

## Venous sampling

Venous sampling is a diagnostic procedure that uses imaging guidance to insert a catheter into a specific vein and remove blood samples for laboratory analysis. Abnormal levels of certain substances in the blood may indicate the presence of disease in the organ or tissue that produces them.

Your doctor will instruct you on how to prepare, including any changes to your medication schedule. Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, allergies and medications you are taking, including herbal supplements and aspirin. You may be advised to stop taking certain medications including certain blood pressure medications, blood thinners such as aspirin or warfarin or other medications such as cinacalcet several days prior to your procedure. You also may be told not to eat or drink anything for several hours before your procedure. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown. Plan to have someone drive you home.



### What is venous sampling?

Venous sampling is a diagnostic procedure that involves insertion of a catheter into a specific vein under imaging guidance to remove blood samples for laboratory analysis. Abnormal levels of certain substances in the blood such as hormones may indicate the presence of disease in the organ or tissue that produces them.

### What are some common uses of the procedure?

There are several different types of venous sampling that are used to identify disease in different parts of the body, including:

- **Adrenal venous sampling (AVS)**, in which blood samples are taken from the veins of the adrenal glands. This is commonly done for patients with a particular form of high blood pressure called primary aldosteronism to guide treatment between surgery and medical therapy. It is less commonly done for patients with Cushing syndrome, an endocrine disorder in which high levels of cortisol may be found in the blood.
- **Parathyroid venous sampling (PAVS)**, in which blood samples are taken from veins in the area of the parathyroid glands in the neck to help locate abnormally functioning glands or pituitary adenoma. This test is most often used after an unsuccessful neck exploration.
- **Inferior petrosal sinus sampling**, in which blood samples are taken from veins that drain the pituitary gland to study disorders related to pituitary hormone production.
- **Ovarian venous sampling**, in which blood samples are taken from the veins of a woman's ovaries to help establish the source of excessive androgen production when imaging studies are not sufficient.
- **Arterial stimulation and venous sampling**, in which blood samples are taken from the hepatic vein after calcium is administered in order to provide information on pancreatic endocrine tumors.

### How should I prepare?

You may need to stop taking blood-thinning medications such as warfarin or aspirin for a few days before the procedure. For AVS, you will be asked to stop taking certain medications to treat high blood pressure for at least two weeks and possibly for four to six weeks. For PAVS, you will need to stop taking cinacalcet, a drug used to treat secondary hyperparathyroidism.

Your doctor may instruct you to not eat or drink anything for a few hours before your exam if it will use contrast material. Tell your doctor about all medications you are taking and if you have any allergies. If you have a known allergy to contrast material, your doctor may prescribe medications (usually a steroid) to reduce the risk of an allergic reaction. To avoid unnecessary delays, contact your doctor well before the date of your exam.

Also tell your doctor about any recent illnesses or other medical conditions and whether you have a history of heart disease, asthma, diabetes, kidney disease, or thyroid problems. Any of these conditions may increase the risk of an adverse effect.

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.

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.*

Inform your doctor of any recent illnesses or other medical conditions and whether you have a history of heart disease, asthma, diabetes, kidney disease, or thyroid problems. Any of these conditions may increase the risk of an unusual adverse effect such as bleeding or infection.

If you are to be sedated for the procedure, you may be asked not to eat or drink anything for two to six hours prior to your exam. Be sure that you have clear instructions from your imaging facility.

If you are sedated, you should not drive for 24 hours after your exam, and you should arrange for someone to drive you home. Because an observation period is necessary following the exam, you should ask your doctor if you will need to be admitted to the hospital overnight.

## What does the equipment look like?

This exam typically uses a radiographic table, one or two x-ray tubes, and a video monitor. Fluoroscopy converts x-rays into video images. Doctors use it to watch and guide procedures. The x-ray machine and a detector suspended over the exam table produce the video.

The catheters used in venous sampling are long plastic tubes about as thick as a strand of spaghetti.

## How does the procedure work?

Before venous sampling begins, doctors inject iodinated contrast material to map the veins and locate the vein or veins of interest.

Once the vein is located, the catheter is advanced to the target area under fluoroscopic guidance. A syringe is then used to withdraw a blood sample. In some cases, two catheters are inserted in order to compare hormone levels between paired glands. Additional blood samples may be taken after administration of medication that increases the hormone production of the adrenal glands. The samples are then sent to a laboratory for analysis of compounds released by the organs or tissue.

## How is the procedure performed?

This procedure is done on an outpatient basis.

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 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 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. This may briefly burn or sting before the area becomes numb.

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

A catheter is first inserted into the vein, usually in the groin, but sometimes in the arm. Contrast material is injected and several x-rays are taken.

Guided by x-rays, the catheter is then inserted through the skin and gently maneuvered through the blood vessel to the target area where blood samples are removed. Sometimes two catheters are inserted through your groin at the same time so blood samples from both glands can be taken simultaneously.

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.

The doctor or nurse will remove your IV line before you go home.

When the procedure is completed, you will be moved to a recovery room or to a hospital room.

## **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, but no serious discomfort.

As the contrast material passes through your body, you may feel warm. This will quickly pass.

You may feel back discomfort while contrast material is injected into the adrenal vein, particularly on the right side.

You should not be able to feel the catheters inside your body. You may feel mild pressure in your back or neck during injection.

You should expect to be in the radiology department for at least half the day, including preparation and recovery. The procedure itself can take anywhere from 30 minutes to four hours or more; the amount of time required for venous sampling will vary depending on the complexity of the procedure.

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

monitored. If the catheter was inserted into the vein in your groin, you may be asked to keep your leg straight for a few hours.

You may feel a little sleepy until the sedative has worn off. Nurses will monitor your heart rate and blood pressure during this period.

You should be able to go home the same day of the procedure. You will be asked to stay for a few hours until you are fully recovered. You must rest for the remainder of the day. Do not return to work. You can go back to normal activities the morning after your procedure.

Do not drive, drink alcohol or operate heavy machinery for 24 hours.

After you return home, you should rest and drink plenty of fluids. You should avoid strenuous exercise and lifting heavy objects for at least 24 hours.

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.

Any change in skin color, pain or a warm feeling in the area where the catheter was inserted should be promptly reported to your physician.

## Who interprets the results and how do I get them?

The interventional radiologist 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?

### Benefits

Venous sampling provides important information about organ and gland function that cannot always be determined by imaging, such as:

- the presence of disease in one or more glands
- potential sources of high blood pressure
- the location of glands that can be difficult to find with imaging
- whether or not surgery is needed

### Risks

- 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.

Less common risks associated with venous sampling include:

- the development of a blood clot
- rupture of the vein
- stroke

- allergic reaction and reduced kidney function associated with the contrast material
- nerve damage
- damage to surrounding structures such as blood vessels, organs and muscles
- for AVS, rupture of the adrenal gland is a potential but rare complication

## What are the limitations of venous sampling?

It can be difficult to insert the catheter into narrow veins and it is sometimes difficult to locate certain veins. It can be difficult to get adequate blood samples, especially from the right adrenal vein. Occasionally, the test has to be repeated. The procedure may not be possible in all patients due to medical and/or technical reasons.

### Disclaimer

This information is copied from the RadiologyInfo Web site (<http://www.radiologyinfo.org>) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at <http://www.radiologyinfo.org> to view or download the latest information.

**Note:** Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

### Copyright

This material is copyrighted by either the Radiological Society of North America (RSNA), 820 Jorie Boulevard, Oak Brook, IL 60523-2251 or the American College of Radiology (ACR), 1891 Preston White Drive, Reston, VA 20191-4397. Commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is prohibited.

Copyright © 2022 Radiological Society of North America, Inc.