

Catheter-directed Thrombolysis

This information is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is Catheter-directed Thrombolysis?

Thrombolysis is a minimally invasive treatment that dissolves abnormal blood clots in blood vessels to help improve blood flow and prevent damage to tissues and organs.

When blood does not flow smoothly through a vessel, it can begin to coagulate, turning from a free-flowing liquid to a semi-solid gel, or blood clots. A blood clot, or thrombus, that forms within a blood vessel may continue to grow, blocking off the blood supply to certain parts of the body and causing damage to tissues and organs. In some patients, blood clots come from one site, dislodge, travel downstream, and lodge in relatively small vessels causing a blockage, or embolization. Untreated, a vascular blockage due to thrombosis or embolization can result in the loss of an organ or extremity, with potentially life-threatening consequences.

In a catheter-directed thrombolysis procedure, x-ray imaging is used to help guide a special medication or medical device to the site of blood clots to dissolve the blockage.

What are some common uses of the procedure?

Catheter-directed thrombolysis is used to treat blood clots in arteries and veins resulting from any of these causes:

- thrombosis in the vascular bed of the diseased arteries, such as thrombosis in an arm or leg artery that has severe narrowing due to atherosclerosis.

- deep vein thrombosis, a condition in which a blood clot forms in a main vein that returns blood flow from the arms or legs back to the heart and lungs. This type of clot may grow big enough to completely block the vein, posing serious risk if part of it breaks off and travels to the lungs (called pulmonary embolism).
- slowed circulation caused by heart disease, which can allow a blood clot to form in one of the heart's chambers. A clot that breaks loose, travels through the bloodstream and lodges in either an organ or artery forming a complete blockage in blood flow at that point is called an embolism.
- thrombosis of the dialysis fistulas or grafts.
- pulmonary embolism.
- thrombosis of the portal vein and other mesenteric veins.

How should I prepare?

Prior to your procedure, you may have your blood tested to determine how well your kidneys are functioning and whether your blood clots normally.

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to anesthesia or to contrast materials. Your physician may advise you to stop taking aspirin or a blood thinner for a specified period of time days before your procedure.

Also inform your doctor about recent illnesses and other medical conditions.

Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy because high doses of radiation can be harmful to the fetus. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby.

You will receive specific instructions on how to prepare, including any changes that need to be made to your regular medication schedule.

You will be admitted to the hospital the day before or the morning of your procedure and be examined by the interventional radiologist before the procedure begins.

Dialysis fistula or graft thrombolysis patients are generally discharged the same day; however, most other conditions require hospitalization for several days with careful monitoring. You will be given a gown to wear during the procedure.

What does the equipment look like?

In this procedure, an x-ray camera, catheter, special medications and a medical device that dissolves blood clots may be used.



The equipment typically used for this examination consists of a radiographic table, an x-ray tube, and fluoroscopic equipment such as an image intensifier, at the other end that converts the x-rays into a video image and sends them to a television-like monitor for viewing that is located in the examining room or in a nearby room. The image intensifier is suspended over a table on which the patient lies. A drawer under the table holds the x-ray film or image recording plate that captures the images.

A catheter used for thrombolysis 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 effectively 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 your condition.

Other equipment used during the procedure includes an intravenous line (IV) and equipment that monitors your heart beat and blood pressure.

How does the procedure work?

Using x-ray guidance and a contrast material that helps define the blood vessel, your physician will insert a catheter through the skin into a vessel (artery or vein) and maneuver it to the site of the thrombosis, or blockage. The blood clot will then be dissolved in one of two ways:

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

How is the procedure performed?

Image-guided, minimally invasive procedures such as thrombolysis are most often performed by a specially trained interventional radiologist in an interventional radiology suite or occasionally in the operating room.

You will be positioned on the examining table.

You will 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 sedation medication can be given intravenously. You may also receive general anesthesia.

The area of your body where the catheter is to be inserted will be shaved, sterilized and covered with a surgical drape. A very small nick in the skin is made at the site.

Guided by x-rays, the physician will insert a catheter through the skin into a blood vessel and advance it to the area of poor circulation.

A contrast material is then injected through the catheter and a series of x-rays is taken to pinpoint the location of the clot. Your physician will review the images and determine whether the clot will be best treated by a clot-dissolving medication, by breaking it up with a mechanical device, or both.

To treat the clot with medication, the catheter is left in place and connected to a special machine that delivers the medication at a precise rate. Clot-dissolving medications are delivered through the catheter over several hours to several days. It may take up to 72 hours for the clot to dissolve (although most clots dissolve within 24 hours), during which time you will be monitored closely by the medical staff.

Removal of the clot from the vessel by a mechanical device is a relatively quick procedure (usually completed in less than one hour) and generally does not require a lengthy hospital stay.

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.

Your intravenous line will be removed.

What will I experience during and after the procedure?

Devices to monitor your heart rate and blood pressure will be attached to your body.

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.

The intravenous (IV) sedative will make you feel relaxed and sleepy. 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.

As the contrast material passes through your body, you may get a warm feeling.

Many patients experience some side effects after thrombolysis. Pain is the most common and can readily be controlled by pain medication taken by mouth or given through your IV.

Who interprets the results and how do I get them?

The interventional radiologist can advise you as to whether the procedure was a technical success when the procedure is completed.

You will be advised as to whether additional treatment is required for the condition that caused the clot or to repair any tissues damaged while your circulation was impaired.

What are the benefits vs. risks?

Benefits

- 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.
- No surgical incision is needed—only a small nick in the skin that does not have to be stitched closed.

Risks

- Any procedure where the skin is penetrated carries a risk of infection.
- There is a very slight risk of an allergic reaction if contrast material is injected.
- 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.
- 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.
- 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 Catheter-directed Thrombolysis?

Technically successful thrombolysis requires that the catheter be placed in a stable position near the clot. This means that the catheter tip is situated so that the clot-dissolving agent can reach the site of the obstruction. In a small percentage of cases, the procedure is not technically possible. It is important to understand that clot removal alone cannot repair tissue already damaged by lack of circulation. Further treatment may be required, both for the underlying condition that caused the clot and for any damage to affected organs or other tissues.

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