinesia of interventricular septum, front wall and apex of a heart. She was transferred to the cardiac intensive care unit (ICU). Cardiac catheterization with possible intervention was performed and demonstrated 100% occlusion of left anterior descending (LAD) coronary artery, but intervention was unsecsesfull because the wire couldn't pass the dissected part of a vessell. Special precautions were taken during the procedure to protect the fetus, such as

draping the maternal abdomen with a lead shield and performing continuous electronic fetal monitoring. The procedure was otherwise unaltered to accommodate the pregnancy. Cardiac surgeon was consulted and recomended conservative treatment rather than high risk coronary artery bypass grafting (CABG) surgery because of advanced pregnancy. After the procedure, the patient was placed on unfractionated heparin, glycoprotein inhibitor, clopidogrel, aspirin and bisoprolol. Immediately after catheterisation, she had multiple episodes of spontaneously resolving nonsustained ventricular tachycardia and heart failure. When stable, she was transferred to the antepartum unit for continued observation. Serial TTEs reveled thin hypokinetic to akinetic interventricular septum with anteroapicoseptal myocardial aneurysm and reduced ejection fraction of left ventricle (EF LV) 41%. The patient was discharged on clopidogrel 75 mg daily, aspirin 100 mg daily and ß-blockade with bisoprolol 2.5 mg daily, with advice to do an elective cesarean section delivery under general anesthesia to avoid stress responses due to the vaginal childbirth and hypotension after regional anesthesia because of a reduced EF LV of 41% and myocardial aneurysm (see figure 1.). After 7 days period of discontinution

of clopidogrel and aspirin, bridged with low molecular weight heparin (LMWH) subcutaneously (sc), an elective cesarean section was indicated by an obstetrition at 38 weeks and 1 day of gestation. Patient was premedicated with 10 mg metroclopramid intravenous (iv) an hour before surgery. After placing an arterial line for invasive blood pressure monitoring, induction was made with 1 µg/kg of fentanyl, 0.3 mg of etomidate and 1 mg/kg of rocuronium. Maintenance was done with 1 MAC of sevoflurane in gas mixure of oxygen and nitrous oxide until the umbilical cord was cut, sevoflurane was discontinued. Ten minutes after intubation, a 3.520 g baby was born with Apgar scores of 10 and 10 (arterial cord gas showed pH 7.27). After that 5 mg of midazolam, 1 µg/kg fentanyl, 5 international units (IU) of oxytocin (as the obstetrician requested) in bolus and 15 IU in slow intravenous infusion were added. During anesthesia she was hemodynamically stable with her sistolic BP kept between 109–128, diastolic BP between 60–80 mmHg and heart rate from 70–86 bpm. She was awoken and extubated in the operating theatre and then transferred to ICU for further hemodynamic monitoring and evaluation. Her medical regimen included oxygen, LWWH sc, ß-blockade and analgesia. On the fourth day postpartum she was transferred to the ward and then to cardiology for futher treatment. The patient and her child did well on follow-up.

Case 2

A 35-year-old pregnant woman (gravidities 2) at 30 weeks of gestation presented to emergency department with chest pain. She described substernal chest pain during cooking, with weakness and radiation back between shoulders. Pain resolved spontaneously within 30 minutes, but repeated once again afterward. She was weak and collapsed without losing conscious. Her first ECG at ambulance showed ST elevation in leads I and aVL. On arrival at the emergency department of an outlying hospital, she had no pain. Her second ECG showed sinus rhythm with HR 113/min. Repeated ECG after an hour (about 3 hours after first chest pain) showed normal sinus rhythm with Q wave in leads I and aVL and negative T wave in same leads. She had been followed up by her obstetrician and had no history of hypertension, proteinuria or diabetes before or during this and previous pregnancy. She is non smoker. Her BMI was 27.04 kg/m^2, but this was during 30 weeks of gestation, when she gained 8 kg. Her family history is free for cardiovascular diseases. Her first troponin I was positive (22.78 ng/ml; normal range is <0.03 ng/ml) and she was transferred to cardiac ICU. Medical regimen was conservative and included LMWH sc, ß-blockade, clopidogrel and aspirin. TTE showed good EF LV 68% without akinesia and good valvular aparathus. Her postinfartion period was uncomplicated, cardiac enzims returned to normal and she was transferred to the antepartum unit for continued observation. Invasive procedures havent been done because of abscence of signs of persistent ischemia and hemodynamic stability of patient. The patient was discharged on aspirin 100 mg daily and bisoprolol 1.25 mg daily.
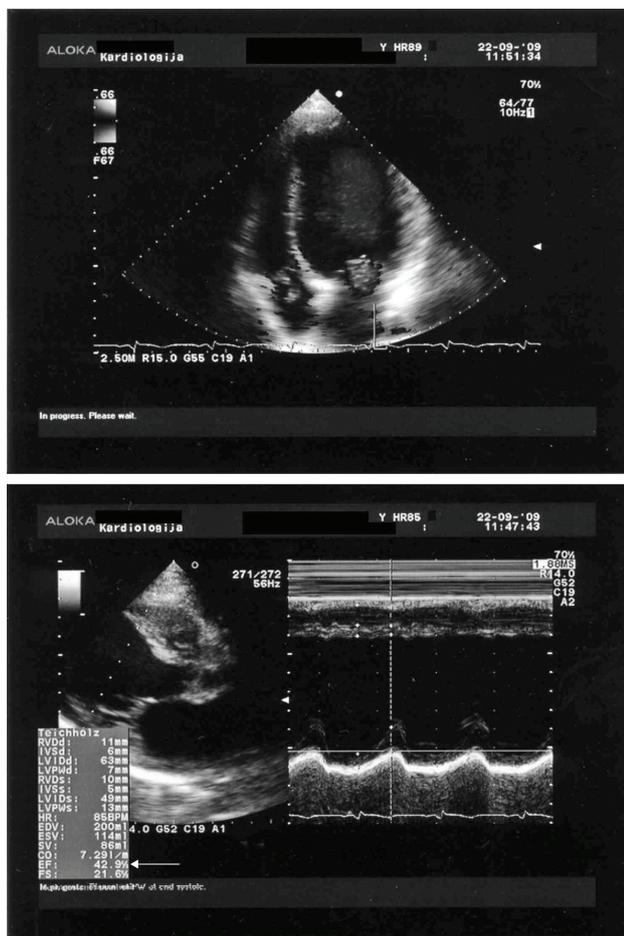

Fig. 1. Case 1: Transthoracic echocardiograph (TTE) showing thin interventricular septum with anteroapicoseptal aneurysm. Ejection fraction of left ventricle (EF LV) is 41%.

She was followed up by cardiologist and obstetrician who recommended a vaginal birth under epidural analgesia and transferred to our hospital. After 5 days period of discontinution of aspirin and thromboprophylaxis with LMWH sc, elective induction of labour with oxytocin began at 38 weeks and 4 days of gestation. She received an early epidural catheter at intervertebral space L3/L4, continuous ECG; oxygenation, fetal heart rate monitoring and an arterial line. Epidural analgesia was done with two bolus doses, each containinig 10 ml mixture of 0.125% levobupivacain and 10 µg per ml of fentanyl. First dose was given before induction of labour and second after amniotomia. Five hours after the induction, the patient underwent a planned, uncomplicated vaginal delivery of a 4.280 g neonate with Apgar scores of 10 and 10. The patient was monitored in ICU for two days postpartum. Her postpartum course was unremarkable and ECG unchanged.

Discussion

Acute MI in pregnancy is uncommon and bears the problem of misdiagnosis. About 150 cases have been published worldwide[1]. Lander et al.[2], however, found in their study that pregnancy increases the risk of MI 3- to 4-fold. The highest incidence has been reported among multigravidas older than 33 years of age during the third trimester[3]. Anterior wall infarctions are the most common. Among the causes of coronary artery occlusion in pregnancy there are four mechanisms: (1) rupture of very small coronary artery plaques (40%) and subsequent thrombus formation triggered by different events, e.g., hypertension; (2) plain coronary artery disease (8%); (3) dissection (30%) of coronary arteries (case 1 and 2 probably) and (4) coronary artery spasms (13%) with or without arterial thrombosis due to enhanced vascular reactivity to angiotensin, norepinephrine and ergot derivatives that are used to control post-partum or postabortion hemorrhage or to suppress lactation[1,3]. The second mechanism is rare among nonpregnant women, but is not uncommon in pregnancy[3]. The gold standard in the therapy of STEMI during pregnancy is immediate coronary angiography and percutaneous transluminal coronary angioplasty (PTCA) with or without stent implantation[1,3]. As the average maternal age increases and assisted reproductive technology allows for very advanced maternal ages, it can be expected that the incidence of MI during pregnancy will rise in the future[1–4]. Despite a known risk factors for ACS (hypertension, diabetes, smoking, family history, obesity, hyperlipidemia, preeclampsia and eclampsia[2,3,5]) our cases show that there might be some undiscovered risk factors in pregnancy related ACS, because they were previously healthy women, one of who developed severe life threatening complications. Prompt diagnosis and immediate therapy are necessary to lower the high mortality of mother and fetus.

Gil et al.[6] in their report published in 2005, preferred general anesthesia to ensure hemodynamic stability, better control of oxygen supply and to reduce oxygen myocardial consumption as there are no clear guidelines with respect to which anesthetic technique is the best in pregnant women with MI. Roth et al.[3] in their 2008 review stated that the mode of delivery in a patient with gestational MI should be determined by obstetric considerations and the clinical status of the mother. An elective cesarean section and the presence of an appropriate medical team, including an experienced obstetrician, obstetric anesthesiologist, cardiologist and pediatrician, allow better control of the time of delivery and avoid a long and stressful labor. Vaginal delivery under epidural analgesia, on the other hand, eliminates the potential risks associated with anesthesia and a major surgical procedure that includes hemodynamic fluctuations, larger blood loss, pain, infection, respiratory complications, damage to pelvic organs, and potential unfavorable effects on future reproductive health[3,7]. An individual decision according to a clinical status of a patient is the key in optimal delivery.

El-Deeb et al.[9] in their 2011 review discuss about challenges of ACS during pregnancy for many reasons. First, a rapid and accurate diagnosis of this condition will continue to be a challenge for physicians owing to the relative rarity of this condition, misinterpretation of signs and symptoms and low level of suspicion. Second, pathophysiology of ACS is different in nonpregnant and pregnant women. Third, a challenge in the standardization of the current recommendation for the management of ACS depends on the pathophysiology of ACS, that is, the main cause of ACS in nonpregnant women, is plaque rupture and subsequent thrombus formation, while coronary dissection is more common in pregnant women. Different etiologies of ACS during pregnancy make uniform recommendations very difficult. Most, if not all of the trials based on the management of ACS, excluded pregnant women, meaning that the use of such medications in pregnancy is not evidence-based. Last, the risk of radiation during PCI is another challenge that may carry considerable hazards to the fetus. Further studies are needed to minimize this risk[9].

The incidence of ACS is rising over the last decades. It usually develops in women with preexisting cardiovascular risk factors; our cases show that there might be some undiscovered risk factors for developing pregnancy related ACS. Today's researches should be concentrated on discovering those »invisible« risk factors for cardiovascular diseases in healthy pregnant women.

Further more, current guidelines for the diagnosis and treatment of MI should be expanded to include pregnancy related MI. The screening and management of cardiovascular risk factors should be achieved before pregnancy[8,9]. The decision of optimal delivery has to be made individually by a team of a cardiologist, an obstetrician and an obstetric anesthesiologist according to a clinical status of a patient.

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AKUTNI KORONARNI SINDROM U TRUDNOĆI: ANESTEZIJA/ANALGEZIJA ZA POROD

SAŽETAK

Akutni koronarni sindrom tijekom trudnoće je rijedak, ali može biti povezan s teškim komplikacijama. Približno 150 srčanih udara tijekom trudnoće je opisano u literaturi širom svijeta, ali nismo pronašli niti jedan slučaj s posljedičnom aneurizmom srčanog mišića. Opisat ćemo 2 bolesnice s akutnim srčanim udarom s ST elevacijom, 1 slučaj kompliciran srčanim zatajenjem, nastankom aneurizme srca i aritmijom; drugi s nekompliciranim tijekom i anesteziološki pristup tijekom poroda. Akutni srčani udar je rijedak u reproduktivnoj dobi i obično nastaje u žena s pridruženim kardiovaskularnim rizicima. Zabrinjavajući je porast incidencije kardiovaskularnih incidenata u ovoj populaciji zbog odgađanja trudnoće u kasniju životnu dob. Naši slučajevi ukazuju da se možda radi o nekim dosad neotkrivenim faktorima rizika za razvoj srčanog udara u trudnoći.