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, doctors often use it in conjunction with another procedure. Therefore, ask your doctor about how to prepare and whether you will be admitted to the hospital. If your procedure will use sedation, your doctor may tell you 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 need to wear a gown.

What is Intravascular Ultrasound?

Intravascular ultrasound (IVUS) is also known as endovascular ultrasound or intravascular echocardiography. It uses a transducer (http://www.radiologyinfo.org) or probe to generate sound waves and produce pictures of the insides of blood vessels. IVUS uses a special catheter (http://www.radiologyinfo.org) with a small ultrasonic transducer on one end. The doctor threads the catheter through an artery or vein to the target location. Once there, the transducer generates sound waves to produce images of the blood vessels and help assess various conditions.

What are some common uses of the procedure?

Doctors use IVUS to assist in the diagnosis and treatment of both arteries and veins. In the veins, doctors most often IVUS for acute and chronic blood clots, especially if narrowing of the veins is thought to be the cause. IVUS can help find areas of narrowing or blockage deep in the body. It also helps measure the veins for appropriate sizing of stents to keep the vessel open.

IVUS is useful in assessing any artery in the body. It is particularly useful in helping doctors see peripheral arteries of the legs and coronary arteries. Doctors often use IVUS in conjunction with catheter angiography to help diagnose *peripheral artery disease (https://www.radiologyinfo.org/en/info/pad) (PAD)*. PAD is best seen using IVUS, which is also useful in planning the size of stents to keep the artery open.

IVUS can visualize the coronary arteries in conjunction with or to help plan for *catheter angiography (https://www.radiologyinfo.org/en/info/angiocath)* or *angioplasty and vascular stenting (https://www.radiologyinfo.org/en/info/angioplasty)* . Unlike angiography, IVUS can show the entire artery wall and reveal more information about plaque buildup (atherosclerosis (http://www.radiologyinfo.org)), which can increase your risk of heart attack. Information from IVUS often affects treatment decisions, such as the sizing of a stent (http://www.radiologyinfo.org) and where it should be placed. Doctors often use it after angioplasty and vascular stenting to confirm the stent is in the correct place and that it has corrected the problem.

IVUS is also used to assess *abdominal aortic aneurysm (https://www.radiologyinfo.org/en/info/abdoaneurysm)* before, during and after interventions to repair the vessel.

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How should I prepare?

While intravascular ultrasound does not use any contrast material, the procedures associated with it (catheter angiography, angioplasty, etc.) do.

Tell your doctor about all the medications you take. List any allergies, especially to iodine contrast materials (http://www.radiologyinfo.org) . Tell your doctor about recent illnesses or other medical conditions.

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

You may need to remove some clothing and/or change into a gown for the exam. Remove jewelry, removable dental appliances, eyeglasses, and any metal objects or clothing that might interfere with the x-ray images.

Women should always tell their doctor and technologist (http://www.radiologyinfo.org) if they are pregnant. Doctors will not perform many tests during pregnancy to avoid exposing the fetus (http://www.radiologyinfo.org) to radiation. If an x-ray is necessary, the doctor will take precautions to minimize radiation exposure to the baby. *See the Radiation Safety (https://www.radiologyinfo.org/en/info/safety-radiation) 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. Keep it on hand for use until all 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 (https://www.acr.org/Clinical-Resources/Contrast-Manual) and its references.*

Some mothers may have concerns about the potential of passing contrast to their infant. They may choose to abstain from breastfeeding for 12 to 24 hours.

If the procedure uses sedation, ask your doctor how long you should abstain from breastfeeding. In addition, you doctor may tell you not to eat or drink anything for four to eight hours before your exam if it uses sedation.

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

Do not drive for 24 hours after your exam if it uses sedation; arrange for someone to drive you home. Because an observation period is necessary following IVUS and it is often used in conjunction with another procedure, ask your doctor if you will need to stay in 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 from the transducer bounce off the artery walls 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?

Doctors usually perform IVUS with angiography in a fluoroscopy room, also called a cath lab or interventional radiology suite.

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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 lie on the procedure table.

The doctor or nurse may connect you to monitors that track your heart rate, blood pressure, oxygen level, and pulse.

A nurse or ultrasound technologist (http://www.radiologyinfo.org) will insert an intravenous (http://www.radiologyinfo.org) (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 (http://www.radiologyinfo.org) .

The nurse will sterilize the area of your body where the catheter is to be inserted. They will sterilize and cover this area with a surgical drape.

Your doctor will numb the area with a local anesthetic (http://www.radiologyinfo.org) . This may briefly burn or sting before the area becomes numb.

The doctor will make a very small skin incision at the site.

The doctor first inserts a sheath into an artery or vein (usually in the groin). Using x-ray or ultrasound guidance, the doctor inserts the catheter into the sheath and gently maneuvers it through the vessel to the target location over a very thin, soft wire. Once in place, the catheter's transducer 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 doctor will remove the catheter and apply pressure 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 nurse will cover this tiny opening in the skin with a dressing.

What will I experience during and after the procedure?

You will feel a slight pinch when the nurse inserts the needle into your vein for the IV line and when they inject the local anesthetic. Most of the sensation is at the skin incision site. The doctor will numb this area using local anesthetic. You may feel pressure when the doctor inserts the catheter into the vein or artery. However, you will not feel serious discomfort.

If the procedure uses sedation, you will feel relaxed, sleepy, and comfortable. You may or may not remain awake, depending on how deeply you are sedated.

You may feel slight pressure when the doctor inserts the catheter (http://www.radiologyinfo.org) , but no serious discomfort.

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

You may need to lie flat on your back for a few hours after the test and apply pressure to the catheter insertion site to prevent bleeding. In some cases, your doctor may use a "closure device" to seal the small hole in the artery. This will allow you to move around sooner.

For several hours, the doctor or nurse will check your catheter site for bleeding or swelling and monitor your blood pressure and heart rate.

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

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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 depends 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 doctor.

Call your doctor 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 (http://www.radiologyinfo.org) or doctor treating you will determine the results of the procedure. They 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 if you have noticed any side effects or changes.

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 (http://www.radiologyinfo.org)
- 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?

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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 (http://www.radiologyinfo.org) .

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