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Diagnostic Ultrasonography

Diagnostic Ultrasound is the same ultrasound technique used in the screening ultrasound and in the anatomy scan. The diagnostic ultrasound is evaluated by a physician specialist who has additional training in maternal-fetal medicine. A diagnostic ultrasound can take 1 hour or more. In addition to a diagnostic ultrasound, there are two other types of ultrasound tests that can assist in the diagnosis of birth defects.

Fetal Echocardiography

Birth defects that involve the heart (congenital heart defects) are the most common of all birth defects and have one of the highest mortality rates following birth. One out of every 100 babies is born with a heart defect. Early diagnosis of a heart defect helps provide the pregnant woman with good prenatal care and allow for a planned delivery at a hospital (tertiary care centre) that will be able to care for a newborn baby with a heart defect. A special type of ultrasound called a fetal echocardiogram is required to confirm a fetal heart defect.

These are answers to some common questions about fetal echocardiography:

When is a fetal echocardiogram necessary?

The prenatal ultrasound tests that are done prior to birth can give information about whether the fetal heart has developed with all four chambers. Most unborn babies do not require any further testing. Some situations in which a fetal echocardiogram may be necessary include, but are not limited to, the following:

- increased nuchal translucency measurement found at the 11 week - 13 week+6day scan
- if a sibling was born with a congenital heart defect
- a family history of congenital heart disease (such as parents, aunts or uncles, or grandparents)
- a chromosomal or genetic abnormality discovered in the fetus
- if a mother has taken certain medications that may cause congenital heart defects, such as anti-seizure medications or prescription acne medications
- a routine prenatal ultrasound has discovered possible heart abnormalities
- poorly controlled insulin-dependent (type 1) diabetes mellitus
- abnormality of another major organ system
- if the mother has used alcohol or drugs during her pregnancy
- if a mother has diabetes, phenylketonuria, or a connective tissue disease such as lupus
- if the mother has had rubella during pregnancy

Who performs a fetal echocardiogram?

A detailed examination of the fetal heart and connecting vessels is carried out

usually at 20 weeks by a consultant cardiologist.

The test is sometimes done earlier in pregnancy using transvaginal ultrasound (the ultrasound probe is inserted in the mother's vagina), but will be repeated later to confirm any findings.

Are there limitations of fetal echocardiography?
Some heart abnormalities are not detectable prenatally even with a detailed expert examination. These tend to be minor defects, such as small holes in the heart, or mild valve abnormalities. In addition, some cardiac defects do not become evident until after birth.

The fetal echocardiogram focuses on the heart primarily and may not show defects in other parts of the fetus.

Doppler Ultrasound

Doppler flow is a type of ultrasound that uses sound waves to measure the flow of blood through a blood vessel. Waveforms of the blood flow are shown on the ultrasound screen. Doppler flow studies may be used to assess blood flow in the umbilical blood vein and arteries, fetal brain, and fetal heart. Doppler flow is sometimes called Doppler 'velocimetry'.

A Doppler flow study is often used when an unborn baby has intrauterine growth restriction (IUGR), which means the unborn baby is smaller than normal for his/her gestational age. An unborn born baby with IUGR does not necessarily have a birth defect; however, many birth defects result in small-for-gestational-age babies. The Doppler flow study may show that blood flow in the umbilical vessels is decreased, indicating that the unborn baby may not be receiving enough blood, nutrients, and oxygen from the placenta.

A specially trained physician performs this test using a technologically advanced ultrasound machine. If the test shows a decreased amount of blood flow, other testing may be needed.

Magnetic Resonance Imaging

Magnetic Resonance Imaging (MRI) is a non-invasive procedure that uses powerful magnets and radio waves to construct pictures of the body. A powerful magnet generates a magnetic field roughly 10,000 times stronger than the natural background magnetism from the earth. Hydrogen atoms within a human body will align with this field. When the focused radio wave pulses towards the aligned hydrogen atoms in tissues of interest, they will return a signal. The subtle difference in the signals rebounding from different tissues is translated into images which enables the MRI to identify organs and the contrast between tissues within the organs. These imaging planes or 'slices' are stored in a computer, or printed on film. MRI can easily be performed through clothing and bones.

What Is Involved With an MRI Scan?

The MRI scanner is like a big square box with a tunnel through the middle. During a MRI scan you have to lie very still in the tunnel, usually on your back, but if this is not possible you may be able to lie on your side.

The table that you lie on is narrow. You can talk to the MRI technologist performing the scan. The scan usually takes up to 30 minutes.

Foam cushions and soft straps are used to help you be comfortable and keep still. You will wear earplugs or headphones to muffle the loud "knocking" noise of the machine.

How is the test performed?

The MRI scanner is located within a specially-shielded room to avoid interference from other radio waves. As MRI relies on magnets, all metal objects such as earrings and certain clothing must be removed. Lying down on a narrow table which slides into a large tunnel-like tube, the pregnant woman is asked to lie very still since excessive movement can blur MRI images and cause certain artifacts.

Is MRI Safe?

The magnetic field and radio waves are believed to be safe and no negative effects on unborn babies have been reported with normal use. There is no ionizing radiation (e.g. x-rays) used in MRI.