

The Basics of Hemodialysis Access

Randal Bast, M.D.

Your nephrologist has asked you to see me about creating an access for hemodialysis. Hemodialysis is a way of clearing metabolic waste products from your body when your kidneys can no longer filter off those waste products themselves. To do hemodialysis, the nurse or technician at the dialysis unit needs to draw blood from your body, run it through a filtering machine, then return the blood to your body. Your veins do not normally have sufficient blood flow in them for this, so a special type of vascular access needs to be created.

There are three main types of vascular access--catheters, fistulas and grafts. We will discuss the advantages and disadvantages of each type.

Catheters:

A dialysis catheter is a special kind of 'IV' that can be used for hemodialysis. Catheters are most commonly placed in the jugular vein in the neck, but can be placed in the femoral vein in the groin or rarely in a large vein under the collar bone. Think of the catheter as a 'double barreled straw.' To work well, the tip of the catheter needs to be within a large volume of blood. When a catheter is placed in the jugular vein, it extends down through the vein into the first chamber of the heart (right atrium). The outside part is usually tunneled down to an exit site on the chest wall. At the dialysis unit, the nurse connects one 'barrel' of the straw to the dialysis machine to draw blood off from the body, and the blood is returned through the other 'barrel.'

The biggest advantage of catheters is that they can be used immediately after being placed, whereas the other types of access may take several weeks or months to get ready. It's also fairly simple for the nurse to hook the catheter up to the dialysis machine.

However, there are many problems with catheters. The catheter needs to stay clean and dry--it can't get wet in the shower. Some people find it bothersome to have a tube sticking out of their skin. Catheters can have blood clots build up on the outside or within the catheter that keep them from working well. The presence of the catheter within the large veins of the chest can cause those veins to become narrowed or completely occluded (central venous stenosis). This may cause arm

The Basics of Hemodialysis Access

Randal Bast, M.D.

swelling and significantly decrease the ability to have a graft or fistula in the arm.

The biggest problems with catheters is the risk of getting an infection in the bloodstream. Sometimes, the infection can be treated with antibiotics. Sometimes, the catheter needs to be removed and replaced with another catheter. Sometimes, it can be an overwhelming infection that causes a patient to die despite aggressive treatment. For these reasons, it is best to avoid catheter use whenever possible.

Arteriovenous Fistula:

The best type of access is an arteriovenous fistula. To create a fistula, we connect a vein directly to an artery. This is usually a fairly minor outpatient procedure done through a one to two inch incision. By redirecting the blood flow, several changes happen. The amount of blood flowing through the vein is immediately increased. Over time, this causes the vein and artery to enlarge, increasing the amount of blood flow even more. Once the vein is large enough and has enough blood flow (matured), the nurses access your bloodstream by sticking two needles into the enlarged vein--one to carry blood from your body to the machine, the other to carry blood back to your body. It will usually take 4-6 weeks or longer for the fistula to mature enough to be used. Because it takes time, it is best to have a fistula created before you need to start on dialysis, so you can avoid needing a catheter.

It is very important to come to your post-operative appointments so I can see how well your fistula is developing. Some of the time, the altered blood flow in the vein will cause a portion of the vein to scar down or narrow and decrease the blood flow. If this becomes bad enough, it could cause the fistula to completely shut down. Narrowing can usually be treated with a simple procedure called an angioplasty in which a special balloon is placed through a small catheter in the vein and inflated to stretch out the narrowed area. If the fistula shuts down completely, we may need to create a new fistula.

Once a fistula is working well, it can often be used many years. Because the fistula is created from your own body materials, it is much less prone to problems with infection or clotting.

The Basics of Hemodialysis Access

Randal Bast, M.D.

AV Grafts:

The third type of access is called a graft. These tend to be much better than catheters, but not quite as good as a fistula. Most of the time, I place a graft in a patient when I don't have any good options for creating a fistula. A graft is tube usually made of a man-made material that we use as an artificial blood vessel. When a graft is placed, one end of the tube is connected to an artery, the tube is tunneled under the skin, and the other end is connected to a vein. The blood flows from the artery, through the tube and into the vein. Once the tube has 'scarred in' to the surrounding tissues over 2-3 weeks, the nurses can access your bloodstream by sticking two needles through the skin into the graft. Grafts tend to work well for 6-12 months, but then develop narrowing where the graft is connected to the vein. This can often be treated with an angioplasty, but tends to come back over time.

Because grafts are made of a foreign material, they have more problems with clotting and infection than fistulas do.

Potential Problems:

Unfortunately, there is no such thing as a perfect hemodialysis access. Over time, problems can develop.

The most common problem is a narrowing, or stenosis of the vessel. This may cause inadequate blood flow through the fistula or graft. Sometimes, it may cause the fistula or graft to clot. Both stenosis and clotting can usually be treated to restore blood flow through the access.

In some patients a portion of the vein or graft may become dilated and cause a large lump to appear in the access. These aneurysms are usually not a problem, but sometimes get large enough that they need to be surgically repaired.

Sometimes a fistula or graft may contribute to inadequate blood flow to the hand and fingers. This happens when the fistula or graft 'steals' too much of the blood from the artery and the tissues of the hand do not get enough oxygen and nutrients. Symptoms of this include pain, numbness,

The Basics of Hemodialysis Access

Randal Bast, M.D.

weakness of the hand, and non-healing sores. This may occur soon after an access is placed or can develop later. If the symptoms are mild, they may be monitored for a while to see if blood flow will improve. If the symptoms remain or worsen, further surgery may be needed. Occasionally, this can cause permanent nerve or tissue damage.

Your dialysis access is your lifeline. Without it, you cannot continue on hemodialysis. It is very important to let the dialysis nurse know if something is changing or seems significantly different. The nurses at the dialysis unit often do special testing to help identify any significant problems. A well-maintained access can provide years of good use.

Further Resources:

www.kidneyschool.org learning module 8 on vascular access

www.fistulafirst.org

www.kidney.org

The Basics of Hemodialysis Access

Randal Bast, M.D.

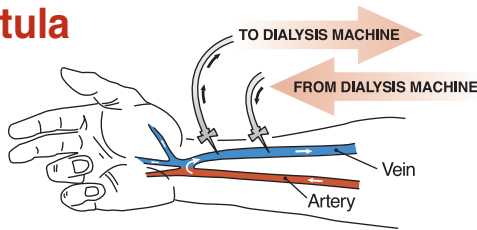
Hemodialysis Vascular Access

Hemodialysis cleans your blood through a fistula, graft or catheter. If you have kidney failure, one of these will be your **LIFELINE!**

Talk with your doctor to decide which type of vascular access is best for you.



Fistula



A fistula directly connects an artery to a vein. The vein stretches over time, allowing needles to be put in it.

Fistulas are the gold standard for hemodialysis.

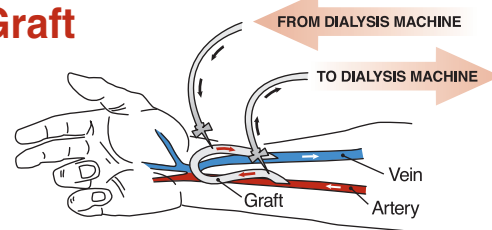
Advantages

- ✓ Permanent
- ✓ Beneath the skin
- ✓ Lasts longest, up to 20 years
- ✓ Provides greater blood flow for better treatment
- ✓ Fewer infections & other complications
- ✓ Fewer hospitalizations
- ✓ Better survival (lower risk of dying than patients with catheters)

Disadvantages

- ✗ May not mature/develop
- ✗ Not possible for all patients
- ✗ Usually cannot be used for at least 6–8 weeks

Graft



A graft is a tube, usually made of plastic, that connects an artery to a vein, allowing needles to be put in it. Grafts are the second best way to get access to the bloodstream for hemodialysis.

Advantages

- ✓ Permanent
- ✓ Beneath the skin
- ✓ May be used after 2 weeks, in some cases
- ✓ May work in patients with poor veins

Disadvantages

- ✗ Increased hospitalizations
- ✗ Increased risk for clotting
- ✗ Increased risk for serious infections
- ✗ Increased risk for other complications and repair procedures
- ✗ Does not last as long as a fistula

Catheter

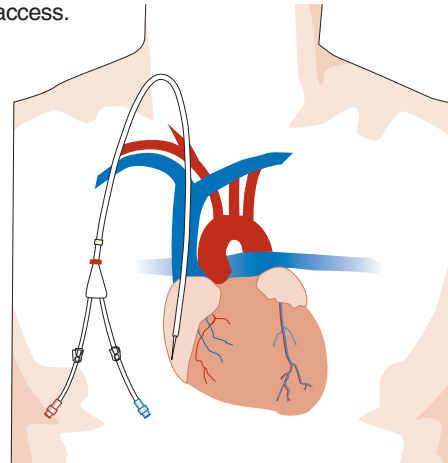
A catheter is a tube inserted into a vein in the neck or chest to provide vascular access for hemodialysis. The tip rests in your heart. It is usually a **temporary** access. It is the third choice for getting access to the bloodstream for hemodialysis. For some patients it is the only choice and it will need to be used as a permanent access.

Advantages

- ✓ Can be used immediately after placement

Disadvantages

- ✗ Higher infection rates, which can be very serious or fatal
- ✗ Increased hospitalizations
- ✗ Does not last long, usually less than one year
- ✗ May require longer treatment times
- ✗ Prolonged use may lead to inadequate dialysis
- ✗ Cannot shower without special appliance
- ✗ High rate of clotting requiring frequent procedures
- ✗ Risk of destroying important vein



Adapted with modifications from a flyer produced by the Roanoke Vascular Access Center, 4/10. This material was prepared by the Mid-Atlantic Renal Coalition as part of the Fistula First Breakthrough Initiative Special Project; further updates prepared by the End Stage Renal Disease Network Coordinating Center, 4/11; under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily reflect CMS policy. CMS Contract Number: HHSM-500-2010-NW002C.