# POLICY FOR IMAGING IN SUSPECTED VENOUS THROMBOEMBOLISM (VTE) DURING PREGNANCY OR PUERPERIUM (RADIOLOGY)

| | |
|---|---|
| Owner/Lead: | Amy Todd |
| Approved by | RADIOLOGY DIRECTORATE / GOVERNANCE MEETING |
| Approval Date | 12th March 2025 |
| Review Date<br>This is the most current document and should be used until a revised version is in place | 12th March 2028 |

## Key amendments to this guideline

| Date | Amendment | Approved by: |
|---|---|---|
| 15th December 2022 | Document extended for 6 months to allow for a thorough review | Amy Todd |
| 12th July 2023 | Document approved at Radiology Directorate Meeting | Radiology Governance Meeting |
| 12th March 2026 | Approved at Radiology Governance Meeting<br>Inserted requirement for Pregnancy Form B completion prior to CT scan (text and flowchart)<br>Removed reference to Q scans<br>Removed reference to Form C (doesn't exist)<br>Added reference to CT3 | Radiology Governance Meeting |

DIRECTORATE: RADIOLOGY

AIM AND SCOPE OF PROCEDURE

This policy is in addition to the trust policy that already exists on the trust intranet (see WHAT-TP-094 under clinical guidelines>speciality/department key documents>obstetrics>antenatal>haematological>VTE in pregnancy) and is specific to imaging for suspected thromboembolic disease in pregnancy or puerperium. This document is to ensure that a specific departmental policy is available in radiology. This is written in accordance with the Royal College of Obstetricians and Gynaecologists (RCOG) Green-Top guidelines 37a and 37b.

Pulmonary embolism (PE) and deep venous thrombosis (DVT) are a leading cause of maternal death in the UK. The risk of PE is 1.3 per 10,000 maternities, with an increased risk of VTE of 4 to 6 times in pregnancy which is further increased post-partum. NICE estimates that the risk of PE can be reduced by 60% and 70% respectively by using low molecular weight heparin (LMWH) to reduce this risk in pregnancy. Notably, the risk of VTE is higher in the first trimester. Potential risk factors include those in table 1 below.

Table 1. Risk factors for venous thromboembolism in pregnancy and the puerperium

| | | |
|---|---|---|
| **Pre-existing** | Previous VTE | |
| | Thrombophilia | *Heritable*<br>Antithrombin deficiency<br>Protein C deficiency<br>Protein S deficiency<br>Factor V Leiden<br>Prothrombin gene mutation |
| | | *Acquired*<br>Antiphospholipid antibodies<br>Persistent lupus anticoagulant and/or persistent moderate/high titre anticardiolipin antibodies and/or $\beta_2$-glycoprotein 1 antibodies |
| | Medical comorbidities e.g. cancer; heart failure; active SLE, inflammatory polyarthropathy or IBD; nephrotic syndrome; type I diabetes mellitus with nephropathy; sickle cell disease;[49] current intravenous drug user | |
| | Age > 35 years | |
| | Obesity (BMI ≥ 30 kg/m$^2$) either prepregnancy or in early pregnancy | |
| | Parity ≥ 3 (a woman becomes para 3 after her third delivery) | |
| | Smoking | |
| | Gross varicose veins (symptomatic or above knee or with associated phlebitis, oedema/skin changes) | |
| | Paraplegia | |
| **Obstetric risk factors** | Multiple pregnancy<br>Current pre-eclampsia | |
| | Caesarean section<br>Prolonged labour (> 24 hours)<br>Mid-cavity or rotational operative delivery<br>Stillbirth<br>Preterm birth<br>Postpartum haemorrhage (> 1 litre/requiring transfusion) | |
| **New onset/transient**<br><br>*These risk factors are potentially reversible and may develop at later stages in gestation than the initial risk assessment or may resolve and therefore what is important is an ongoing individual risk assessment* | Any surgical procedure in pregnancy or puerperium except immediate repair of the perineum, e.g. appendicectomy, postpartum sterilisation<br>Bone fracture | |
| | Hyperemesis, dehydration | |
| | Ovarian hyperstimulation syndrome (first trimester only) | Assisted reproductive technology (ART), in vitro fertilisation (IVF) |
| | Admission or immobility (≥ 3 days' bed rest) | e.g. pelvic girdle pain restricting mobility |
| | Current systemic infection (requiring intravenous antibiotics or admission to hospital) | e.g. pneumonia, pyelonephritis, postpartum wound infection |
| | Long-distance travel (> 4 hours) | |

Although 70% of pregnant patients may have identifiable classical risk factors for VTE, there is no evidence for using a pre-test probability scoring in pregnant patients, as this is not considered reliable. European and American literature suggest that D-dimers in the first trimester of pregnancy can be negative, allowing the exclusion of first trimester patients but this is not established in UK guidelines and is stated as low level evidence according to the RCOG.

In the instance of suspected clinical signs of DVT, the patient should undergo a unilateral Doppler ultrasound of the leg veins. If this is negative and the clinical suspicion of a DVT remains high, the US should be repeated at day 7. In the situation of a suspected PE, patients should undergo an ECG, blood tests and CXR prior to any other imaging. If both a PE and DVT are suspected, the patient should undergo a Doppler US in preference to a CTPA or VQ scan as confirmation of a DVT will allow therapeutic LMWH to be commenced without an examination requiring radiation exposure to the mother or foetus. In some cases where iliac vein thrombosis is suspected, an MR venogram (MRV) may be indicated.

If there is a clinical suspicion of a PE, the two main tests available within the imaging department include VQ imaging or CTPA at the Worcester site and CTPA at the Alexandra Hospital site. Prior to considering further imaging, it is important to exclude any lung disease on the CXR which should be reviewed and reported by the duty radiologist during vetting. CTPA should be chosen in preference if the patient has an

abnormal CXR rather than a VQ scan as errors may occur in interpretation of VQ/Q scans in the presence of known lung disease or acute infection. As with any other contrast examination, patients undergoing CTPA require renal function tests to be available prior to the study being undertaken. All imaging tests including CTPA and VQ scans should be discussed between the requesting consultant and duty radiologist. CTPA examinations are generally available during daytime and weekends but will not be considered over-night unless in the case of a life-threatening PE (see below).

VQ scans are only available on a Tuesday and Friday mornings. Requests can be made on ICE following discussion with the duty radiologist. A V-Q (ventilation-perfusion) scan delivers a **higher dose to the foetus with a higher risk of childhood cancer** (1 in 280,000) but it should be noted that with the imaging technique used at WRH this foetal dose is still in the low range (<0.3mGy). A V/Q scan delivers a lower dose to the mother and this should be taken into consideration, especially for younger mothers. Notably CTPA delivers a much **higher dose to breast tissue** (up to x 20) with increased susceptibility in view of the hormonal changes occurring during pregnancy. The dose for a CTPA varies from 0.5-2.0 mGy depending on the size of the patient and which scanner is used. Of the Worcester scanners, CT1 has a lower dose than CT2 and CT3, so CT1 should always be used in preference. Although a Q scan (perfusion) only will help to reduce the radiation dose, this saving is minimal compared with a V/Q scan. At WRH, it is in the order of 0.001 mGy for the foetus and 0.2 mGy for the mother. In addition, a ventilation only scan that reveals a ventilation defect requiring a later addition of a perfusion scan will increase the scan times significantly and can introduce errors in comparative positioning between the two parts of the scan, potentially causing artefacts. Therefore, a V/Q scan is performed in preference to a perfusion only scan. A CTPA would be preferable if the preceding CXR is abnormal and shows a possible area of consolidation or underlying lung disease where a PE is still suspected.

There is a theoretical **risk of childhood or foetal hypothyroidism** with intravenous non-iodinated contrast media but a much lower risk of childhood cancer compared with VQ scans (< 1 in a million). A neonatal thyroid function test is recommended if the mother has undergone a CTPA during pregnancy. Overall, the negative predictive value (NPV) of a VQ scan is 99% and the NPV of CTPA of optimal quality is 100%. When deciding to undertake CTPA, it should be considered that CTPA studies in pregnancy may be suboptimal due to the hyperdynamic circulation during pregnancy and therefore small PE's may be missed in scans of lower diagnostic quality. All studies involving a high radiation dose should be discussed with the consultant teams and the duty radiologist with informed consent being obtained from the mother as both tests require risks of radiation exposure to the mother and foetus which need to be understood by the patient and clinical teams. There is an electronic consent form that should be completed by the requesting team prior to the study for all examinations involving a radiation exposure.

The CTPA request and VQ request can be made on ICE and ensure adequate written consent obtained prior to requesting. In order to comply with the IRMER (2017) Regulations, the referrer and patient will need to complete the Radiology directorate Examination Form B which can be found on the intranet policies and procedures under Radiology or obtained from the CT or Nuclear Medicine department.

In the situation of a patient presenting with a life-threatening PE, the patient should undergo testing within the hour with either a portable trans-thoracic echo (TTE) or CTPA. In these situations, it would not be appropriate to wait for renal function due to the high mortality rate and the urgent need for thrombolysis in life-threatening PE. The patient should have immediate review by experienced clinicians including the on-call obstetric consultant, medical and anaesthetic teams. The patient should already be started on anti-coagulant treatment prior to imaging. Portable echocardiogram (TTE) or CTPA should be performed within an hour of presentation to determine the need for urgent thrombolysis in life-threatening PE (please refer to the trust intranet WHAT guideline WHAT-TP-094).

Please see flow-chart on page 5 relating to presentation with DVT and/or PE. Please ensure that patient consent Is obtained prior to the examination being performed.

Abbreviations:-

VTE: venous thrombo-embolism

PE: pulmonary embolism

DVT: deep venous thrombosis

LMWH: low molecular weight heparin

RCOG: Royal College of Obstetricians and Gynaecologists

CXR: chest x-ray

CTPA: Computed tomography pulmonary angiogram

MRV: MR venogram

VQ scan: Ventilation-Perfusion scan

NPV: Negative predictive value

TTE: trans-thoracic echocardiogram

US: ultrasound References: -

- Reducing the risk of Venous Thromboembolism during Pregnancy and the Puerperium: acute management. Green Top Guideline No 37a. April 2015.

Thromboembolic Disease in Pregnancy and the Puerperium: Acute Management. Green Top Guideline No 37b. April 2015.

**"Life threatening" PE** is **defined as one that is associated with cardiovascular collapse and therefore, a high risk of death or severe morbidity.**