



Intravascular Ultrasound

Intravascular ultrasound (IVUS) uses a transducer or probe to generate sound waves and produce images of blood vessels. When used to evaluate the coronary arteries, IVUS can show the entire artery wall and provide important information about the amount and type of plaque buildup, which can help determine if you are at risk for heart attack. Ultrasound does not use ionizing radiation, has no known harmful effects, and can provide clear pictures of soft tissues that are not well seen on x-ray images.



This procedure requires little or no special preparation. However, since it is often used in conjunction with another procedure, you should ask your doctor about how to prepare and whether you will be admitted to the hospital for observation. If you are to be sedated, you may be asked not to eat or drink anything for up to eight hours before your exam. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

What is Intravascular Ultrasound?

Intravascular ultrasound (IVUS), also known as endovascular ultrasound or intravascular echocardiography, is an imaging technique that uses a transducer or probe to generate sound waves and produce pictures of the insides of blood vessels. The technique uses a special catheter with a small ultrasonic transducer on one end. The catheter is threaded through an artery or vein to the target location, where sound waves are generated by the transducer to produce images of the blood vessels and help physicians assess various conditions.

What are some common uses of the procedure?

IVUS is used as an adjunct in the diagnosis and treatment of both arteries and veins. In the veins, IVUS is most often used for acute and chronic blood clots, especially if narrowing of the veins is thought to be the culprit. The endovascular ultrasound can help find areas of narrowing or occlusion deep in the body and

also help measure the veins for appropriate sizing of stents to keep the vessel open.

In the arteries, IVUS is performed to see peripheral arteries of the legs and coronary arteries, although it may be used in any artery in the body. IVUS is often used in conjunction with catheter angiography to help diagnose peripheral artery disease which is not well seen on the angiogram and to plan the size of stents which may need to be placed to keep the artery open.

IVUS can be used to visualize the coronary arteries in conjunction with or to help plan for catheter angiography or angioplasty and vascular stenting. Unlike angiography, IVUS can show the entire artery wall and reveal more information about plaque buildup (atherosclerosis), which is associated with an increased risk of heart attack. Information from IVUS often affects treatment decisions, such as the sizing of a stent and where it should be placed. It is often used after angioplasty and vascular stenting to confirm the stent has been placed correctly and that the procedure has addressed the problem.

IVUS is also used to assess abdominal aortic aneurysm before, during and after interventions to repair the vessel.

How should I prepare?

You should inform your physician of any medications being taken and if there are any allergies, especially to iodinated contrast materials. Also inform your doctor about recent illnesses or other medical conditions.

Be sure to mention kidney disease and diabetes mellitus to your doctor.

You will be asked to remove some of your clothes and to wear a gown during the exam. You may also be asked to remove jewelry, removable dental appliances, eye-glasses and any metal objects or clothing that might interfere with the x-ray images.

Women should always inform their physician and x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby. See the Safety page for more information about pregnancy and x-rays.

If you are breastfeeding at the time of the exam, ask your doctor how to proceed. It may help to pump breast milk ahead of time and keep it on hand for use until contrast material has cleared from your body, about 24 hours after the test. However, the most recent American College of Radiology (ACR) Manual on Contrast Media reports that studies show the amount of contrast absorbed by the infant during breastfeeding is extremely low. For further information please consult the ACR Manual on Contrast Media and its references.

Some mothers may be concerned about the potential side effects of contrast to their infant and choose to abstain from breastfeeding for 12 to 24 hours.

If sedation is used for the procedure, please ask your doctor about how long you should abstain from breastfeeding your infant. In addition, you may be asked not to eat or drink anything for four to eight hours before your exam if sedation is used.

Be sure that you have clear instructions from your health care facility.

Do not drive for 24 hours after your exam if sedation is used; arrange for someone to drive you home. Because an observation period is necessary following IVUS and the exam is often used in conjunction with another procedure, you should ask your doctor if you will need to be admitted to the hospital overnight.

What does the equipment look like?

The IVUS catheter is a thin, flexible tube with a tiny ultrasonic transducer attached to one end. The other end of the catheter connects to a computer workstation that converts the sound waves from the transducer into real-time images on a monitor. Different size catheters are available depending on the type of blood vessel being imaged.

How does the procedure work?

IVUS uses high-frequency sound waves to provide images from inside the blood vessels. Sound waves sent from the transducer bounce off of the walls of the artery and return to the transducer as echoes. A computer helps convert these echoes into images on the monitor to produce pictures of the coronary arteries or other blood vessels.

How is the procedure performed?

IVUS is usually performed in conjunction with angiography in a fluoroscopy room, also called a cath lab or interventional radiology suite.

This procedure is often done on an outpatient basis. However, some patients may require admission following the procedure. Ask your doctor if you will need to be admitted.

You will be positioned on the procedure table.

You may be connected to monitors that track your heart rate, blood pressure, oxygen level and pulse.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm to administer a sedative. This procedure may use moderate sedation. It does not require a breathing tube. However, some patients may require general anesthesia.

The area of your body where the catheter is to be inserted will be sterilized and covered with a surgical drape.

Your physician will numb the area with a local anesthetic. This may briefly burn or sting before the area becomes numb.

A very small skin incision is made at the site.

A sheath is first inserted into an artery or vein (usually in the groin). Using x-ray or ultrasound guidance, the catheter is inserted into the sheath and gently maneuvered through the vessel to the target location over a very thin, soft wire. Once in place, the transducer on the end of the catheter uses sound waves to produce pictures of the blood vessels. Doctors can move the catheter to obtain images of the inside of the vessels at different locations.

When the procedure is complete, the catheter is removed and pressure is applied to stop any bleeding. Sometimes, your doctor may use a closure device to seal the small hole in the artery. This will allow you to move around more quickly. No stitches are visible on the skin. The tiny opening in the skin is covered with a dressing.

What will I experience during and after the procedure?

You will feel a slight pinch when the needle is inserted into your vein for the IV line and when the local anesthetic is injected. Most of the sensation is at the skin incision site. This is numbed using local anesthetic. You may feel pressure when the catheter is inserted into the vein or artery. However, you will not feel serious discomfort.

If the procedure is done with sedation, the intravenous (IV) sedative will make you feel relaxed, sleepy and comfortable for the procedure. You may or may not remain awake, depending on how deeply you are sedated.

You may feel slight pressure when the catheter is inserted, but no serious discomfort.

You will not feel the catheter in your artery or vein, nor will there be any pain during acquisition of the ultrasound images.

You may need to lie flat on your back for a few hours after the test with pressure applied to the catheter insertion site in your groin to prevent bleeding. In some cases, your physician may use a device that seals the small hole in the artery, called a "closure device," which will allow you to move around sooner.

For several hours, your catheter site will be checked for bleeding or swelling and your blood pressure and heart rate will be monitored.

You may feel a little sleepy until the sedative has worn off.

Your time in the hospital will vary depending on whether IVUS was done in conjunction with another procedure such as catheter angiography or angioplasty. While IVUS itself does not add to your recovery time, catheter angiography recovery will require you to stay in the hospital for observation for up to six hours. Angioplasty and vascular stenting recovery may require 12 to 24 hours. Recovery from vein procedures depend heavily on the complexity of your procedure.

After you return home, you should rest and drink plenty of fluids. Avoid lifting heavy objects and strenuous exercise for at least 24 hours, sometimes longer. It is strongly recommended that you quit smoking as this is a major contributor to diseases of the arteries and veins.

The catheter insertion site may be bruised and sore. If bleeding begins where the catheter was inserted, you should lie down, apply pressure to the site and call your physician.

Call your physician immediately if you notice any change in the color of your leg, pain, swelling or warm feeling in the area where the catheter was inserted.

Who interprets the results and how do I get them?

The interventional radiologist or physician treating you will determine the results of the procedure and will send a report to your referring physician, who will share the results with you.

Your interventional radiologist may recommend a follow-up visit.

This visit may include a physical check-up, imaging exam(s) and blood tests. During your follow-up visit, tell your doctor about any side effects or changes you have noticed.

What are the benefits vs. risks?

IVUS has many benefits including:

- showing the presence and amount of plaque in arteries
- measuring the degree to which the vessel has become narrowed from plaque
- providing information about what the plaque is made of
- detection of restenosis
- more accurate stent placement and reduced incidence of stent thrombosis in arteries and veins
- finding stenosis or narrowing which is not well seen with angiography
- finding areas of vein external compression, which may be predisposed to blood clots
- no exposure to ionizing radiation
- Any procedure that places a catheter inside a blood vessel carries certain risks. These risks include damage to the blood vessel, bruising or bleeding at the puncture site, and infection. The doctor will take precautions to mitigate these risks.

Other risks may include:

- irregular heart rhythms (arrhythmia)
- a blood clot
- an allergic reaction to the medications used during the procedure
- in very rare cases, a heart attack, stroke, or blood clot in the lung

IVUS itself adds little additional risk to angioplasty and catheter angiography.

What are the limitations of Intravascular Ultrasound?

Because of the catheter's size and stiffness, IVUS sometimes cannot be navigated through very narrowed or twisted blood vessels. The technology sometimes produces image artifacts. There is conflicting information regarding the ability of IVUS to characterize high-risk plaques and thrombus.

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