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Obstetric Ultrasound

What is Obstetrical Ultrasound Imaging?

Ultrasound imaging, also called ultrasound scanning or sonography, involves exposing part of the body to high-frequency sound waves to produce pictures of the inside of the body. Ultrasound examinations do not use ionizing radiation (as used in x-rays). Because ultrasound images are captured in real-time, they can show the structure and movement of the body's internal organs, as well as blood flowing through blood vessels.

Ultrasound imaging is a noninvasive medical test that helps physicians diagnose and treat medical conditions.

Obstetrical ultrasound provides pictures of an embryo or fetus within a woman's uterus, as well as the mother's uterus and ovaries.

A Doppler ultrasound study may be part of an obstetrical ultrasound examination.

Doppler ultrasound is a special ultrasound technique that evaluates blood flow through a blood vessel, including the body's major arteries and veins in the abdomen, arms, legs and neck.

During an obstetrical ultrasound the examiner may evaluate blood flow in the umbilical cord or may in some cases assess blood flow in the fetus or placenta.

What are some common uses of the procedure?

Obstetrical ultrasound is a useful clinical test to:

- establish the presence of a living embryo/fetus.
- estimate the age of the pregnancy.
- diagnose congenital abnormalities of the fetus.
- evaluate the position of the fetus.
- evaluate the position of the placenta.
- determine if there are multiple pregnancies.
- determine the amount of amniotic fluid around the baby.
- check for opening or shortening of the cervix or mouth of the womb.
- assess fetal growth.
- assess fetal well-being.



How should I prepare?

You should wear a loose-fitting, two-piece outfit for the examination. Only the lower abdominal area needs to be exposed during this procedure.

If an ultrasound is ordered by your clinician early in your pregnancy, you may be instructed to have a full bladder for the procedure. Air interferes with sound waves, so if your bladder is distended, the air-filled bowel is pushed out of the way by the bladder and an image of the uterus and embryo or fetus is obtained.

The radiologist or sonographer may elect to examine an early pregnancy by means of transvaginal ultrasound. This requires an empty urinary bladder. You should ask for specific instructions for this imaging study when you make your appointment. For more information on transvaginal ultrasound, see the Pelvic Ultrasound page (www.RadiologyInfo.org/en/info.cfm?pg=pelvus).

What does the equipment look like?

Ultrasound scanners consist of a console containing a computer and electronics, a video display screen and a transducer that is used to do the scanning. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. The transducer sends out inaudible high frequency sound waves into the body and then listens for the returning echoes from the tissues in the body. The principles are similar to sonar used by boats and submarines.

The ultrasound image is immediately visible on a video display screen that looks like a computer or television monitor. The image is created based on the amplitude (strength), frequency and time it takes for the sound signal to return from the area of the patient being examined to the transducer and the type of body structure the sound travels through.



How does the procedure work?

Ultrasound imaging is based on the same principles involved in the sonar used by bats, ships, fishermen and the weather service. When a sound wave strikes an object, it bounces back, or echoes. By measuring these echo waves, it is possible to determine how far away the object is and its size, shape and consistency (whether the object is solid, filled with fluid, or both).



Transabdominal transducer

In medicine, ultrasound is used to detect changes in appearance of organs, tissues, and vessels or detect abnormal masses, such as tumors.

In an ultrasound examination, a transducer both sends the sound waves and receives/records the echoing waves. When the transducer is pressed against the skin, it directs small pulses of inaudible, high-frequency sound waves into the body. As the sound waves bounce off of internal organs, fluids and tissues, the sensitive microphone in the transducer records tiny changes in the sound's pitch and

direction. These signature waves are instantly measured and displayed by a computer, which in turn creates a real-time picture on the monitor. One or more frames of the moving pictures are typically captured as still images. Small loops of the moving “real time” images may also be saved.

The movement of the embryo or fetus and his or her heartbeat can be seen as an ongoing ultrasound movie. Most ultrasound devices also have an audio component that processes the echoes produced by blood flowing through the fetal heart, blood vessels and umbilical cord. This sound can be made audible to human ears and has been described by patients as a whooshing noise.



Doppler ultrasound, a special application of ultrasound, measures the direction and speed of blood cells as they move through vessels. The movement of blood cells causes a change in pitch of the reflected sound waves (called the Doppler effect). A computer collects and processes the sounds and creates graphs or color pictures that represent the flow of blood through the blood vessels.

How is the procedure performed?

For most ultrasound exams, the patient is positioned lying face-up on an examination table that can be tilted or moved.

A clear water-based gel is applied to the area of the body being studied to help the transducer make secure contact with the body and eliminate air pockets between the transducer and the skin that can block the sound waves from passing into your body. The sonographer (ultrasound technologist) or radiologist then presses the transducer firmly against the skin in various locations, sweeping over the area of interest or angling the sound beam from a farther location to better see an area of concern.

Sometimes the radiologist determines that a transvaginal scan needs to be performed. This technique often provides improved, more detailed images of the uterus and ovaries. This method of scanning is especially useful in early pregnancy.

Transvaginal ultrasound is performed very much like a gynecologic exam and involves the insertion of the transducer into the vagina after the patient empties her bladder. The tip of the transducer is smaller than the standard speculum used when performing a Pap test. A protective cover is placed over the transducer, lubricated with a small amount of gel, and then inserted into the vagina. Only two to three inches of the transducer end are inserted into the vagina. The images are obtained from different orientations to get the best views of the uterus and ovaries. Transvaginal ultrasound is usually performed with the patient lying on her back, possibly with her feet in stirrups similar to a gynecologic exam.



Transvaginal transducer

Doppler sonography is performed using the same transducer.

When the examination is complete, the patient may be asked to dress and wait while the ultrasound images are reviewed.

This ultrasound examination is usually completed within 30 minutes.

What will I experience during and after the procedure?

Most ultrasound examinations are painless, fast and easy.

After you are positioned on the examination table, the radiologist or sonographer will apply some warm water-based gel on your skin and then place the transducer firmly against your body, moving it back and forth over the area of interest until the desired images are captured. There is usually no discomfort from pressure as the transducer is pressed against the area being examined.



If scanning is performed over an area of tenderness, you may feel pressure or minor pain from the transducer.

At times the sonographer may have to press more firmly to get closer to the embryo or fetus to visualize the structure better. Any discomfort is usually minimal and temporary.

If a Doppler ultrasound study is performed, you may actually hear pulse-like sounds that change in pitch as the blood flow is monitored and measured.

With transvaginal scanning, there may be minimal discomfort as the transducer is moved in the vagina.

Once the imaging is complete, the gel will be wiped off your skin.

After an ultrasound examination, you should be able to resume your normal activities immediately.

Who interprets the results and how do I get them?

A radiologist, a physician specifically trained to supervise and interpret radiology examinations, will analyze the images and send a signed report to your primary care physician or the physician who referred you for the exam, who will share the results with you. In some cases the radiologist may discuss results with you at the conclusion of your examination.

Follow-up examinations are often necessary, and your doctor will explain the exact reason why another exam is requested. Sometimes a follow-up exam is done because a suspicious or questionable finding needs clarification with additional views or a special imaging technique. A follow-up examination may be necessary so that any change in a known abnormality can be detected over time. Follow-up examinations are sometimes the best way to see if treatment is working or if an abnormality is stable over time.

What are the benefits vs. risks?

Benefits

- Most ultrasound scanning is noninvasive (no needles or injections) and is usually painless.
- Ultrasound is widely available, easy-to-use and less expensive than other imaging methods.
- Ultrasound imaging does not use any ionizing radiation.
- Ultrasound scanning gives a clear picture of soft tissues that do not show up well on x-ray images.
- Ultrasound is the preferred imaging modality for the diagnosis and monitoring of pregnant

women and their unborn babies.

- Ultrasound has been used to evaluate pregnancy for nearly four decades and there has been no evidence of harm to the patient, embryo or fetus. Nevertheless, ultrasound should be performed only when medically indicated.
- Ultrasound allows the doctor to see inside the uterus and provides much information about the pregnancy.

Risks

- For standard diagnostic ultrasound there are no known harmful effects on humans.

What are the limitations of Obstetrical Ultrasound Imaging?

Obstetric ultrasound cannot identify all fetal abnormalities. Consequently, when there are clinical or laboratory suspicions for a possible abnormality, a pregnant woman may have to undergo nonradiologic testing such as amniocentesis (the evaluation of fluid taken from the sac surrounding the fetus) or chorionic villus sampling (evaluation of placental tissue) to determine the health of the fetus, or she may be referred by her primary care provider to a perinatologist (an obstetrician specializing in high-risk pregnancies).

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