



Pulmonary embolism during pregnancy – still a diagnostic challenge?

Czy zatorowość płucna w okresie ciąży nadal jest wyzwaniem diagnostycznym?

Joanna Pszczoła¹, Kinga Zujko¹, Anna Szpakowicz² ,
Anna Tomaszuk-Kazberuk² 

¹Students' Research Club, Department of Cardiology, Medical University of Białystok, Poland

²Department of Cardiology, Medical University of Białystok, Poland

Abstract

We present the case of a woman in the 11th week of pregnancy who was diagnosed with a pulmonary embolism (PE) and had no thrombosis in ultrasound of the lower extremities. We decided to perform computed tomography pulmonary angiography which showed embolic material in the proximal parts of the pulmonary arteries. After introducing enoxaparin treatment the patient's clinical condition gradually improved. However, the dose had to be adjusted based on anti-Xa level.

Key words: pulmonary embolism, pregnancy, dyspnoea

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Introduction

Pulmonary embolism (PE) is a clinical consequence of deep vein thrombosis. It is a great challenge to diagnose it and manage in pregnancy because of many difficulties. Pregnancy is associated with a 2- to 5-times higher risk of developing venous thromboembolism (VTE) [1, 2]. The symptoms of PE are often difficult to identify because of their similarity to signs associated with pregnancy itself. On the other hand, aggressive diagnostic methods and both for pregnant woman and the fetus.

Case report

We present the case of a woman in the 11th week of her second pregnancy who was diagnosed with PE without evidence of thrombosis in ultrasonography of the lower limbs. The 28-year-old patient had been pregnant for the first time four years previously, and this had been terminated

in the 37th week by caesarean section for obstetric reasons. On admission, the patient reported shortness of breath of three days' duration, and palpitations. She had a history of hypothyroidism (Hashimoto's disease) and iron deficiency anaemia. On physical examination, tachypnoea was noted, SaO₂ about 90%, heart rate (HR) 110/min, RR 93/55 mm Hg. There were no signs of congestion.

On electrocardiography (ECG), there was sinus rhythm and inverted T waves over inferior and anterior wall (Figure 1). Laboratory tests showed an increased cardiac troponin concentration (0.038 ng/mL, upper normal value 0.024), increased D-dimer (24.488 ng/mL, upper normal value 500), a moderately elevated C-reactive protein (CRP) concentration, and leukocytosis. These results prompted the performance of an echocardiography scan and a lower extremities ultrasound.

On echocardiography, there was good global systolic function of the left ventricle and indirect features of PE [shortened acceleration time (ACT) with the presence of

Address for correspondence: dr hab. n. med. Anna Szpakowicz, Klinika Kardiologii, Uniwersytet Medyczny w Białymstoku, ul. Kilińskiego 1, 15–089 Białystok, Poland, e-mail: akodzi@poczta.onet.pl

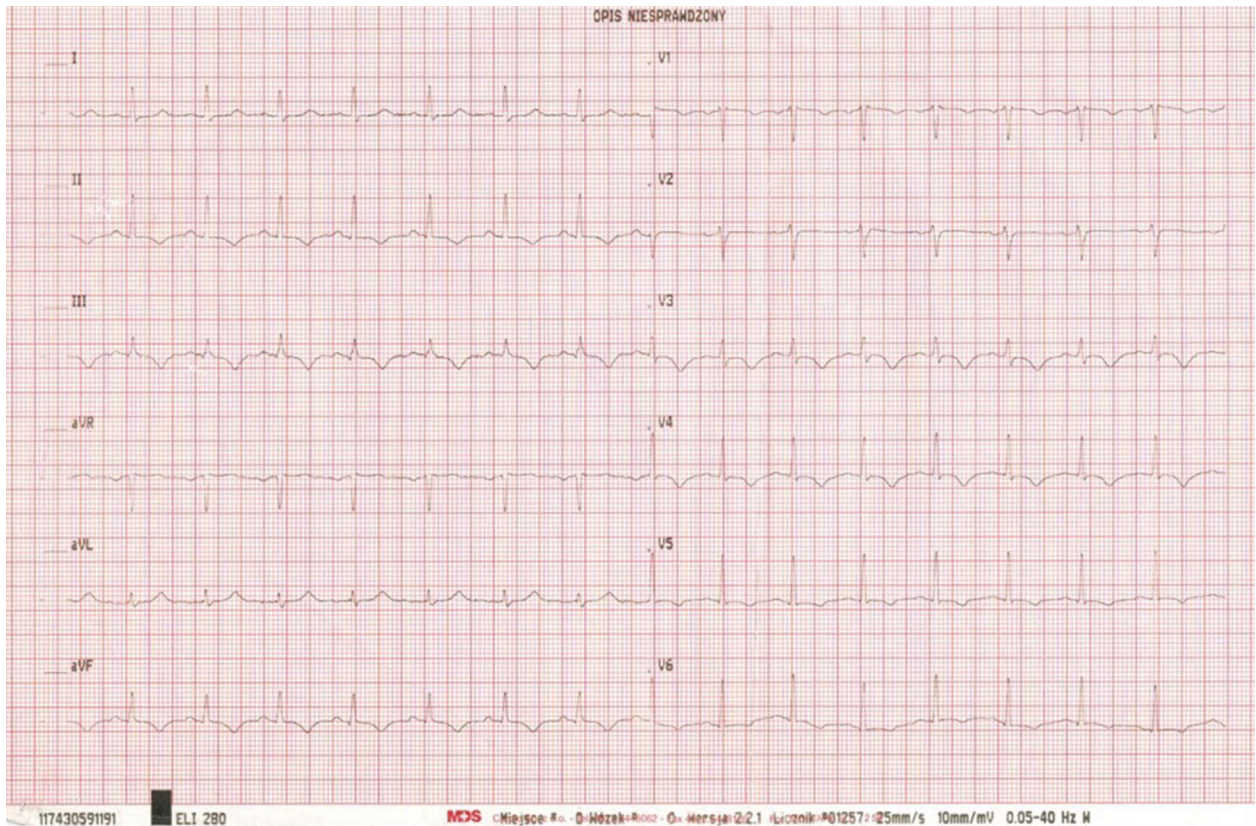


Figure 1. ECG on admission

mid systolic notching, McConnell's sign, enlarged right ventricle.

In ultrasound of the veins of the lower limbs, there were no signs of thrombosis.

It was decided not to perform a chest angiography computed tomography (angio-CT) because of the pregnancy. Non-fractionated heparin (NFH) intravenous (i.v.) and passive oxygen therapy were given at that time.

The patient was referred to a higher reference hospital, where the laboratory and echo findings were confirmed. The condition of the patient was moderate: RR 111/88 mm Hg, HR 111/min, SpO₂ 98% on passive oxygen therapy with a flow of 2 L/min.

Lung scintigraphy was contraindicated due to reported intolerance to Tc-99m that was previously used for diagnosis of thyroid gland disease. Due to the clinical picture it was decided to perform computed tomography pulmonary angiography (CTPA), which showed embolic material in the proximal parts of the pulmonary arteries.

Intermediate-high risk pulmonary embolism was diagnosed. Unfractionated heparin was exchanged with enoxaparin dosed 1 mg/kg bid (early pregnancy mass was considered). Based on anti-Xa level the dose was increased from 60 to 70 mg. The patient's condition gradually improved, she remained circulatory and respiratory efficient and the

patient was discharged home in good condition. Discharge ECG (Figure 2) showed reversion of overload changes. Treatment with enoxaparin was continued throughout pregnancy and withdrawn 24 hours before planned delivery. Her pregnancy was terminated in the 39th week with caesarian section due to obstetric reasons, a child was born healthy.

Discussion

PE is the leading cause of maternal deaths during pregnancy in developed countries. Therefore proper management of PE in pregnancy is extremely important. The risk of PE is even higher in the puerperium period. This is caused by physiological changes in the woman's body, such as those that promote coagulation, reduced fibrinolysis, and blood stasis in the lower extremities [3, 4].

ECG changes have low sensitivity and frequently unspecific signs are observed, like in our case.

D-dimer is increased in physiologic pregnancy and no official cut-off value is given. Therefore diagnostic value of D-dimers in pregnancy is limited. Elevated levels of D-dimers can accompany not only thrombosis, but also pregnancy itself, inflammation, and cancer. However, D-dimer testing, if negative, may help avoid unnecessary diagnostics, especially CTPA, which is especially important in

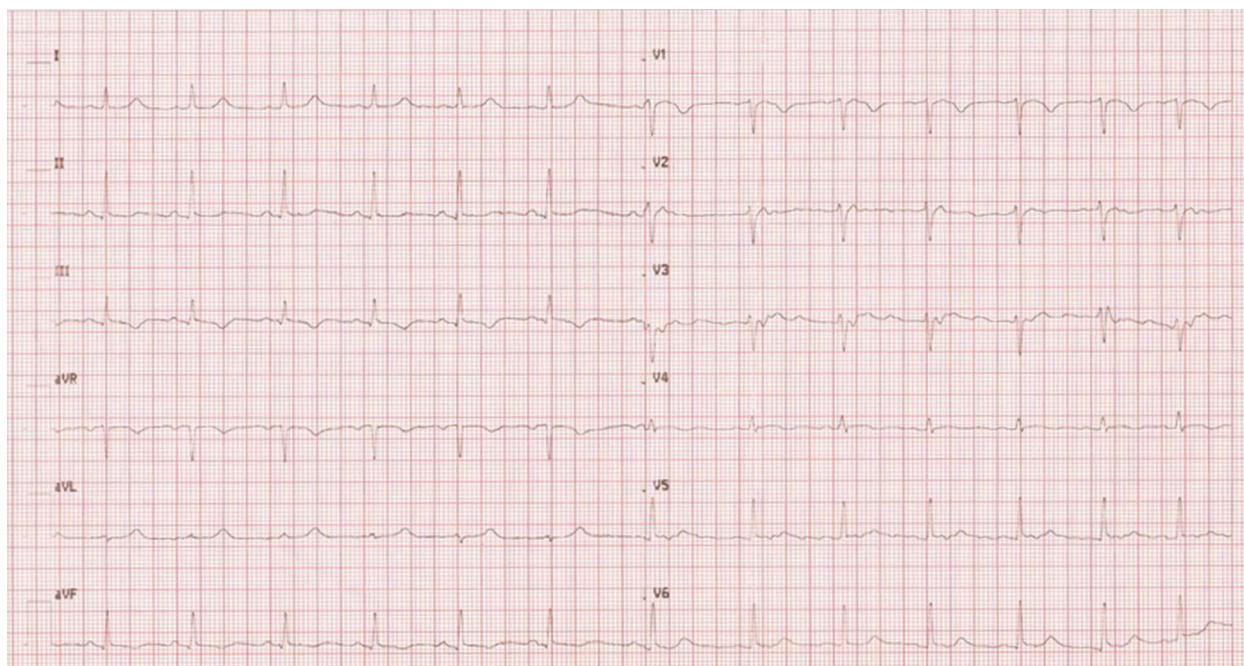


Figure 2. ECG on discharge

pregnant women. Therefore in the latest guidelines [1] D-dimer should be considered to rule out PE during pregnancy and postpartum period.

The most common sources of PE are the deep veins of the lower limbs. But the clot can also come from pelvic veins, which are not visualized in ultrasonography. This is not that rare case and could be present in our patient. It should be noted that a negative result of lower limb ultrasonography does not rule out thrombosis and further diagnostics is needed. If it was positive, this would be the final step of our diagnostics. A new and safe method that shows pelvic vein thrombosis is magnetic resonance venography, but the availability of this procedure is very low. If ultrasonography of the lower limbs is negative and chest X-ray is normal, lung scintigraphy should be performed, but without the ventilation phase. This will reduce the radiation exposure of mother and foetus. In our patient, scintigraphy could not be performed due to severe intolerance to the contrast agent.

The last choice method is CTPA, which is normally the gold standard in adults. There is a practice to avoid it in pregnancy. However, it should be remembered that risk associated with long-term anticoagulation during pregnancy is relatively high. Therefore the disease should be confirmed with any of available methods. The dose absorbed by the foetus during radiological examination of the mother's chest, scintigraphy, and CTPA is permissible. So, in cases where there is a significant clinical suspicion of a PE during pregnancy, radiological examinations can be performed [1].

Van der Pol et al. [2] suggest the use of the pregnancy-adapted YEARS algorithm. This consists of the following features: clinical signs of deep vein thrombosis, haemoptysis and PE, with the additional help of D-dimer concentration $< 1,000$ ng/mL. This can safely rule out PE in pregnant women. CT pulmonary angiography was not carried out in 39% of patients, thus avoiding potential harm from radiation exposure. Avoidance of CTPA occurred in 65% of patients during the first trimester (when radiation is potentially most harmful to the foetus), in 46% of patients during the second trimester, and in 32% of patients during the third trimester [2]. This decreasing percentage may be explained by the physiological increase in D-dimer concentration that occurs in pregnant women.

On the other hand, the UK's Diagnosis of Pulmonary Embolism in Pregnancy research group (DiPEP) [4] found that blood clots in pulmonary arteries are difficult to diagnose without a scan. None of the clinical decision rules or blood tests were able to reliably show which women had PE. An economic analysis showed that scanning every woman with a suspected blood clot was a worthwhile use of National Health System (NHS) resources. The DiPEP report revealed that the risks of scanning are very small, whereas the benefits of detecting and treating pregnant women with a PE are very significant. The authors maintained that clinical decision rules and blood tests should not be used to select which women with a suspected blood clot in pregnancy should have a scan.

Moreover, the current guidance of the UK's Royal College of Obstetricians and Gynaecologists is that women

should be given information about the risks and benefits of investigation, and should be involved in decision-making [4].

Controversies about this topic were raised by Wan et al. [3]. Current clinical practice guidelines are limited by a lack of direct evidence from high quality studies. The reliance on retrospective studies and expert opinion probably contributes to discrepancies seen between guideline recommendations and practice among clinicians. Further prospective studies on clinical prediction rules, D-dimer testing, and diagnostic imaging are required [3].

Low-molecular weight heparin (LMWH) is a standard treatment of PE during pregnancy in accordance

with the European Society of Cardiology (ESC) guidelines published in 2019. In the majority of cases it does not require anti-Xa monitoring, but in our patient anti-Xa measurement showed insufficient dosing of LMWH and it was increased.

For women with high-risk PE, thrombolysis or surgical embolectomy may be considered. Non-vitamin K-antagonists oral anticoagulants (NOACs) during pregnancy are not recommended.

Conflict(s) of interest

The authors report no conflict of interest.

Streszczenie

Opisano przypadek kobiety w 11. tygodniu ciąży, u której zdiagnozowano zatorowość płucną (PE) bez towarzyszącej zakrzepicy żył kończyn dolnych w ultrasonografii. Zdecydowano o wykonaniu u pacjentki angio-CT tętnic płucnych, która wykazała obecność materiału zatorowego w bliższych częściach tętnic. Po włączeniu do leczenia enoksaparyny stan kliniczny chorej stopniowo się poprawiał. Jednak na podstawie pomiaru anty-Xa należało zmodyfikować dawkowanie leku.

Słowa kluczowe: zatorowość płucna, ciąża, duszność

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