TEST

Cardiac intravascular ultrasound

Cardiac intravascular ultrasound uses a tiny catheter to image coronary arteries from inside.

WHAT IT MEASURES
Coronary artery walls, plaque, lumen size, and stent position

SAMPLE
None; ultrasound images from inside a coronary artery

FASTING NEEDED?
Sometimes, before catheterisation or sedation

HOW LONG IT TAKES
Usually 1-3 hours including catheterisation or treatment

RESULTS IN
Immediate; written report timing varies by cardiac laboratory

USED FOR
Diagnosing artery narrowing and guiding or checking stent treatment

MAIN LIMITATION
Only images vessel segments reached by the catheter

Overview

Cardiac intravascular ultrasound, usually called IVUS, creates detailed pictures from inside a coronary artery. These arteries supply blood to the heart muscle.

A small ultrasound probe on a thin catheter sends out sound waves and records their echoes, producing cross-sectional images. IVUS can show the artery wall, plaque, calcium, the channel through which blood flows, and coronary stents.

A coronary angiogram uses X-rays and contrast dye to show the channel's outline. IVUS adds information about the wall and plaque that may not be clear on an angiogram. Because it is invasive, IVUS is generally used during an angiogram or coronary treatment rather than for routine screening.

Why the test is ordered

IVUS may be used when an angiogram does not provide enough detail about a narrowing. It

can assess artery size, plaque, and vessel structure.

During coronary angioplasty, IVUS can help the team:

It is particularly useful in selected complex procedures, including treatment of the left main coronary artery, branching arteries, long areas of disease, or heavily calcified plaque.

- choose a stent's size and length
- check whether a stent has fully expanded
- confirm that it sits against the artery wall
- look for damage at the stent edges
- investigate narrowing or clotting in a previously treated area

Who should have the test

IVUS is most often considered for someone already having coronary angiography, angioplasty, or stenting. It is not normally used to screen people without symptoms or known coronary artery concerns.

Your cardiologist may suggest it if the severity of a narrowing is uncertain, the artery is difficult to measure on an angiogram, or detailed imaging could make treatment safer or more precise. It is not required for every procedure.

How to prepare

Follow the instructions for your cardiac catheterisation appointment. You may need to avoid food and drink for several hours, especially if sedation is planned. Do not fast unless your care team tells you to.

Tell the team about all medicines and supplements you take. Ask for specific instructions if you use blood-thinning or diabetes medicines. Do not stop them on your own.

Also tell the team about:

Kidney function does not affect IVUS images, but it matters because the accompanying angiogram often uses contrast dye. Blood tests may be arranged beforehand.

If you receive sedation, you will usually need someone to take you home. Leave valuables at home and wear comfortable clothing.

- kidney problems

- previous reactions to contrast dye
- bleeding conditions
- allergies
- any possibility that you are pregnant

What happens during the test

IVUS is performed in a cardiac catheterisation laboratory. You lie on an X-ray table while monitors track your heart rhythm, blood pressure, and oxygen level.

The team cleans and numbs an area at your wrist or groin. A short tube called a sheath is placed into an artery. Sedation may help you relax, although many people remain awake.

Using X-ray guidance, the cardiologist moves a catheter toward the coronary arteries. An angiogram is usually performed first. A fine guidewire is passed through the artery, and the IVUS catheter travels over it.

The probe moves through the area being examined, sometimes using a controlled automatic pullback. Images appear immediately. You will not feel the ultrasound waves, but you may notice pressure at the access site or brief chest discomfort.

The images may guide treatment or check a stent during the same appointment. Afterward, the catheters are removed and pressure or a closure device is applied at the wrist or groin.

Understanding your results

IVUS produces images rather than a single positive or negative result. The cardiologist assesses:

The findings are considered with your angiogram, symptoms, blood-flow measurements, and treatment history. A narrow-looking area does not always restrict blood flow enough to require treatment.

There is no universal normal range for every coronary artery or IVUS measurement. Interpretation depends on the artery, equipment, cardiac laboratory, and clinical context.

- the size and shape of the open channel, called the lumen
- the artery's overall size
- the amount and distribution of plaque

- calcium within plaque
- stent expansion and contact with the artery wall
- tears or other changes around a treated area

What affects the results

Image quality depends mainly on catheter position and whether it can pass through the area. A very tight, curved, or heavily calcified artery may be difficult to image completely.

Calcium may block ultrasound waves and hide deeper structures. The guidewire and catheter can also create shadows or artefacts caused by the equipment or technique rather than the artery.

Temporary artery spasm can make the channel look smaller, so cardiologists often give medicine to relax the artery before taking measurements. Movement or uneven catheter pullback may also cause small differences.

Kidney function and pregnancy do not distort IVUS images, but they can affect decisions about contrast dye, X-ray exposure, and how the procedure should be performed.

Accuracy and limitations

IVUS gives a more detailed view of the artery wall and stent than angiography alone. It can identify poor stent expansion or contact that might otherwise be missed.

There is no single accuracy figure because IVUS answers several questions. Results depend on image quality, equipment, the structure being measured, and the interpreter's experience.

IVUS can miss a problem if the catheter cannot cross it or the affected section is not scanned. Heavy calcium may hide tissue, while artefacts may resemble a tear or poor stent contact.

IVUS shows anatomy but does not directly determine whether a narrowing limits blood flow. Pressure-wire tests such as FFR or iFR may be better for that question. Optical coherence tomography offers finer surface detail for some stent problems but usually needs additional contrast. CT coronary angiography is non-invasive but cannot guide treatment during catheterisation.

Risks and complications

IVUS risks are mainly those of cardiac catheterisation. Bruising, tenderness, or minor bleeding at the wrist or groin is common.

Uncommon but important complications include artery damage, significant bleeding, clot formation, abnormal heart rhythms, heart attack, stroke, or the need for urgent treatment. The IVUS catheter can occasionally trigger coronary spasm or injure the artery.

Ultrasound itself does not use radiation or contrast dye. However, the accompanying procedure usually uses X-rays and may use contrast, which can cause an allergic reaction or affect kidney function.

What happens next

The cardiologist usually reviews the images during the procedure. Findings may lead to stent placement, further stent expansion, additional treatment, or no change in the plan.

Before discharge, you should receive instructions about medicines, activity, wound care, and follow-up. A small bruise and mild tenderness can usually wait for routine follow-up if they are improving.

Seek urgent medical advice for increasing swelling, worsening pain, redness, drainage, or persistent bleeding from the wrist or groin.

Call emergency services for severe or persistent chest pain, marked breathlessness, fainting, uncontrolled bleeding, or a hand or leg that becomes suddenly cold, pale, numb, or very painful.

Common questions

Can I drink coffee before IVUS?

Follow your fasting instructions. Coffee may not be allowed, particularly if it contains milk or sugar.

Does the time of day matter?

It does not usually affect the images, but appointment timing may determine when you stop eating, drinking, or taking certain medicines.

Can I exercise beforehand?

Light activity generally does not alter results. Avoid strenuous exercise if your team has restricted activity or it causes chest discomfort.

Will I be awake?

Many people remain awake with local anaesthetic and light sedation. You may feel pressure at the wrist or groin but will not feel the ultrasound waves.

How long will I stay in hospital?

Your total stay depends on the access site, sedation, whether you have angioplasty, and whether observation is needed.

Can I drive home afterward?

Usually not. Arrange transport and follow your discharge instructions.

Sources

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