

Ultrasound - Venous (Extremities)

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What is Venous Ultrasound?

All ultrasound exams use very high-frequency sound waves and echoes to obtain images of structures inside the body. Different signals are produced when the beam of sound waves is focused at a particular site and the waves bounce back from different types of tissue and body fluid. The resulting pattern of echoes forms an accurate picture of whatever is being examined, in this case the veins throughout the body that carry blood back to the heart. Ultrasound studies differ from x-rays in one very important respect: there is no exposure to ionizing radiation. Another term for an ultrasound exam is "sonography."



Ultrasound: Common femoral vein thrombosis.

The principle of ultrasound imaging is very much like that of sonar—a method used by navy ships to detect submarines (or by fishing boats to locate large schools of fish). The echo pattern of the returning sound waves that bounce off the object makes it stand out from the background pattern. Another example of this principle is the bat, which, when flying about, replaces eyesight with a sonar-type system to avoid colliding with nearby objects and to find insects to eat. In medicine, the procedure is used to detect disease that changes the appearance of organs, tissues, or abnormal masses, such as tumors. When a blood clot develops inside a vein, venous ultrasound can show the clot and also the slowing or complete block of blood flow that it causes.

What are some common uses of Venous Ultrasound?

The most common reason for a venous ultrasound exam is to search for blood clots, especially in the veins of the leg. These clots may break off and pass into the lungs, where they can cause a dangerous condition called pulmonary embolism. If found in time, there are treatments that can prevent this from happening.

Other reasons to do a venous ultrasound study:

- Find the cause of long-standing leg swelling. In people with varicose veins, a common condition, the valves that keep blood flowing in the right direction may not work well, and venous ultrasound can help the surgeon decide how best to deal with this condition.
- Aid placement of a needle or catheter in a large interior vein. Sonography can help locate the exact site of the vein and avoid complications, such as bleeding or air in the chest cavity.
- Map out the veins in the leg or arm so that segments may be removed and used to bypass an area of disease. An example is using pieces of vein from the leg to surgically bypass narrowed coronary arteries.
- Examine a blood vessel graft used for dialysis if it is not working as expected; an area of narrowing in the graft may be responsible.

How should I prepare for my Venous Ultrasound procedure?

You should dress comfortably, but you will have to remove all clothing and jewelry in the area to be examined. Otherwise, there are no special measures that need be taken. You may have heard that a period of fasting is necessary, but this is important only if you are to have an examination of

veins in your abdomen. In this case, you will probably be asked not to ingest any food or fluids except water for six to eight hours ahead of time.

What does the Venous Ultrasound equipment look like?

A small, hand-held device called a transducer, which looks like a microphone, is placed over the area of interest. Transducers are available that conform to different parts of the body, such as the leg, for doing a venous ultrasound study. They range in size from that of a fat pen to one resembling a deck of cards. Once the exam begins, the ultrasound image can be seen in black and white on the screen (or in color if a special type of exam, called "color flow" or "power Doppler ultrasound," is done to monitor blood flow in the veins).

How does the Venous Ultrasound procedure work?

The ultrasound transducer generates sound waves that pass through the skin and also serves as a microphone to record the returning sounds—the echoes. When pressed against the skin, the transducer directs high-frequency sound waves toward the veins being studied and records any changes in the pitch and direction of the returning echoes. The bounce-back echoes, or the signature, are automatically measured by the computer and converted electronically to a picture that shows what is happening at that instant—creating a so-called "real-time" image on the monitor screen. These images can be videotaped, or they may be frozen in time to obtain still pictures. If a Doppler study is done, changes in blood flow can be displayed in color on the screen and actually heard as a change in pitch.

How is Venous Ultrasound performed?

After positioning the patient on the adjustable examination table, the technologist will apply a gel-like material onto the skin to make close contact between the skin and transducer, eliminating air pockets. This will ensure that the sound waves are freely conducted into and out of the body. The radiologist or technologist presses the transducer firmly to the skin and moves it back and forth to obtain complete images of areas of interest. The entire area of interest will be scanned to obtain images from different perspectives. Sometimes the examiner may want to obtain images while you are standing upright. You will be asked to relax and remain calm during the examination. The radiologist also may ask you health-related questions during the exam and may repeat some images to clarify the findings.

What will I experience during my Venous Ultrasound?

You will not hear any of the ultrasound emission or the echoes sent back to the screen, although you may hear pulse-like sounds if a Doppler examination is ordered. You will probably lie on your back, and the table may be tilted or moved to provide better access to a particular area. You may be standing for the procedure. Often, you will have a chance to watch the screen along with the examiner, though it will not be easy to make sense out of what you see. Most ultrasound studies take no longer than a half-hour. Venous ultrasound is usually a painless examination. If, however, your leg is swollen and tender, the pressure from the ultrasound transducer may add to your discomfort.

What are the benefits vs. risks of Venous Ultrasound?

Benefits

- Ultrasound scanning is widely available and less expensive than other imaging methods. No radiation exposure is involved. Furthermore, this procedure is noninvasive, requiring no penetration of the skin or any body cavity.
- Ultrasound scanning gives a clear picture of soft tissues that do not show up well on x-ray images.
- Venous ultrasound helps to detect blood clots in the veins of the legs before they become dislodged and pass to the lungs. It can also show the movement of blood within blood vessels.
- Compared to venography, which requires injecting contrast material into a vein, venous ultrasound is nearly as accurate for detecting blood clots in the calf and almost fully as accurate in finding clots in veins of the thigh.
- Sonography is easily carried out, painless and causes no health problems. It may be repeated as often as is necessary.

Risks

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

What are the limitations of Venous Ultrasound?

Veins lying deep beneath the skin, especially small veins in the calf, may be hard to see clearly. It can be difficult to tell whether a blood clot has totally closed off a vein or whether a small amount of blood is still getting through.