

Obstetric ultrasound

What is an obstetric ultrasound?^[1] ^[2]

Obstetric ultrasound was first introduced in the late 1950s. It is now widely used and has become a useful tool in monitoring and diagnosis. Ultrasound scans use sound waves which are considered safe for mother and baby.

Ultrasound scans are used routinely in obstetric care, particularly a booking scan and anomaly scan.

Ultrasound scans are also used to assess fetal growth and well-being if there are any concerns, or if there are any other concerns, such as suspected breech presentation after 36 weeks. Ultrasound scans are also used to confirm and monitor multiple pregnancies.

Ultrasound scans should not be used after 28 weeks for uncomplicated singleton pregnancies.

Booking scan

The first obstetric ultrasound scan is ideally performed between 11+2 weeks and 14+1 weeks.^[3] The purpose is to:

- [Diagnose pregnancy](#).
- Accurately determine gestational age.^[4] This is essential for intervention of post-maturity, and for accurate serum screening for [Down's syndrome](#).
- Determine viability - to confirm the presence of a heartbeat and exclude [ectopic pregnancy](#) and [hydatidiform mole](#).
- Determine fetal number and, in [multiple pregnancies](#), the chorionicity/amnionicity.^[1]
- Detect gross fetal abnormalities.

Procedure

- Measurement of crown-rump length accurately measures gestational age if performed before 13 weeks. After 13 weeks, the fetus becomes increasingly flexed so results are inaccurate. Alternatives that can be used after this include bi-parietal diameter, and/or head circumference, or femur length.
- it is usually performed abdominally, although occasionally a vaginal scan is necessary.
- Nuchal translucency scans for risk of [Down's syndrome](#) are best performed between 10-14 weeks.^[5]

Screening for structural abnormalities - anomaly scan

An ultrasound scan should be offered to take place between 18+0 weeks and 20+6 weeks.^[2] This scan can provide dating information and diagnosis of multiple pregnancy, in units where no booking scan is performed.

The main purpose is:

- To reassure the mother that her baby appears to have no gross structural abnormalities:
 - 50% of significant abnormalities will be detected by the 20-week screening scan - see below.
 - To provide the parents with options - eg, termination, preparation, and appropriate care throughout the rest of the pregnancy and delivery.
- To determine placental morphology and localisation:^[6]
 - Where the placenta extends within 20 mm of the internal cervical os, another scan at 32 weeks should be offered to see if this is persisting.
 - Transvaginal scanning is preferred over transabdominal for this indication.

- To confirm that fetal growth is appropriate.

Procedure

- Assess growth by the measurement methods below:
 - Bi-parietal diameter (most accurate for dating up to 20 weeks).
 - Head circumference.
 - Femur length.
 - Abdominal circumference.
- Look at the head shape and internal structures:
 - Cavum septum pellucidum.
 - Cerebellum.
 - Ventricular size at atrium (<10 mm).
- Minimum standards:
 - Spine: longitudinal and transverse.
 - Abdominal shape and content at the level of the stomach.
 - Abdominal shape and content at the level of the kidneys and umbilicus.
 - Renal pelvis (<5 mm AP measurement).
 - Longitudinal axis - abdominal-thoracic appearance (diaphragm/bladder).
 - Thorax at level of four-chamber cardiac view.
 - Aortic arch.
 - Arms - three bones and hand (not counting the fingers).
 - Legs - three bones and orientation of feet (not counting the toes).

- Optimal standards:
 - Cardiac outflow tracts.
 - Face, nose and lips; 15% of women may have to return for further checks.

Aneuploidy checks

Aneuploidy scans are not routinely performed, as many normal pregnancies may have some of these features - ie there is a high false-positive rate. Pregnancies affected by aneuploidy (abnormal chromosome number) will have sonographic markers. However, 50-80% of affected cases will already be identified by triple test, maternal age and nuchal translucency measurements. Indications for a 'marker' scan include:

- Family history of abnormalities, such as a [neural tube defect \(NTD\)](#).
- [Multiple pregnancies](#).
- Maternal [diabetes](#) or [epilepsy](#).
- [Recurrent miscarriage](#).
- [Polyhydramnios](#).
- Alpha-fetoprotein (AFP) abnormal/maternal age >35 years.
- [Oligohydramnios](#).

Ultrasound checklist for screening for aneuploidy

Common sonographic 'markers' for aneuploidy	Other risk factors
Choroid plexus cyst	Maternal age
Ventriculomegaly (>10 mm at the atrium)	Serum screening results
Echogenic bowel (equivalent to bone density)	Nuchal translucency (10- to 14-week scan)
Head shape	
Nuchal pad (>5 mm at 20 weeks)	
Cisterna magna	
Cleft lip	
Echogenic foci in heart	
Dilated renal pelvis (>5 mm AP)	
Short femur/humerus	
Talipes	
Sandal gap	
Clinodactyly	
Clenched hand	
Two-vessel cord	

General standards

In the UK these are set by the Royal College of Obstetricians and Gynaecologists (RCOG) and the Royal College of Radiologists to assure the quality of service provision. They include providing clear, written advice that includes detection rates for defined, common conditions. A trained counsellor in the area of diagnosis and screening should be available, as should a quiet room for breaking bad news about the baby. It should be possible to discuss the findings with an obstetrician within 24 hours or soon after detection of the anomaly.

Potential detection rates

Conditions that can be screened for in the 20-week scan include: [Edwards' syndrome](#), [Patau's syndrome](#), [anencephaly](#), [spina bifida](#), [cleft lip](#), [congenital diaphragmatic hernia](#), [gastroschisis](#), [exomphalos](#), [congenital heart disease](#), [bilateral renal agenesis](#), and lethal skeletal dysplasia.^[7] See also the article on [Prenatal Diagnosis](#).

Fetal presentation and cervical length:

- Suspected fetal malpresentation (eg, [breech](#)) should be confirmed by an ultrasound examination after 36 weeks.^[8]
- Cervical length measured by transvaginal ultrasonography in asymptomatic high-risk women predicts spontaneous preterm birth at less than 35 weeks of gestation.^[9]

Doppler ultrasound

Doppler ultrasound uses high-intensity sound waves to detect the blood circulation in the baby, uterus and placenta.

- The application has extended from the umbilical cord to fetal vessels (aorta, cerebral and renal arteries) as well as maternal vessels supplying the placental intervillous space.
- It is used for high-risk pregnancies where there is concern about baby's well-being - eg, intrauterine growth restriction, hypertensive disorders of pregnancy - and to distinguish between the normal small fetus and the 'sick' small fetus.

- Despite its advances, Doppler ultrasound is not of use in routine antenatal screening because several studies have shown it is an unnecessary intervention and may cause possible adverse effects. Its current role in optimising management, particularly timing of delivery, remains unclear.

In high-risk populations uterine artery Doppler at 20–24 weeks of pregnancy has a moderate predictive value for a severely small for gestational age (SGA) neonate.^[10] If a woman has an abnormal uterine artery Doppler at 20–24 weeks of pregnancy which subsequently normalises there is still an increased risk of an SGA neonate. Repeating uterine artery Doppler is therefore of limited value.

Women with an abnormal uterine artery Doppler at 20–24 weeks should be referred for serial ultrasound measurement of fetal size and assessment of well-being with umbilical artery Doppler, commencing at 26–28 weeks of pregnancy. Additional information on fetal well-being is assessed by measuring the depth of the biggest liquor pool.

Women with a normal uterine artery Doppler do not require serial measurement of fetal size and serial assessment of well-being with umbilical artery Doppler unless they develop specific pregnancy complications – for example, antepartum haemorrhage or hypertension. However, they should be offered a scan for fetal size and umbilical artery Doppler during the third trimester.

Further reading

- [Pre-conception – advice and management](#); NICE CKS, November 2022 (UK access only)
- [Drukker L, Noble JA, Papageorghiou AT](#); Introduction to artificial intelligence in ultrasound imaging in obstetrics and gynecology. *Ultrasound Obstet Gynecol.* 2020 Oct;56(4):498–505. doi: 10.1002/uog.22122.

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