

The Role of Ultrasound in Pregnancy

A/Prof Lisa Hui
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“Ultrasounds are actually a medical investigation that have a very specific indication and purpose.”



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Hi, everyone. My name's Lisa Hui. I'm a Maternal Fetal Medicine Specialist at the Mercy Hospital for Women and the Northern Hospital and a tutor at the Northern Clinical School. Today I'm going to talk about the role of ultrasound in pregnancy.

It's an integral part of a pregnant woman's journey and it's something that they and their families look forward to with a lot of excitement and anticipation. You've probably seen photos that pregnant women have posted in social media and it's used to plan gender reveal parties and it really is part of the socialization of a woman and becoming a mum.

However, the purpose of this podcast is to remind you that ultrasounds are actually a medical investigation that have a very specific indication and purpose. And so what I want to do is just walk through the common ultrasounds that are performed during pregnancy and explain what information we need from these scans and how we deal with unexpected results.

So if there was one, only one scan that we could have during pregnancy, the one that would provide the most value would be the first trimester dating scan. So this is the first scan that a woman will typically have during her pregnancy. Her GP will refer her for this, and we generally plan it for around eight weeks gestation.

If it's too early, the pregnancy is too small to get meaningful information. If it's too late, then the accuracy of dating declines. So this dating scan is also called the viability scan because it serves two main purposes. One, establishing a woman's gestational age and also confirming that there is a live embryo present.

Now we use this scan to date a pregnancy because there's very little biological variation in the growth rate of a fetus or embryo in first trimester. But as you will be aware, there's a lot of variation in size of babies towards the end of pregnancy. So using size to estimate gestation means that the first trimester is the most accurate time to do this.

We can date a pregnancy using a woman's last menstrual period, but that is less accurate. So if the first trimester ultrasound shows a discrepancy in the due date of five days or more, then we will correct the due date based on the ultrasound. And we measure the first trimester embryo using something called the crown rump length. That's just the straight linear measurement from the top of the head to the bottom of the embryo. So not including the legs, and there are very specific nomograms for establishing gestational age based on the CRL or crown rump length.

That scan also serves other important purposes. One is diagnosing a multiple pregnancy, so we should be able to detect that at this stage. And also to confirm that it is an intrauterine pregnancy. Ectopic pregnancy is a potentially life threatening condition, so that is something that we can exclude. Once we document an intrauterine pregnancy. So these are the key purposes of that first scan; to diagnose multiple pregnancy, ensure there is a live pregnancy by documenting fetal heart motion, confirming an estimated due date, and excluding ectopic pregnancy.

All of those things really guide the rest of our pregnancy care. The second scan that women typically have is a scan at around twelve weeks.

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So this is usually ordered between eleven to thirteen weeks gestation and it was originally introduced for the purposes of screening for Down's syndrome and other chromosome conditions like Edwards syndrome and Patau syndrome.

So these are the three most common trisomies. Trisomy 21, 18 and 13 and the twelve week scan was a component of something called first trimester combined screening. So at this scan we measured the baby's nuchal translucency measurement, that's the thickness at the back of the baby's neck. And we know that babies with chromosome conditions are more likely to have a thickened nuchal translucency measurement.

So the first trimester combined test for fetal aneuploidy involves an algorithm where we take the measurement of the nuchal translucency, the crown rump length, maternal age, and the results of blood serum markers. And that gives us an estimated probability of that pregnancy having Down syndrome, Edwards syndrome, or Patau syndrome.

And conventionally, if the risk of any of these conditions is greater than 1 in 300, then women are offered genetic counseling and diagnostic testing with an amniocentesis or CVS to confirm whether the baby has the condition or not. These days a lot of women are using a different type of test for aneuploidy screening that's just a blood test, that's non-invasive prenatal testing which analyzes cell free DNA, maternal plasma.

It's much more accurate than the combined first trimester screening test, but women who have non-invasive prenatal testing, or NIPT, are also advised to have the twelve week scan anyway. So even though we don't need the nuchal translucency measurement to calculate the risk of Down syndrome, it is now a very good scan for early detection of fetal structural abnormalities.

So it's still important regardless of whether a woman chooses to have a specific screening test for Down syndrome or not. So that's a twelve week scan. And again it does all the things that the eight week scan can do, confirm dates and so on, that the main purpose is for aneuploidy screening and for detecting structural abnormalities.

So we would expect to pick up about 50 percent of major structural abnormalities at the twelve week scan, but it will never reach 100 percent because the baby is still developing and some things are just not going to be detectable that early. And for that reason, the standard gestation at which to perform a fetal anomaly scan is twenty weeks.

So any time between eighteen to twenty-two weeks is the recommended period to do the formal fetal morphology scan. And that scan usually takes about 45 minutes and there's a very detailed checklist of standard views that we need to obtain to screen for the most common structural anomalies.

About 3 percent of all pregnancies are affected by a congenital anomaly, which is a lot higher than most women expect. And a lot of women coming for that twenty week scan see it as a social occasion and they often bring their partners and pre COVID, often mums and friends, and often their kids as well. So one of the important things that we do when we're doing ultrasounds for women is actually ensuring that they understand the medical purpose of the scan.

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And if there are too many people in the room and that impedes the concentration of the sonographer, then we should ask those support people to leave the room, have one person in there with the woman. And then, if time permits, bring in the the rest of the family for a quick look at the end, but it's not a great situation to be diagnosing an abnormality when you have the whole family watching you and potentially being a distraction.

So at this twenty week scan, as well as checking the fetal anatomy, we also check placental position. This is where we might diagnose placenta praevia, where the placenta is implanted over the internal cervical os of the cervix, or a low-lying placenta, where it's not overlying the internal os, but the margin of the placenta is within two centimetres.

And for those women with a low-lying placenta, we would offer a follow up scan in third trimester to see if the placenta is still low lying. The majority of these low-lying placentas will not be within two centimetres of the os by the end of third trimester because the lower segment grows and stretches quite considerably.

However, those with a complete placenta previa, where the placenta's already overlapping the cervix these are much less likely to move away sufficiently to allow vaginal birth. So women with a low-lying placenta will be advised to have a caesarean section if it remains low in third trimester. And then there's one other important bit of information we get from the twenty week scan and that's the cervical length.

So we measure the length of the cervix to assess a woman's risk of preterm birth. If the cervix is less than 25mm then we would discuss potential prophylactic interventions including vaginal progesterone or cervical cerclage. So, in summary, the three main reasons we do the twenty week scan is to detect fetal structural abnormalities, diagnose placenta praevia, and identify women at increased risk of preterm birth.

Women at this scan often ask for to know the fetal sex and that is something that most sonographers and doctors are happy to disclose at that time. A lot of women already know the fetal sex because they've had non-invasive prenatal testing which can diagnose fetal sex based on detection of sex chromosome DNA in maternal blood.

Following the twenty week scan you will also notice that a lot of women have third trimester growth scans. Now this isn't routine for every pregnant woman, so some low-risk women will not have another scan after twenty weeks.

But if women do have risk factors for fetal growth restriction or they develop obstetric complications such as preeclampsia. or antepartum hemorrhage, then they will very likely have a growth scan to check on fetal growth and well-being.

When we check fetal growth, we can't do a crown rump length after first trimester, so we can't measure how long the baby is. We measure the head circumference, the biparietal diameter of the skull, abdominal circumference, and femur length, and then we use those measurements to calculate an estimated fetal weight. And we use that to monitor fetal growth.

We also measure blood flow through the umbilical cord often referred to as the umbilical cord dopplers.

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And we measure the fluid around the baby. These are indicators of fetal well-being and placental function. So if a woman has medical risk factors like essential hypertension or preexisting diabetes or a high BMI she would usually be booked in for some growth scans in third trimester but as I said some women may not have one if they are low risk.

And then towards the end of pregnancy, women may have ultrasound monitoring if they go over their due date. So this is called post term monitoring and this is to identify babies that might be at increased risk of stillbirth and need earlier delivery. So we would normally recommend all women have an induction of labour by forty-two weeks in order to reduce the risk of stillbirth. And most hospitals will institute some sort of foetal monitoring after forty weeks.

So in that scan, we're not measuring foetal growth. It's very inaccurate to measure baby size after thirty-seven weeks. We're just looking at the umbilical artery dopplers, the amniotic fluid level and then usually perform a CTG in conjunction with that overall well-being assessment.

So they're the main circumstances in which we use ultrasound. We also use it as a point of care tool in clinic if we're not sure about fetal presentation, if you're not sure if a baby's breech and you're booking her for an induction, then of course you want to double check your physical examination with a scan.

We also use ultrasound in high-risk tertiary referral settings for babies with suspected anomalies, complicated twin pregnancies or if a woman needs an invasive procedure like an amniocentesis. Other situations where we might use it is if a woman comes in with reduced fetal movements and we can't detect a fetal heartbeat.

So that's one of, I guess the most fraught situations, when we have to diagnose a fetal death by ultrasound for someone who's come in with reduced fetal movements and that's a situation where we would always try and be as sympathetic and yet clear and direct in our language as possible when communicating unexpected news like this to a woman.

Obstetric ultrasound is very different from a lot of other radiological procedures because a woman is awake, she's looking directly at you as you are scanning, and a lot of women expect to be given information during the scan while you're actually concentrating on obtaining the diagnostic information. So part of our role as doctors and sonographers is to explain to a woman what the procedure is for, what we're going to do.

Women usually have their own monitor so they can watch the scan and look at the baby as we are acquiring the images. But we also have to explain that if we're not talking during the scan, it doesn't mean that there's something wrong, that we're actually just concentrating on the technical aspects of the imaging, and that we will explain everything to them at the end of the scan. And that just stops the woman getting incredibly anxious if the sonographer is suddenly going quiet and not giving a kind of running commentary of what she's looking at.

When we do have to give unexpected news like a diagnosis of miscarriage or a fetal death then giving a woman and her support person privacy and sympathy and support is very important, so it's something that is one of the more challenging aspects of pregnancy care, and in those situations, it is also very helpful to have a second

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person come in and confirm the diagnosis, both from, a medical perspective, but also to convey to the woman that we are taking the diagnosis and the implications of the results very seriously.

So there are actually some guidelines, published in the UK, about how we communicate unexpected findings, such as a fetal anomaly or news of a missed miscarriage or fetal death to pregnant women, which I recommend to you. And I'll put a link to it in the podcast at the end. It gives suggested plain English language for some of the terminology that women might not understand. And just helps make what can be a pretty distressing situation less unpleasant. If we're avoiding medical jargon and using information or conveying information in a way that the woman understands.

The last thing I guess to mention is that ultrasound is considered a very safe diagnostic modality. It does have the potential biologically to cause tissue heating properties, tissue heating, but the level of power that we use in obstetric ultrasound is not such that we would ever really get to a dangerous level.

However, there is the principle of using ultrasound exposure at a minimum as required for the diagnostic purposes. So the ALARA principle, it stands for as low as reasonably achievable, and that refers to our general principle for exposing women and developing babies to ultrasound energy.

So the sorts of ultrasound that does expose the baby to more energy than usual are the sorts of modalities we use to assess blood flow. So Doppler measurements and pulsed wave Doppler, particularly because it has a very focused energy, are the things that are more likely to potentially cause tissue heating. But we generally don't have an upper limit for the number of scans that someone can have in pregnancy. And most women don't have a huge amount of concern about ultrasound exposures.

I hope that gives you a bit of background as to the types of ultrasound that we do in pregnancy and why we do them. And so next time you're in the clinic listening to a doctor convey results of an ultrasound back to a woman, or if you're fortunate enough to watch an ultrasound on a pregnant woman, then just think to yourself, why is this woman having the scan? What information are we obtaining from it and how is that going to guide our management for this woman and her baby?

I hope you enjoy the term, hope you enjoy watching some ultrasounds, seeing cute pictures of babies, but don't forget it is a medical intervention that we're doing for a specific reason.

Have a great time in women's health and enjoy the rest of the podcast series.

Here is the link to the paper Prof Lisa Hui mentions in the episode

<https://journals.sagepub.com/doi/full/10.1177/1742271X20935911>