

RENALIS

A Guide to the Care of the Circulatory System



Author: Dr. Tiit Kivistik

June 2023

Hemodialysis

To cleanse your blood of waste products using an artificial kidney machine (hemodialysis), your bloodstream needs to be connected to the hemodialysis machine.

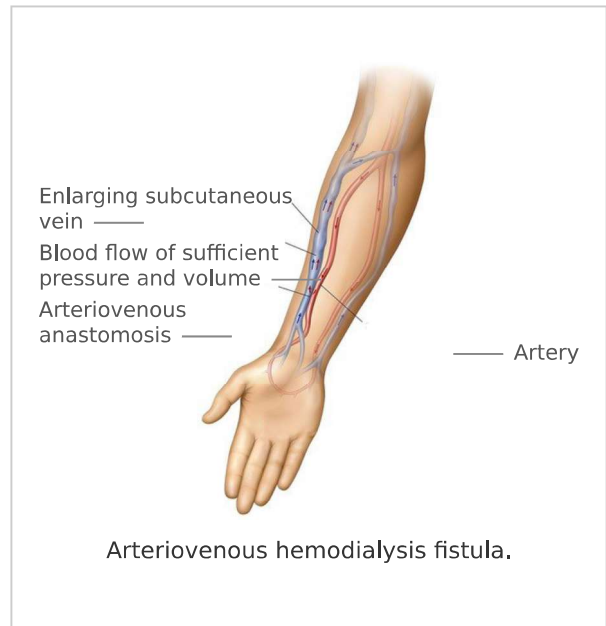
If hemodialysis is chosen as your renal replacement therapy, the necessary vascular access route will be selected by your treating nephrologist and surgeon, who will first examine your blood vessels and assess their condition and options.



Arteriovenous Hemodialysis Fistula (AVF)

If you will need hemodialysis over a longer period (more than a year), the best solution for you is surgery to create a connection between an artery and a vein in your arm — a so-called arteriovenous or native hemodialysis fistula (AVF).

After this connection is created, blood begins to flow from the artery — under higher pressure and in a greater volume — directly into the vein and from there back to the heart.



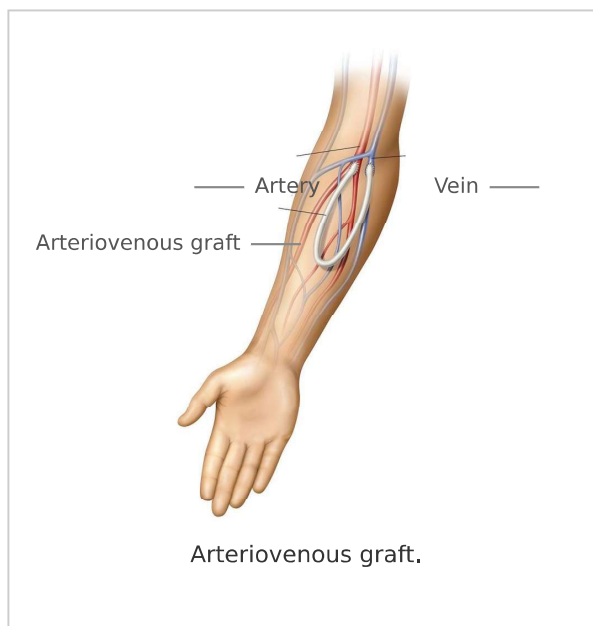
The purpose of this surgery is for the subcutaneous veins in your arm to widen and their walls to become stronger. The veins under the skin enlarge, becoming more visible on the surface. It is easier and safer to insert dialysis needles or cannulas into enlarged veins. These veins carry sufficient blood flow to ensure high-quality, rapid blood cleansing by the artificial kidney machine.



The subcutaneous veins have widened.

The goal of the surgery is to widen and strengthen the subcutaneous veins in the arm.

Arteriovenous Graft (AVG)



The desired enlargement of the veins is not always achieved by connecting a patient's own blood vessels. If a patient requiring dialysis has vessels that are too thin, or that have been damaged by previously placed catheters and cannulas used for administering medication, or if the desired changes do not occur in the subcutaneous

veins after surgery, there remains the option of placing an artificial blood vessel between the artery and vein of the arm (arteriovenous graft, AVG).

Whenever possible, our first choice is always to create a fistula from the patient's own blood vessels rather than to place a vascular graft.

The goal of the surgery is to create the necessary access route using an artificial blood vessel.



Arteriovenous graft placed under the skin.

- Your treating nephrologist will decide together with you what form your renal replacement therapy will take, explaining the advantages of each option and any possible related issues.

The surgeon who will operate on you will explain the nature of the surgery and what it involves.

Guidance Following AVF/ AVG Surgery

The vascular connection created on your arm, through which you will be connected to the artificial kidney machine, is like a lifeline for you — the quality of your dialysis in the years ahead, and in turn your quality of life, depends on how long it continues to function well.

As a patient, you can do everything within your power to make your coming years on dialysis as trouble-free as possible.

Arteriovenous Connection (AVF)

If an arteriovenous (AV) connection has been created on your arm during surgery, this will be followed by:

- a wound-healing period (10–14 days), after which the skin sutures are removed from the wound;
- a vein-“maturation” period (the expected changes in the subcutaneous veins), lasting 4–8 weeks.

NB

During the vein “maturation” period, inserting needles or cannulas into the vessels of this limb is permitted only in exceptional cases!

The vessels of the arm used for dialysis may be punctured only for the purpose of hemodialysis, and this may begin only once the vein has sufficiently “matured”.

Vascular Graft (AVG)

- If a vascular graft was placed when your arteriovenous connection was created, the arteriovenous connection can be used for hemodialysis as soon as the wounds have healed and the swelling has subsided. There is no need to wait for the vein to “mature”.

The final decision on when to start using the arteriovenous connection is made by the hemodialysis team.



The following information is very important for you if you have had an arteriovenous connection created or an arteriovenous graft placed during surgery.

If, 2 days after surgery, the wound is dry, it may be washed with clean running water and liquid soap.

- your treating physician will prescribe an antithrombotic medication (usually a standing prescription of cardio-aspirin, 1 tablet daily);
- change the wound dressing after 24–48 hours. If the dressing becomes wet, it may be changed sooner, but a pressure bandage should be avoided on the wound. A pressure bandage may only be applied in the case of more serious bleeding, and it is preferable that it be applied by a healthcare worker familiar with dialysis fistulas;
- if, 2 days after surgery, the wound is dry, it may be washed with clean running water and liquid soap. After washing, dry the wound with a clean towel. In both actions, avoid rubbing the wound hard. After this, a disinfectant solution intended for wounds (available over the counter at a pharmacy) may be applied and allowed to air-dry. Three days after surgery, covering the wound with a dressing is no longer mandatory;
- however, if you find yourself in an environment dirtier than usual, covering the wound with a dressing is still recommended. If the wound is left uncovered, make sure the clothing covering that area is clean;
- swimming and the sauna are permitted only after the wound sutures have been removed;



Keeping the arm bent at more than 90 degrees.



Keeping the arm hanging down.

During the first few days, avoid keeping your arm hanging down for long periods and avoid bending your elbow joint more than 90 degrees.

- in the event of heavy bleeding from the wound, seek emergency care at the nearest medical facility or contact the doctor or facility that performed your surgery;
- during the first few days, avoid keeping your arm hanging down for long periods and avoid bending your elbow joint more than 90 degrees;
- if, 3 or more days after surgery, redness, swelling of the wound, or a rise in temperature appears that was not present on previous post-operative days, contact your treating physician/facility;
- during the first week, avoid physical exertion on the AVF arm (strength training, carrying heavy loads);
- one week after surgery, you may begin simple exercises with the AVF arm that help the AVF veins “mature” (clenching the hand into a fist and releasing, squeezing a soft ball);



Constant pressure on the skin.



Simple exercises for vein "maturation".

One week after surgery, you may begin simple exercises with the AVF arm.

The edges of clothing, jewelry, and straps (a watch strap, bag strap, etc.) covering the AVF limb must not exert constant, strong, i.e. constricting, pressure on the skin of the AVF limb.

- the edges of clothing, jewelry, and straps (a watch strap, bag strap, etc.) covering the AVF limb must not exert constant, strong, i.e. constricting, pressure on the skin of the AVF limb;
- your dialysis nurse will teach you how to monitor the arm with the arteriovenous connection;
- if you have questions about the fistula or dialysis, ask them right away if possible, or
- write your question down somewhere so that when you meet with your treating physician or dialysis nurse, you can ask it and receive an answer;
- it is important to know that various problems can sometimes arise with an AVF or AVG, which may require repeat surgical procedures aimed at improving the function of the fistula or restoring the function of a non-functioning fistula.

AVF/AVG Thrombosis

Problems associated with fistulas, and guidance on what you can do to maintain good AVF function and prevent problems.



Full flexion of the elbow joint.

AVF or AVG thrombosis is the blockage of the AV connection and blood vessels by a clot, which interrupts blood flow through the AV connection so that dialysis can no longer be performed through it. This is the most common of all possible problems.

There can be several causes for a clot to form, and it is sometimes difficult to pinpoint a single exact cause. We present here important information on what you can do to reduce the risk of this problem and complication.

If such a problem occurs, it is necessary to restore blood flow in the AV connection as quickly as possible.

Avoid prolonged (more than 3 minutes) full flexion of the elbow joint during daily activities and while sleeping.

! External signs of a possible clot or blockage in the AVF, in which case you should contact the dialysis center as quickly as possible:

- unusual pain in the AVF vein that appeared after a dressing was applied to the puncture site on the day of dialysis or on subsequent days;
 - an unusually sudden, strong pulse in the AVF vein, or subcutaneous veins on the AVF arm or in the shoulder area that have unusually suddenly and intensely become visible;
 - the thrill (a light pulsing vibration) previously felt by hand on the AVF veins or AV graft has disappeared (your dialysis nurse will teach you how to monitor the AVF and check for this thrill);
 - sudden swelling of the AVF arm that was not previously present.
-

– To reduce the risk of thrombosis, you should completely avoid:

- prolonged (more than 3 minutes) full flexion of the elbow joint during daily activities and while sleeping;
- prolonged (more than 3 minutes) external pressure on the AVF arm from daily activities, from wearing covering clothing, jewelry, or straps, or while sleeping;
- extreme external temperatures — both heat and cold (a protective covering for the AVF arm against heat or cold is recommended);
- injecting medications or vaccines into the AVF arm;
- getting tattoos on the AVF arm;
- extreme overall physical exertion and muscle strain involving the AVF arm;
- smoking (increases the overall risk of clot formation);
- diets not approved by your treating physician, and fluid deficiency;
- excessive alcohol consumption.

AVF/AVG Inflammation Caused by Bacteria

- keeping your hands clean — wash your hands frequently with clean water and soap, and also wash the AVF area once a day. Wash the arm with the AVF fistula before dialysis needles are inserted (your dialysis nurse will give exact instructions);
- avoid intense rubbing of the AVF area and scraping scabs off healing puncture sites;
- avoid swimming, bathing, and the sauna for the first 8 hours after dialysis;
- avoid coughing or sneezing toward the AVF arm;
- avoid activities and environments involving the AVF arm that could injure the skin (for example, direct contact with mineral insulation wool, pricks and scratches from plants, insect bites, etc.). Any skin injury, however minor, gives bacteria living on the skin's surface a good opportunity to penetrate deeper into the tissue and cause purulent inflammation there;
- clothing covering the AVF arm must always be clean and must not cause an allergic reaction on the skin;
- only the dialysis nurse may puncture the AVF arm with a needle or cannula, and medications or vaccines must not be injected into this arm.

This refers to inflammation caused by bacteria in the body's own tissue or on the artificial blood vessel. Such inflammation more often becomes a serious problem in the case of vascular grafts placed in the body. This is because a graft is a synthetic material, and its risk of infection is considerably higher than that of the body's own tissue. Living tissue is better protected against pus-forming pathogens by the body's defense cells. Nevertheless, bacterial inflammation can also occur in the body's own tissue. Bacteria that cause purulent inflammation enter deeper tissue or the graft from the surface of the skin, and based on this, the following recommendations are given to help you prevent inflammation:



Signs of bacterial inflammation of the AV fistula, in which case you should contact the dialysis center as quickly as possible:

- redness, swelling, or pain has appeared at the AVF puncture site or over the entire AVF arm;
- discharge (pus, blood) is persistently coming from the AVF puncture site, or there is a small skin defect through which the vascular graft can be seen;
- a subcutaneous pulsating or firm lump has suddenly appeared and is growing in the AVF puncture area.

Bleeding from the AVF Puncture Site

Bleeding from the AVF puncture site after dialysis or between dialysis sessions refers to abnormally heavy or prolonged bleeding from the needle hole left in the vessel. Normally, by the day after dialysis the needle hole is covered by a scab and no longer bleeds.

If you notice what seems to you to be abnormal, delayed bleeding, be sure to tell your dialysis nurse about it.

What to Do If Heavy Bleeding Occurs from the AVF Puncture Site:

- Place the thumb of your other hand exactly on the bleeding point and press on it with the minimum force needed to stop the bleeding. If pressing on the bleeding point makes the bleeding worse, the finger stopping the bleeding is not in the right place;
- avoid covering the bleeding site with large paper towels, cloths, or gauze pads while pressing on it, since underneath them the pressure stopping the bleeding may not be applied at the right spot or with the right force;
- instead of a finger, the cap of a plastic bottle can also be used, pressed hollow-side down against the skin at the bleeding site, firmly enough that blood does not escape between the edge of the cap and the skin. The cap can be fixed in the right place with the right pressure using a bandage;
- call for help so that you can get to a medical facility as quickly as possible. A tourniquet may only be used by those who know how, as improper use can increase the bleeding.



Heavy bleeding.

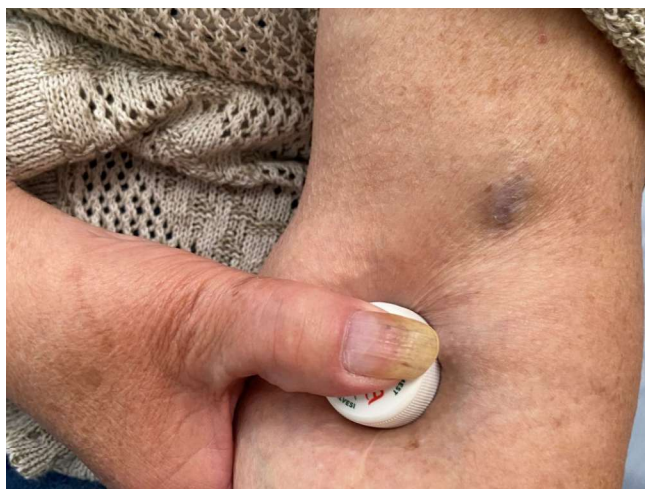


Placing the thumb on the bleeding site.

Place the thumb of your other hand exactly on the bleeding site.



Pressing a plastic bottle cap onto the bleeding site.



Stopped bleeding and blood clot.

Recommendations for Preventing Bleeding Problems:

- Do not remove the dressing from the puncture site after dialysis before 3–4 hours have passed;
- if the dialysis nurse applied a pressure bandage to the puncture site after dialysis, check with her when you may remove it;
- after dialysis, avoid physical exertion on the arm for the rest of that day;
- do not scrape or remove scabs from the skin at previously unhealed puncture sites;
- do not measure blood pressure on the AVF arm.

Instead of a finger, a plastic bottle cap can also be used, pressed hollow-side down against the skin at the bleeding site.



Avoid covering the bleeding site with large paper towels.

You yourself are the most important person in assessing the external condition of your fistula. If you notice anything unusual about your fistula, be sure to tell your dialysis nurse or treating physician.

During each dialysis session, the dialysis nurse examines your fistula and assesses its condition. Because nurses rotate at dialysis centers, the same nurse may not always be working with you. As a result, a dialysis nurse may find it difficult to assess changes that have occurred in your fistula.

The long-term good function of the arteriovenous connection on your arm is ensured by your cooperation with the dialysis team and your careful handling of the fistula.

To this end, we do our very best.
