

# Imaging in pregnancy

Imaging is important for the diagnosis of acute and chronic conditions. However, debate over the safety of imaging modalities for pregnant women can result in avoidance of useful diagnostic tests in pregnancy and the potential for delayed diagnosis. This infographic summarises the benefits and risks of various imaging techniques in pregnancy and highlights appropriate techniques for women presenting with common medical symptoms to healthcare professionals.

## Ionising radiation

### Radiography (X-ray)

Radiographs are commonly used to investigate a wide range of symptoms. Chest X-rays are recommended for all patients complaining of chronic cough (> 8 weeks), or atypical symptoms of haemoptysis, fever, chest pain or weight loss.

### Computed tomography (CT)

Uses of CT are wide ranging, including assessing injuries following trauma, diagnosing pulmonary embolism and investigating gastrointestinal complications (appendicitis, small bowel obstruction) and malignancy.

## What are the risks?

Ionising radiation can have **stochastic effects** (those which occur by chance) or **deterministic effects** on the fetus.

**Deterministic effects** are predictable based on **threshold doses of radiation**. They can include fetal malformation, fetal growth restriction and neurological effects. Importantly, it is estimated that these effects will only occur at fetal radiation doses **greater than 50 mGy**.

Radiation dose is measured in units of gray (Gy) and milligray (mGy)

### What is the fetal exposure in common investigations?

Cervical spine X-ray (AP and lateral views): <0.001 mGy

Chest X-ray (two views): ≤0.01 mGy

Abdominal X-ray: 0.1–3.0 mGy

Pelvic CT scan: 10–50 mGy

## Other imaging modalities

### Ultrasound



Potential negative effects may be thermal or mechanical, relating to increased tissue temperature or bubbles of gas forming in tissues, respectively.

**Overall, it is thought that there are no significant negative effects of ultrasound when exposure is limited to <60 minutes.**

### Magnetic resonance imaging (MRI)



MRI enables us to see deep soft tissue structures and is useful for assessing conditions including cerebral venous thrombosis, acute appendicitis and Crohn's disease. Antenatal MRI is increasingly used to evaluate fetal anomalies, including cranial lesions and neural tube defects.

MRI has several advantages over ultrasound, including improved resolution and the option to visualise both sides of the fetal brain.

The fetus is exposed to a magnetic field more than 10 000 times greater than that of Earth (50µT).

Theoretical concerns are teratogenesis and acoustic damage, but in practice, **MRI can be performed at any stage in pregnancy if maternal benefits outweigh fetal risks.**

### Nuclear medicine imaging



Nuclear studies – including pulmonary ventilation/perfusion (V/Q) scans – are useful to determine organ function by using a radioisotope. In general, fetal radiation exposure from V/Q scans is <5 mGy.

Positron emission tomography (PET) scanning may be necessary for imaging of malignancy during pregnancy. The most commonly used radiotracer in PET scanning is <sup>18</sup>F-FDG.

**Data indicate that PET scanning with <sup>18</sup>F-FDG should not be withheld for fear of excessive radiation exposure.**

### Use of gadolinium contrast

Gadolinium-based contrast agents are useful in enhancing MRI of the central nervous system.

However, there are possible risks to fetal organ development and of concerns about nephrogenic systemic fibrosis.

**It is recommended that gadolinium contrast is avoided unless benefits outweigh fetal risks.**

## Imaging women presenting with common symptoms in pregnancy

### Headache

- Clinicians should be alert to causes of secondary headache in pregnancy (e.g. pre-eclampsia, acute arterial hypertension, stroke and malignancy).
- Imaging modality depends on the suspected pathology, but MRI and CT are most commonly used.

### Shortness of breath

- Could be a sign of pulmonary embolism (PE).
- First-line investigations should include electrocardiogram and chest radiograph.
- If PE is suspected but there are no signs of deep vein thrombosis (DVT), V/Q scan or CTPA should be performed.

### Breast mass

- Ultrasound is recommended, along with tissue biopsy.
- If malignancy is found, mammography is advised.
- With fetal shielding, radiation exposure from mammography is <0.01 mGy.

### Abdominal pain

- Ultrasound and non-contrast MRI are recommended.
- Ultrasound is useful in imaging the appendix, bowel, liver and kidneys.
- MRI can help to identify bowel obstruction, fistulas or abscesses.

### Calf pain / leg swelling

- First-line imaging for suspected DVT presenting with calf pain is compression duplex ultrasound.

## Remember...

**Safety of imaging in pregnancy is improved by careful history taking and examination and clear identification of the clinical question to be answered and the timeframe in which it should be investigated. Seek advice from a senior radiologist regarding the most suitable imaging modality, and provide appropriate counselling of women.**

This is a summary of a review article published in TOG. For further details on imaging in pregnancy, please read the full paper: Eastwood KA, Mohan AR. Imaging in pregnancy. The Obstetrician & Gynaecologist 2019; <https://doi.org/10.1111/tog.12604>

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