



## Intravascular Ultrasound

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



This procedure requires little or no special preparation. However, because 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 told not to eat or drink anything 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 their condition.

## What are some common uses of the procedure?

IVUS is most often used to visualize the coronary arteries in conjunction with or to help plan for catheter angiography or angioplasty and vascular stenting. Unlike angioplasty, 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.

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, you should ask your doctor how to proceed. It may help to pump breast milk ahead of time and keep it on hand for use after contrast material has cleared from your body, about 24 hours after the test.

If sedation is used for the procedure, you may be asked not to eat or drink anything for four to eight hours before your exam. 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.

## 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 a picture of the coronary arteries or other blood vessels.

## How is the procedure performed?

IVUS is done in the catheterization lab, also called the cath lab, usually in conjunction with angiography or angioplasty.

This procedure is often done on an outpatient basis. However, some patients may require admission following the procedure. Please consult with your physician as to whether or not you will be admitted.

You will be positioned on the examining table.

You may be connected to monitors that track your heart rate, blood pressure and pulse during the procedure.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm so that sedative medication can be given intravenously. Moderate sedation may be used. As an alternative, you may receive 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.

A very small skin incision is made at the site.

A sheath is first inserted into an artery (usually in the groin) or a vein. Using x-ray or ultrasound guidance, the catheter is inserted into the sheath and gently maneuvered through the vessel to the target location. 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 get pictures of the inside of the vessels at different locations.

At the end of the procedure, the catheter will be removed and pressure will be applied to stop any bleeding. The opening in the skin is then covered with a dressing. No sutures are needed.

## What will I experience during and after the procedure?

You will feel a slight pin prick when the needle is inserted into your vein for the intravenous line (IV) and when the local anesthetic is injected. Most of the sensation is at the skin incision site which is numbed using local anesthetic. You may feel pressure when the catheter is inserted into the vein or artery.

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 and you will not feel any pain during acquisition of the ultrasound images.

You may need to lie flat on your back and apply pressure to the catheter insertion site for a few hours after the test 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 more quickly.

For several hours, your catheter site will be checked for bleeding or swelling and your blood pressure and heart rate will be monitored. Your physician may prescribe medication to relax your arteries to protect against spasm of the arteries or to prevent blood clots.

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 up to six hours. Angioplasty and vascular stenting recovery may require 12 to 24 hours.

After you return home, you should rest and drink plenty of fluids. Avoid lifting heavy objects and strenuous exercise for at least 24 hours. It is strongly recommended that you quit smoking as this is a major cause of atherosclerosis.

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 after your procedure or treatment is complete.

The visit may include a physical check-up, imaging procedure(s) and blood or other lab tests. During your follow-up visit, you may discuss with your doctor any changes or side effects you have experienced since your procedure or treatment.

## What are the benefits vs. risks?

IVUS has many benefits for coronary artery imaging, including:

- showing the presence and amount of coronary artery plaque

- 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
- no exposure to ionizing radiation
- Any procedure that involves placement of 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. However precaution is taken 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
- kidney failure
- in very rare cases, a heart attack or stroke

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

## What are the limitations of Intravascular Ultrasound?

Because of the catheter's size, IVUS cannot be used to image smaller or more narrowed coronary arteries. 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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