



# CARDIAC ARREST DUE TO OUT-OF-HOSPITAL PULMONARY EMBOLISM DURING PREGNANCY: SUCCESSFUL THROMBOLYSIS

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## ABSTRACT

**Introduction:** Pulmonary embolism (PE) is a rare, severe complication in pregnancy, in which case thrombolysis can be lifesaving but has risks. We aim to highlight actions specific to pregnant women.

**Case Description:** A 24-week pregnant woman developed shortness of breath and experienced sudden cardiac arrest. Cardiopulmonary resuscitation (CPR) was begun immediately in the ambulance and a perimortem caesarean section was performed upon arrival at hospital, but the new-born died. After 55 minutes of CPR, bedside echocardiography revealed right ventricular strain and thrombolysis was given. The uterus was bandaged to minimize blood loss. After massive transfusions and correction of haemostasis, a hysterectomy was performed due to inability of the uterus to contract. After 3 weeks, the patient was discharged in good health and placed on continuous anticoagulant treatment with warfarin.

**Discussion:** Approximately 3% of all out-of-hospital cardiac arrest cases are due to PE. Among the few patients who survive at the scene, thrombolysis can be lifesaving and should be considered in pregnant women with unstable PE. Prompt collaborative diagnostic work-up in the emergency room is necessary. In a pregnant woman with cardiac arrest, a perimortem caesarean section improves the chances of both maternal and fetal survival.

**Conclusion:** Thrombolysis should be considered for patients with PE in pregnancy with the same indications as in a non-pregnant woman. In case of survival, there is profuse bleeding with need for massive transfusions and haemostasis correction. Despite being in very poor condition, the above patient survived and was fully restored to health.

## KEYWORDS

Pregnancy, thrombolysis, cardiac arrest, lifestyle, pulmonary embolism

## LEARNING POINTS

- In a young person with a non-shockable rhythm, pulmonary embolism should be kept in mind, especially if they have risk factors for thromboembolism, and pregnant women should be thrombolysed on the same indication as non-pregnant women.
- In cardiac arrest, a perimortem caesarean section improves the chances of both maternal and fetal survival, but after major surgery one should be prepared for the need for massive transfusions after thrombolysis. Bandaging the uterus might minimize bleeding. Despite 1-hour cardiac arrest with CPR, the patient survived and made a complete recovery.
- Lifestyle advice with exercise and sun exposure might help avoid rethrombosis and depression in both the short and long term.



## BACKGROUND

Pulmonary embolism (PE) is rare condition in the general population (2/10,000), but causes one in six cases of maternal mortality<sup>[1]</sup>. Non-pregnant patients with in-hospital cardiac arrest (IHCA) due to PE have an 8% chance of survival without thrombolysis<sup>[2]</sup>. The prognosis of out-of-hospital cardiac arrest (OHCA) is even worse, although there are some case reports of pregnant women surviving<sup>[3]</sup>. This case report highlights several aspects of cardiac arrest due to PE that are special to pregnancy.

## CASE DESCRIPTION

A 30-year-old, normal weight, 24-week pregnant woman fainted on her way to work and reported shortness of breath. She lost consciousness and experienced a cardiac arrest with pulseless electrical activity (PEA) in the ambulance. At hospital, a perimortem caesarean section was performed during cardiopulmonary resuscitation (CPR). The new-born was immediately taken care of but soon died. Echocardiography showed right ventricular strain and despite profuse acidosis and prolonged CPR (1 hour), thrombolytic therapy was given. Spontaneous heart activity was seen after 5 minutes, but CPR continued for another 30 minutes. The uterus was bandaged to minimize bleeding. The patient needed a massive blood transfusion and extra fibrinogen. As the uterus had not contracted after 9 hours, a hysterectomy was considered necessary. After 3 weeks of care, the patient was discharged in good health on warfarin. After 45 minutes of CPR, a cardiologist and a senior obstetrician (PL) were called. The patient showed clinical signs of shock and the echocardiography sign of RV strain. Diagnoses other than high-risk PE seemed unlikely. Blood pH was 6.7 and lactate 17 µg/l. There was a reluctance to give thrombolysis due to pregnancy, the severe acidosis, and the long duration of cardiac arrest.

After almost 1 hour of CPR, the patient received thrombolytic therapy with Actilyse (rtPA), bolus 10 mg i.v., followed by a 50 mg infusion for 2 hours. The uterus was completely atonic and was compressed with a sterile sports bandage over the suture line to minimize bleeding. A regular pulse was noted 5 minutes after the start of thrombolysis but the CPR continued for another 30 minutes.

Contact was made with the extracorporeal membrane oxygenation (ECMO) team but the patient was considered to be in too poor a condition for ECMO and she was admitted to the local intensive care unit (ICU).

After 3 hours, a board-hard abdomen was noted as a sign of fresh blood in the abdomen. Clinically the patient showed signs of a proximal deep vein thrombosis. Haemoglobin was 80 g/l, pH 6.8 and lactate 17.0 µg/l (very high). Rotational thromboelastometry analysis (ROTEM) showed no coagulation with fibrinogen <0.3 g/l (reference in pregnancy 3–6 g/l). The patient was transfused with a total of 17 U of erythrocyte concentrate, 8 U of plasma and 2 U of platelets. Six grams of fibrinogen was given to reach s-fibrinogen >3.0 g/l. About 9 hours later, embolization of the uterine

vessels was performed. Since the uterus did not contract, a hysterectomy was performed.

The second day the patient was intubated in the ICU and sedated. Computed tomography confirmed PE and she was given a low-dose low molecular heparin (LMWH) with the intention of giving a full dose when haemostasis recovered. She was peripherally warm, her abdomen was soft, and she responded with a hand squeeze.

On day 3, the patient was still sedated. Urine was concentrated, and s-creatinine had increased from 150 to 220 mEq/l. A thrombophilia investigation showed a heterozygous factor V Leiden mutation.

On the eighth day, the patient was in good condition. In addition to LMWH, she was given lifestyle advice to combat blood clots and depression<sup>[4,5]</sup>. Echocardiography and laboratory values were now normal. Warfarin was introduced.

After 8 weeks, the patient had recovered physically and showed no signs of depression. She used compression stockings, and her breathing was unaffected.

## DISCUSSION

Pregnancy entails a 10-fold increased risk of venous thromboembolism (13/10,000, of which approximately 20% are due to PE) and an increased risk of complications such as aortic dissection, stroke and cardiomyopathy<sup>[1]</sup>. A recent review in Stockholm in 2021 showed that 3% of all IHCA were caused by PE<sup>[2]</sup>. In comparison with non-thrombolysed patients, the survival rate for IHCA with thrombolysis was 44% (7/16) vs. 8% (4/48)<sup>[2]</sup>. Approximately 3% of all cases with OHCA were caused by PE and of the 17% who did not die at the scene, the respective 30-day survival rate was 16% if thrombolysis was given and 6% if not<sup>[6]</sup>. In reviews of case reports, the cause of death is mostly cardiogenic shock, re-thromboembolism and multi-organ failure<sup>[3]</sup>.

A pregnant uterus consumes about 20% of available oxygen from the blood and CPR becomes more efficient after delivery of the fetus. The goal of perimortem caesarean section is to increase the chance of both maternal and fetal survival. Therefore, perimortem caesarean section is recommended in Sweden in case of cardiac arrest at over 20 gestational weeks<sup>[6,7]</sup>. Actilyse does not cross the placenta barrier and thus does not affect the fetus per se.

In this case, since thrombolysis was given in close proximity to major surgery, we expected heavy bleeding. We first performed CPR, then dealt with the bleeding and the patient's fragile haemodynamic status. The uterus was bandaged to minimize bleeding. After 9 hours, the uterus was re-examined. Since it did not contract, a hysterectomy was considered necessary. Diagnostically, radiology takes too long in case of cardiac arrest. Echocardiography can be performed in the emergency room and can differentiate unstable high-risk PE from aortic dissection and cardiomyopathy. The combination of multidisciplinary cooperation was crucial in this case. PEA increased the likelihood that PE was the cause of cardiac arrest<sup>[6]</sup>.

In retrospect, the patient probably already had a left-sided proximal pelvic thrombosis 1 week before the PE. The symptoms of proximal thrombosis mimic common back problems in pregnancy and both doctor and patient delay is common.

About 50% of thromboembolic cases occur in high-risk situations such as pregnancy and surgery. The other half occur in low-risk periods<sup>[8]</sup>. An attractive way to lower the thromboembolic risk in both low- and high-risk periods is through lifestyle alteration<sup>[8]</sup>. Physical exercise, active sun exposure, and maintenance of normal weight reduce the risk of thrombosis<sup>[9]</sup>. Since 2012 these three suggestions have been recommended in Sweden for pregnant women with an increased risk of thromboembolism<sup>[8]</sup>. There is a reduced prevalence of fatal cardiovascular disease with both exercise and sun exposure<sup>[9]</sup>, the latter likely an effect of increased nitric oxide levels<sup>[10]</sup>. Both physical exercise and active sun exposure are reported to be effective in reducing the tendency to depression, possibly an effect of a reduced stress level due to higher endorphin and serotonin levels<sup>[4,5]</sup>. The United Nations Environmental Effects Panel recently stated that studies are needed to better understand the beneficial effects of sun exposure.

The hardest thing for the patient was the loss of her child, but she felt grateful that she got a second chance at life. She was advised against uterus transplantation, but stimulation for egg retrieval was considered fine. She initiated the process for surrogacy and is now a mother.

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