

## Dialysis and Fistula/Graft Declotting and Interventions

Dialysis fistula and graft interventions improve blood flow in dialysis fistulas and grafts. Arteriovenous fistulae and grafts are artificial blood vessel connections between an artery and a vein. They are used to facilitate kidney dialysis - a treatment that uses a special machine to remove waste materials from the body. These blood vessel connections can clog or narrow and require interventions to restore their proper function.

Your doctor will tell you how to prepare and whether you will be admitted to the hospital; however, this is usually done as an outpatient. Inform your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, allergies and medications you're taking. You may be advised to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners several days prior to your procedure. Leave jewelry at home and wear loose, comfortable clothing. You will be asked to wear a gown.



### What are Dialysis and Fistula/Graft Declotting and Interventions?

Dialysis fistula and graft interventions are minimally invasive procedures performed to improve or restore blood flow in the fistula or grafts placed in the blood vessels of dialysis patients.

Dialysis is a process used to treat patients whose kidneys are not working properly. It involves a special machine and tubing that removes blood from the body, cleanses it of waste and extra fluid and then returns it back to the body.

In order for a person to undergo dialysis, a physician first creates access to the patient's vessel using one of three methods:

- a fistula, which is made by joining together an artery and vein to make a bigger high-flow blood vessel.
- a graft, in which a soft synthetic tube is placed between an artery and a vein, creating an artificial high-flow blood vessel.
- catheter access, in which a narrow plastic tube is inserted into a large vein, usually in the neck or groin.

When fistulas and grafts become clogged or narrowed, preventing a patient from undergoing dialysis, interventional radiologists use image-guided interventions to fix the problem, such as:

- Catheter-directed thrombolysis, which dissolves blood clots that build up in fistulas and grafts by injecting a medicine.
- *Catheter-directed mechanical thrombectomy*, where the clot is physically removed or mashed up using devices inserted into the vein.
- Angioplasty and vascular stenting, which use mechanical devices, such as balloons, to open fistulas and grafts and help them remain open. After the balloon is removed, a small wire mesh tube called a stent may be implanted to keep the fistula or graft open if angioplasty alone fails.

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

These procedures are used to treat:

- Narrowing of dialysis fistulas or grafts: When there is decreased flow in a graft or fistula, angioplasty or angioplasty with

vascular stenting may be performed.

- Thrombosis of dialysis fistulas or grafts: When blood does not flow smoothly, it can begin to coagulate, turning from a free-flowing liquid to a semi-solid gel, called a blood clot or thrombus. When blood clots in a fistula or graft prevent dialysis from being performed, catheter-directed thrombectomy (clot removal) with mechanical devices, and/or clot-dissolving drugs may be performed. Angioplasty or angioplasty with vascular stenting may also be performed in this setting.

## How should I prepare?

Tell your doctor about all the medications you take, including herbal supplements. List any allergies, especially to local anesthetic, general anesthesia, or contrast materials. Your doctor may tell you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners before your procedure.

Tell your doctor about recent illnesses or other medical conditions.

Always tell your doctor, technologist, or nurse if you are or could be pregnant. Doctors will not perform many tests during pregnancy to avoid exposing the fetus 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.

You will receive specific instructions on how to prepare, including any changes you need to make to your regular medication schedule.

The nurse will give you a gown to wear during the procedure.

## What does the equipment look like?

These procedures may use x-ray imaging equipment, ultrasound, guide wires, sheaths, catheters, medical devices that break up or dissolve blood clots, balloon catheters and stents.

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 are suspended over the exam table to produce the images.

A guide wire is a thin wire used to guide the placement of the diagnostic catheter, angioplasty balloon catheter, and the vascular stent. A sheath is a vascular tube placed into the fistula or graft and allows easy catheter exchanges during these procedures.

A catheter is a long, thin, hollow plastic tube, about as thick as a strand of spaghetti. These catheters are designed so that blood dissolving medications can be delivered successfully within the blood clot. There also are medical devices that can be used to dissolve the clots mechanically. Your interventional radiologist will decide which technique is most appropriate for you.

A balloon catheter is a long, thin plastic tube with a balloon at its tip. Some balloon catheters may also have a drug coating. A stent is a small, wire mesh tube. Balloons and stents come in varying sizes to match the size of the diseased blood vessel.

Stents are specially designed metal mesh tubes that are collapsed when they are inserted into the body and then expanded inside the vessel to prop the walls open. In some cases, the stent may have an artificial fabric covering.

This procedure may use other equipment, including an intravenous line (IV), ultrasound machine and devices that monitor your heart beat and blood pressure.

## How does the procedure work?

Angioplasty and vascular stenting (<https://www.radiologyinfo.org/en/info/angioplasty>) : Using imaging guidance, an inflatable balloon mounted at the tip of a catheter is inserted through the skin into the fistula or graft and advanced to the blockage. There, the balloon is inflated and deflated. In this process, the balloon expands the vein or artery wall, increasing blood flow through the fistula or graft. The doctor may place a stent to hold the vessel open.

Catheter-directed thrombectomy or thrombolysis (<https://www.radiologyinfo.org/en/info/thrombo>) : Using x-ray guidance and a contrast material that helps show the blood vessel, your interventional radiologist will insert a catheter through the skin into a vessel (artery or vein) and direct it to the thrombosis, or blockage. The blood clot will then be dissolved in one of two ways:

- by delivering medication directly to the blood clot (thrombolysis).
- by positioning a mechanical device at the site to break up the clot (thrombectomy).

## How is the procedure performed?

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 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 technologist 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.

**Angioplasty and Vascular Stenting:** After local anesthetic, a sheath or short tube is first inserted into the fistula or graft. This tube is similar in size to the needles used during regular dialysis sessions.

Guided by x-rays, the catheter is then inserted through the sheath and advanced until it reaches the site of the blockage. Once the catheter is in place, contrast material will be injected and an angiogram or x-rays will be taken of the blocked vessel to help identify the site of the blockage.

With x-ray guidance, a guide wire will then be moved to the site, followed by the balloon-tipped catheter. Once it reaches the blockage, the balloon will be inflated for a short period of time. The same site may be repeatedly treated with the same balloon, a different balloon, or the balloon may be moved to other sites.

Additional x-rays will be taken to determine how much the blood flow has improved. When your interventional radiologist is satisfied that the vessel has been opened enough, the balloon catheter, guide wire and catheter will be removed.

Many angioplasty procedures also include the placement of a stent, a small, flexible tube made of wire mesh. The stents are positioned and expanded with a balloon. When the balloon is deflated and removed, the stent remains permanently in place, acting like a scaffold to hold open the vessel.

If a sheath was inserted into your arm or wrist, it will typically be removed at the end of the procedure.

**Catheter Thrombolysis:** Guided by x-rays, your interventional radiologist will insert a catheter through the skin into the clotted

dialysis fistula or graft.

Your interventional radiologist will determine whether the clot will be best treated by a clot-dissolving medication, by breaking it up with a mechanical device, or both.

In chemical thrombolysis, clot-dissolving medications are delivered through the catheter over a few or several minutes. Removal of the clot from the vessel by chemical thrombolysis or a mechanical device is a relatively quick procedure (usually completed within one to two hours) and generally does not require a lengthy hospital stay.

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.

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

The doctor or nurse will attach devices to your body to monitor your heart rate and blood pressure.

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 should 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.

**Angioplasty and Vascular Stenting:** It is common for patients to feel some discomfort when the balloon is inflated because the blood vessel is being stretched. Your discomfort should lessen as the balloon is deflated.

After the procedure, your access site into the fistula or graft will be checked for bleeding or swelling and your blood pressure and heart rate will be monitored.

After you return home, you should rest and avoid lifting heavy objects and strenuous exercise for at least 24 hours. You should avoid smoking permanently (since this is a major cause of atherosclerosis). If bleeding begins where the catheter was inserted, you should lie down, apply pressure to the site and call your physician. Any change in color in your leg or arm (depending on where your dialysis access is located) and any pain or a warm feeling in the area where the catheter was inserted should be promptly reported to your physician.

After an angioplasty or stent placement procedure you may be instructed to take one or more medications (such as aspirin, or blood thinners such as Plavix®, Lovenox® or Coumadin®) for a period of time. These medications can prevent blood clots from forming at the site of treatment during healing. The effect of Coumadin® will be monitored with frequent blood tests.

In general, magnetic resonance imaging (MRI) may be safely performed following stent placement, but make sure that you notify the MRI department that you have recently had a stent. Although stents used today may be considered safe for MRI, you may need several weeks after stent placement for MRI to be safe. Metal detectors will not affect a stent.

**Catheter-directed Thrombolysis:** Some patients experience some side effects after thrombolysis. Pain is the most common and can readily be controlled by pain medication given orally or administered through your IV.

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

After the procedure is complete, the interventional radiologist will tell you whether the procedure was a success.

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

- No surgical incision is necessary—only a small nick in the skin that does not need stitches.

#### Angioplasty and Vascular Stenting:

- These procedures are performed using local anesthesia or conscious sedation; no general anesthetic is required in the majority of patients.
- You will be able to return to your normal activities shortly after the procedure.

#### Catheter-directed Thrombolysis:

- Catheter-directed thrombolysis can greatly improve blood flow and reduce or eliminate the related symptoms and effects without the need for more invasive surgery.
- Thrombolysis is a safe, highly effective way of re-establishing circulation blocked by a clot.
- Thrombolysis is less invasive than conventional open surgery to remove clots and the hospital stay is relatively brief. Blood loss is less than with traditional surgical treatment and there is no obvious surgical incision.

### Risks

- Any procedure that penetrates the skin carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.
- There is a very slight risk of an allergic reaction if the procedure uses an injection of contrast material.
- 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.

#### Angioplasty and Vascular Stenting

- Major complications following angioplasty are uncommon. However, inserting the catheter can lead to injury of the artery or vein. The balloon also poses a risk of blood clots or tearing the artery or vein.
- When angioplasty is performed, blockages can recur, although most of these arteries can be opened again successfully. This can also occur when a stent is placed in the artery at the time of the angioplasty.
- Heavy bleeding from the catheter insertion site may require special medications or a blood transfusion.
- A relatively rare complication associated with balloon angioplasty is abrupt vessel closure, or occlusion. This blockage in the area treated by the balloon angioplasty typically occurs within 24 hours of the procedure. If it happens, treatment with medication into the vessel to dissolve clots followed by angioplasty or stenting may be appropriate. In some cases, emergency bypass surgery may be needed.
- Other rare complications include heart attack and sudden cardiac death.
- Contrast material used during these procedures may cause renal failure, a decrease in kidney function, particularly

if there is already some degree of decreased kidney function.

- There is a risk of damage to the fistula or graft. If the fistula or graft stops working, placement of a new access may be necessary, including possible placement of a dialysis catheter.

### **Catheter-directed Thrombolysis**

- There is a risk of infection after thrombolysis, even if an antibiotic has been given.
- Whenever anticoagulant or thrombolytic agents are used, there is a risk that bleeding will occur elsewhere in the body. The most serious complication is intracranial bleeding or bleeding in the head which can lead to stroke.
- In some cases, the material that is blocking your vessel may move to another part of the vascular system. Usually this can be treated with further thrombolysis but sometimes may require surgery.
- There is a risk of kidney damage in patients with diabetes or other pre-existing kidney disease.

## **What are the limitations of Dialysis and Fistula/Graft Dec clotting and Interventions?**

Some blockages of the veins or arteries are too difficult to open with catheters and balloons. Surgery may be needed to bypass the blockage. If that is the case, a dialysis catheter may need to be placed in a neck vein to allow you to receive dialysis temporarily until a surgeon is able to fix or revise your dialysis fistula or graft.

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