TEST

Duplex ultrasound

A duplex ultrasound uses sound waves to show blood vessels and measure blood flow.

WHAT IT MEASURES
Blood vessel structure, blood-flow direction, and blood-flow speed

SAMPLE
None

FASTING NEEDED?
Sometimes for abdominal scans; follow your appointment instructions

HOW LONG IT TAKES
Usually 30 to 60 minutes

RESULTS IN
Same day to several days; varies by laboratory or imaging service

USED FOR
Screening, diagnosis, treatment planning, and monitoring

MAIN LIMITATION
Operator skill and difficult-to-reach vessels can affect accuracy

Overview

A duplex ultrasound examines blood vessels by combining standard ultrasound with Doppler ultrasound. Standard ultrasound creates pictures of vessels and nearby tissues, while Doppler measures the direction and speed of moving blood.

The test can show whether an artery or vein is open, narrowed, blocked, enlarged, or affected by a blood clot. Common areas examined include the legs, arms, neck, abdomen, and vessels supplying transplanted organs.

Duplex ultrasound does not use ionising radiation. A standard examination also does not require an injection of contrast dye.

Why the test is ordered

Your healthcare professional may order duplex ultrasound to investigate symptoms such as one-sided leg swelling, leg pain while walking, a cold or discoloured limb, or swelling around a dialysis access.

The test may look for:

It can also help plan treatment or monitor a repaired artery, graft, stent, or known area of narrowing.

- A deep vein blood clot, called deep vein thrombosis or DVT
- Narrowing caused by fatty deposits, known as plaque
- Reduced blood flow to an arm or leg
- A widened or bulging artery, called an aneurysm
- Varicose veins or leaking vein valves
- Narrowing or blockage in a bypass graft, stent, or dialysis access

Who should have the test

You may be offered this test if your symptoms, examination, or another test suggests a blood vessel problem. It is also used to monitor diagnosed vascular conditions or previous vascular procedures.

The most suitable test depends on the vessel and clinical question. Deep vessels in the chest, abdomen, or pelvis may be better assessed with CT, MRI, or another imaging test.

Duplex ultrasound can usually be performed during pregnancy because it does not use radiation. Tell the examiner if you are pregnant because pregnancy changes blood flow and affects interpretation.

How to prepare

For most arm, leg, or neck scans, you can eat and drink normally and take prescribed medicines unless your appointment instructions say otherwise.

An abdominal vascular scan may require fasting because food and bowel gas can obscure deep vessels. Follow the imaging service's instructions about food, water, and medicines.

Wear loose clothing that allows access to the area. You may need to remove jewellery, compression stockings, or clothing covering it.

Tell the imaging service about recent vascular surgery, stents, grafts, dressings, wounds, or severe tenderness because these may affect how the examination is performed.

What happens during the test

You will usually lie on an examination couch. The examiner applies water-based gel to your skin and moves a handheld transducer over the area. You may hear pulsing or whooshing sounds from the Doppler signal.

During a vein scan, the examiner may press firmly with the transducer. A healthy vein normally flattens under pressure, while a vein containing a clot may not. The examiner may also squeeze part of your limb or ask you to change position.

During an artery scan, blood-flow speeds are measured at several points. You may need to keep still or briefly hold your breath. The test usually takes 30 to 60 minutes, although complex examinations can take longer.

Understanding your results

The report describes the examined vessels and whether blood is moving through them as expected. It may cover:

Patent means a vessel is open. Stenosis means narrowing, and occlusion means complete blockage. A waveform shows how blood flow changes during each heartbeat.

There is no single normal blood-flow speed for every examination. Results are interpreted using the vessel tested, flow pattern, nearby vessels, and the laboratory's criteria. Age, pregnancy, medicines, previous procedures, symptoms, and other test results may also affect interpretation.

- Whether a vein is fully compressible
- The presence and location of a blood clot
- Arterial narrowing or blockage
- Blood-flow direction and speed
- Plaque, aneurysms, grafts, stents, or abnormal connections
- Changes since an earlier scan

What affects the results

Image quality and blood-flow measurements can be affected by:

Kidney function does not usually affect standard duplex ultrasound, which does not require kidney-cleared contrast dye. A recent blood transfusion also has no usual direct effect on the

images, although both may matter to your wider assessment.

- Deep vessels, larger body size, swelling, wounds, or dressings
- Bowel gas during abdominal scans
- Calcium in an artery, which can block sound
- Movement, breathing, or difficulty maintaining a position
- The examiner's transducer angle and pressure
- Recent exercise
- Nicotine, caffeine, temperature, pain, stress, or dehydration
- Medicines affecting blood pressure, heart rate, or vessel width
- Pregnancy, an irregular heartbeat, or reduced heart pumping strength
- Recent surgery, stents, or grafts

Accuracy and limitations

Accuracy depends on the body area, condition, image quality, and examiner's experience. Ultrasound works best when vessels are close enough to the skin to be seen clearly.

For suspected DVT, it is better at detecting clots in the larger thigh veins than small calf clots or clots deep in the pelvis. A clot may be missed if the vein cannot be seen clearly, the clot is very small, or only part of the limb is examined.

Pressure on a vessel, vessel bending, calcium, or unusual blood flow can sometimes make narrowing appear more severe than it is. Changes left by an old clot may also be difficult to distinguish from a newer clot.

If results are unclear or do not explain ongoing symptoms, another ultrasound or different imaging may be needed. CT angiography or MR angiography can show deep vessels more widely. Catheter angiography provides detailed images and may allow treatment at the same time, but it is invasive and is not usually needed for an initial assessment.

Risks and complications

Standard duplex ultrasound is non-invasive, does not use radiation, and has no known harmful effects when performed appropriately.

Transducer pressure may be uncomfortable over a tender, swollen, or recently operated area.

Discomfort usually stops when the pressure is removed.

What happens next

A specialist may review the images before issuing the final report. Results may be available the same day or within several days.

A normal or stable result may require only routine follow-up. An uncertain result may lead to repeat ultrasound or another imaging test. If a clot, narrowing, or blockage is found, management depends on its location and severity, your symptoms, and your overall health.

Do not wait for a routine result if you develop sudden shortness of breath, chest pain, coughing up blood, collapse, or stroke signs such as facial drooping, arm weakness, or difficulty speaking. Seek emergency medical help. Rapidly worsening limb pain, coldness, numbness, weakness, or marked colour change also needs urgent assessment.

Common questions

Can I drink coffee before a duplex ultrasound?

Usually, yes, for an arm, leg, or neck scan. Some abdominal scans require fasting and avoiding coffee. Follow your appointment instructions.

Does the time of day matter?

Usually not. Timing may matter when repeated scans need comparable conditions or swelling changes during the day.

Can I exercise beforehand?

Gentle normal activity is usually acceptable. Avoid strenuous exercise immediately beforehand because it can temporarily change heart rate and blood flow, unless the test is designed to assess exercise-related symptoms.

Can I take my medicines?

Usually, yes. Do not stop prescribed medicines unless the service arranging the test specifically tells you to. Bring an up-to-date medicine list if requested.

Will the scan hurt?

The sound waves do not hurt. Firm pressure can be uncomfortable when the examiner compresses a swollen or tender vein.

Can I drive afterwards?

Yes, in most cases. Standard duplex ultrasound does not involve sedation, radiation, or an injection, so you can normally resume usual activities immediately.

Sources

- RadiologyInfo.org: Vascular Ultrasound
- National Institute for Health and Care Excellence: Venous thromboembolic diseases-diagnosis, management and thrombophilia testing, NICE guideline NG158
- Needleman L, Cronan JJ, Lilly MP, et al. "Ultrasound for Lower Extremity Deep Venous Thrombosis: Multidisciplinary Recommendations From the Society of Radiologists in Ultrasound Consensus Conference." Circulation . 2018;137(14):1505-1515.
- American Institute of Ultrasound in Medicine: Practice Parameters for Ultrasound Examinations
- American College of Radiology: Appropriateness Criteria-Suspected Lower-Extremity Deep Vein Thrombosis
- NHS: Ultrasound scan