Predialysis: hemodialysis

azdelta
Uw ziekenhuis.

Dear patient,

You have just been informed by your attending physician that your kidneys are not functioning properly and that you will become dependent on dialysis in the future.
You probably have a lot of questions, but you cannot or do not dare to ask them.
You may feel a need to have a conversation or obtain some information, or you may wish to talk to someone who is in the same situation.
The doctor, nurse and social services are always prepared to listen to you and answer the questions you have.

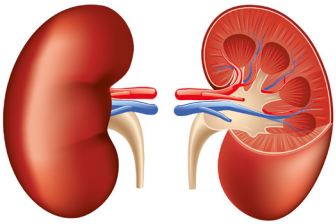
You will find their contact information on the back of this leaflet.

The Department of Nephrology

1. General information

Anatomy of the kidneys

The kidneys are bean-shaped organs located outside the peritoneum on both sides next to the spine, approximately at the level of the lumbar region.



A normal adult kidney is about 12 cm long, 5 cm wide and weighs about 160 grams. A kidney consists of several layers of tissue and the renal pelvis. It is a very blood-rich organ.

In fact, a kidney is composed of one million small units (nephrons) that work more or less independently. The blood is purified in the first part of such a nephron. A large quantity of highly diluted filtrate is formed there, containing not only a lot of water and waste products, but also useful substances. Most of the water and useful substances are recovered from the filtrate in the last tubular part of a nephron. What remains is the urine.

1.2. Functions of the kidneys

The kidneys filter the blood 24 hours a day.

- They remove **excess fluid** from the body.
- They remove **waste products** from the body (food releases harmful waste products such as urea) through the urine.
- They are also responsible for **maintaining certain substances** in our body (e.g. potassium).
- They regulate the **acidity** (pH) of the blood.
- They produce a hormone **(erythropoietin)** that stimulates the bone marrow to produce red blood cells.
- They also produce a hormone that plays a role in **blood pressure regulation** (renin).
- In addition, the kidneys play a role in regulating the calcium content in the bones by producing the active form of **vitamin D**.

1.3. Causes of chronic kidney problems

- Diabetes: 35%
- Years of uncontrolled blood pressure
- Atherosclerosis of the renal artery (arteria renalis)
- Kidney cysts, hereditary
- Chronic kidney inflammation, e.g. due to kidney stones
- Kidney damage caused by years of taking pain-relieving pills or powders
- Sometimes the cause is unknown

1.4. Symptoms of kidney disorders

When only 15% of the kidney is working, and the various functions are no longer recovering, this is called **end-stage renal disease** and renal replacement therapy is necessary.

You may suddenly be confronted with end-stage renal disease due to a very rapid decline in kidney function, but this may also be a process that takes years.

People with advanced kidney disease may have one or more of the following symptoms to varying degrees: **fatigue, drowsiness,** discomfort in the legs, **muscle weakness,** sensation of burning feet, **headache**, vomiting, decreased or increased urine production, tightness in the chest, shortness of breath, **accumulation of fluid** under the skin (oedema), (e.g. in the feet, ankles or face), **itching and/or cramps**, gout (due to accumulation of uric acid), **bad breath**, rapid bruising and nosebleeds, **high blood pressure**.

These symptoms are due to the fact that the kidneys are not adequately excreting the **waste products** of metabolism and finally, also **water**.
Among other things, phosphates can accumulate in the blood, stimulating the parathyroid gland. The result is decalcification of the bones and calcification of the blood vessels, among other things.

With a rapid decline in kidney function, the symptoms of the disease are usually more pronounced. People have more symptoms than when the loss of kidney function is slow: they feel sicker.

Without treatment, end-stage renal disease is life-threatening. It is therefore necessary to replace kidney function.

Based on your symptoms and blood test results, the attending physician will choose between continuing treatment with **drugs and diet** (e.g. low salt, fluid restriction, low potassium, protein restriction) or starting **renal replacement therapy**.

2. Hemodialysis (artificial kidney treatment)

2.1. Operation of an artificial kidney

Hemodialysis is the most commonly used treatment so far. During artificial kidney treatment – or dialysis – your blood is purified outside the body with a dialysis machine.



The blood is temporarily prevented from clotting and pumped through a filter, the artificial kidney.
This artificial kidney contains a semi-permeable membrane. The blood flows through very thin tubes on one side of that plastic membrane, and dialysis solution (dialysate) flows on the other side.



The artificial kidney has a dual function: on the one hand, waste products and excess water flow through this membrane into the dialysis solution, and, on the other hand, useful substances can be added to the blood. The purified blood is returned to the patient.

The artificial kidney will therefore:

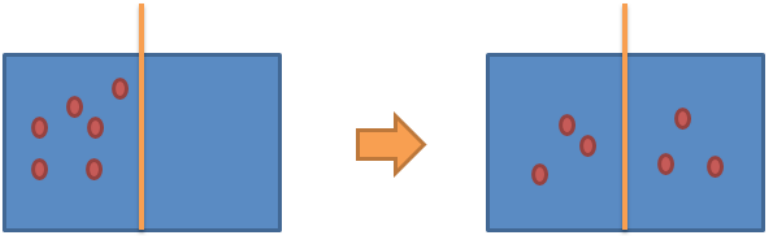
- remove waste products such as urea, creatinine and uric acid
- extract excess water (ultrafiltration)
- correct the acidity of the blood by absorbing bicarbonate from the dialysis solution.

For this treatment, the patient must visit the artificial kidney clinic three times a week for about four hours each time.

The exchange of ions and waste products

This **can be done in two ways**:

- **diffusion**
  Waste products from the blood pass through the membrane into the dialysis solution when the concentration of the substance in the blood is higher than that of the dialysis solution. The exchange takes place until the concentrations in the blood and the dialysis solution are the same.



Diffusion through the semi-permeable membrane of the artificial kidney.

Because the dialysis solution is constantly being refreshed, we see that the concentration of this substance in the dialysis solution is not becoming equal to that of the blood, so the exchange continues. The opposite is also true. When there is a substance in the dialysis solution with a higher concentration than that of the blood, we see that there will be a transfer of that substance from the dialysis solution to the blood.

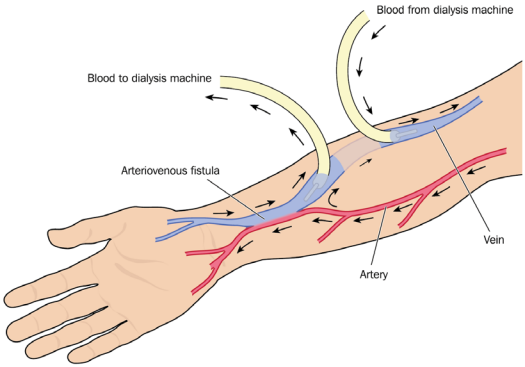
- **ultrafiltration**
  If the hydrostatic pressure in the blood compartment is higher than that in the dialysis solution, the fluid from the blood will be forced through the membrane. Fluid can also be extracted from the blood by creating negative pressure on the dialysis solution. This removes plasma water and all of the substances dissolved in it.

2.2. Access route: fistula - catheter

A good access route to the bloodstream is needed to enable a sufficiently powerful blood flow through the artificial kidney. A distinction is made between:

- the creation of a fistula
- the use of a catheter (temporary or permanent)
- the use of a catheter in combination with a fistula

a) Creation of a fistula at least four to six weeks before the start of haemodialysis.
This is an internal surgical connection of an artery and a vein. Because of the greater pressure in the artery, blood is sent to the superficial vein, which will expand and become easy to insert needles into.
This is usually done using the blood vessels of the forearm.



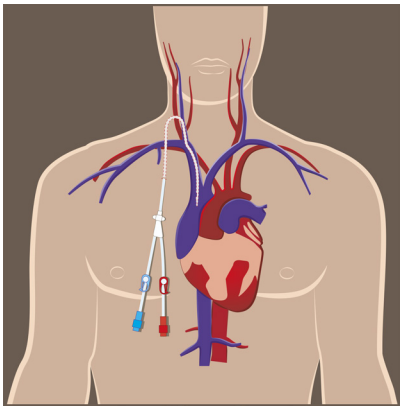
The fistula is the patient's lifeline and must always be well cared for and monitored by him or her.
The nurse punctures the fistula with one or two needles every dialysis session.



Fistula

b) Fistula placement at the time dialysis begins
A temporary or permanent catheter (tube) is then also placed for dialysis, and the catheter is used until the fistula is developed and easy to puncture.

If the placement of a fistula is impossible, a permanent catheter will be surgically implanted at the base of the neck (usually under general anaesthesia) in the operating theatre.





Dialysis catheter

To prevent clotting in the catheter, a small amount of anticoagulant medication will be introduced into the catheter after each dialysis session.

c) A combination of the fistula with the catheter
In some cases, the fistula is created at the same time as the catheter placement. The blood is then drawn through the fistula and returned through the catheter.

2.2. Diet and medication

In addition to dialysis, diet, fluid restriction and medication are important.
Blood samples are taken monthly, and the doctor will use the results to adjust your medication individually.

You must also adhere to the diet:
- restriction of fats, products containing salt and potassium
- adequate protein intake
- low potassium (e.g. max. one piece of fruit/day + low intake of vegetables)
- fluid restriction: e.g. 600 ml per day for someone who no longer has any remaining kidney function.
- the less weight you gain between dialysis sessions, the better you will tolerate the dialysis.

Drinking more means more fluid in the body with often unpleasant or severe consequences: swollen feet, high blood pressure, shortness of breath and prolonged dialysis time. In time, this can cause strain on the heart.

2.3. Introduction to hemodialysis at our centre

Hemodialysis takes place in our hospital (the main centre) under the responsibility of our kidney specialists.

In total, approximately 210 to 220 patients are treated with hemodialysis at the main centre.

Patients are on dialysis per group: the first group comes on Monday, Wednesday and Friday mornings, the second group in the afternoon of the same days, the third group on Tuesday, Thursday, and Saturday mornings and the fourth group in the afternoon of the same days.

The centre is open from Monday to Saturday from 7 a.m. to 6:30 p.m.
The on-call service is available all other times of the week.

Dialysis is also possible at a CAD (Collective Auto Dialysis clinic, associated with the main centre in Roeselare). The CADs associated with AZ Delta are: Menen, Tielt, Veurne and Torhout. Patients may choose this option because of the shorter distance from their place of residence to a CAD or because of familiarity with the hospitals listed.

A number of factors are important for dialysis at a CAD location.

- Treatment at a CAD (not the main centre) requires the patient to be medically stable.
- Additional or recurrent medical problems mean treatment will have to be at the main centre, whether or not temporarily, according to the patient's progress.
- Each application for treatment at a CAD must take into account the places available and often requires some waiting time.

2.4. Practical course of a dialysis session

You can come to the dialysis clinic by a patient transport service, a taxi or your own car.
You will be reimbursed. The amount will vary depending on the form of transport and the health insurance fund.

On arrival, you will be weighed and your blood pressure measured. You will then be connected to the artificial kidney. All technical activities, such as operating the equipment, preparing for dialysis, puncturing the fistula and aftercare, are carried out by dialysis nurses.
During the dialysis session, we will offer you a cup of coffee (if you tolerate the dialysis well).
You can also have breakfast in the dialysis dining room.
In the course of the dialysis session, your blood pressure will

be checked regularly (the machine will also be monitored) and the doctor will visit.
After dialysis, the patient can have lunch at the restaurant (for those having dialysis in the morning).

The total time you are away from home for one treatment is the transfer time to and from the hospital, the time for connection and disconnection (+/- 30 min) and the dialysis time, which usually lasts four hours.

2.5. Showering and bathing

If you have an arteriovenous fistula in your arm as an access route, showering and bathing are no problem at all. Bathing with a catheter is not recommended. Showering is only allowed if the catheter is sufficiently protected with a transparent plaster.

2.6. Travel

You will still be able to travel at home and abroad. You can then have dialysis temporarily at a clinic near your travel destination.

Notes

Contact

Hemodialysis Clinic
Dialysis Dispatch
t 051 23 38 98

www.azdelta.be

Source: Department of Nephrology

Physicians

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Dr Bart Maes
Dr Thomas Malfait
Dr Hans Schepkens
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