
Department of Transplantation Medicine and Nephrology
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End Stage Renal Diseases

<table>
<thead>
<tr>
<th>ESRD Patients</th>
<th>2,310,000</th>
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<tbody>
<tr>
<td>thereof HD</td>
<td>1,585,000</td>
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<tr>
<td>thereof PD</td>
<td>190,000</td>
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<tr>
<td>thereof Tx</td>
<td>535,000</td>
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| World Population | 6.7 billion |

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<th>Annual Growth Rates</th>
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<tr>
<td>World population</td>
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<tr>
<td>ESRD</td>
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The main causes of end-stage renal failure among patients starting dialysis in Poland (epidemiology)

- Diabetic nephropathy 29.6%
- Chronic glomerulonephritis 17.1%
- Hypertensive nephropathy 16.0%
- Reasons unknown or poorly defined 11.5%
- Interstitial nephritis 5.8%
- Polycystic kidney degeneration 4.4%
- Cancer of the urinary tract 3.5%
- Multiple myeloma 1.5%
- Secondary amyloidosis 1.3%
Renal Replacement Therapy

DIALYSIS:
• HEMODIALYSIS
• PERITONEAL DIALYSIS

KIDNEY TRANSPLANTATION:
• LIVING RELATED DONOR
• DEATH/CEASED DONOR
DIALYSIS

HEMODIALYSIS
(extracorporeal dialysis)

PERITONEAL DIALYSIS
(intracorporeal dialysis)
HEMODIALYSIS (ACCESS)

Catheter
- ACUTE
- PERMANENT
HEMODIALYSIS
(ACCESS)

Catheter
(ACUTE, PERMANENT) - external

Arterio-venous fistula
(internal)
History of vascular access

- First hemodialysis (Kolff) – 1944
- Scribner fistula – 1960
- Cimino i Brescii fistula – 1966
Scribner fistula
Cimino i Brescii fistula

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†Physician, Renal Service, Dialysis Unit
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§Attending surgeon, Surgical Service
Location possibilities of vascular access for dialysis

PRIMARY AND SECONDARY ACCESS TO DIALYSIS
Widok od przodu

- V. cephalica
- N. cutaneus antebrachii posterior (gałąź n. radialis)
- N. cutaneus antebrachii lateralis (gałąź n. musculocutaneus)
- V. mediana (intermedia) basilica
- V. mediana (intermedia) cephalica
- V. cephalica accessoria
- V. cephalica
- V. mediana (intermedia) antebrachii

W 70% przypadków w. mediana cephalica i basilica łączą się w nieparzystą w. mediana tricipitalna, która w zegaż mija do w. basilica (ewentualnie z ryciny 44a).

- Ramus palmaris nervi ulnaris
- Ramus dorsalis nervi ulnaris
- Retinaculum flexorum
- Aponeurosis palmaris
- Lig. metacarpale transversum superficialis

- Vv. meta-carpales dorsales
- Vv. inter-capitulares
- Nn. digitales palmares proprii et vv. digitales palmares

Vv., nn. digitales dorsales

Anatomy
Anatomy
Anatomy
Production of vascular access for dialysis (tactics)

- Selecting the optimal development time primary access to dialysis.
- Select the type of primary arteriovenous fistula.
- Prevention of complications leading to the cessation of operations of primary arteriovenous fistula.
- Select the type of secondary arteriovenous fistula.
Team of arterio-venous fistula

SURGEON

PATIENT

NEPHROLOGIST

NURSE
Production of vascular access for dialysis (tactics)
A patient with chronic renal failure should have made arterio-venous fistula, where:

* creatinine clearance less than 25 mL / min.
* creatinine level is greater than 4 mg / dl.
* it is expected that within a year ill will require hemodialysis
* The original arterio-venous fistula of the patient's own blood vessels „mature" at least one month (preferably 3-4 months).
* PTFE fistula should "mature" at least 4 - 6 weeks.
Avoiding puncture veins of the upper limb (especially cephalic vein)

You can use the veins of the hand dorsum.

Avoiding the subclavian venous catheterization
Primary choice arteriovenous fistula

* 1. radial-cephalic arteriovenous fistula
* 2. brachio-cephalic arteriovenous fistula
* 3. brachiocephalic subcutaneous ulnar displacement of the basilic vein.
* 4. arteriovenous fistula with a PTFE on the arm or forearm
Arterio-venous fistula radial-cephalic (SIDE TO SIDE) and modification

Telescopic connected vessels of end to end radio-cephalic fistula
Arterio-venous fistula radial-cephalic (CIMINO-BRESCIA)

BENEFITS

* Easy to carry
* Proximal vessels are preserved for possible production of secondary access for dialysis
* A small number of complications
COMPLICATIONS

* Stenosis at the site of vascular anastomosis.
* Fistula thrombosis
* The venous hypertension syndrome in the hand
Arterio-venous fistula radial-cephalic (CIMINO-BRESCIA)

Stenosis at the site of vascular anastomosis
INDICATIONS FOR PRODUCTION ARTERIOVENOUS FISTULA FOR HEMODIALYSIS AT ARM

* lack of suitable vein on the forearm.
* constant failure arteriovenous fistula on the forearm.
Arterio-venous fistula brachiocephalic (end to side)

BENEFITS:

* higher blood flow compared to the forearm fistulas.
* more frequent swelling hand and steal syndrome than in the case of fistula on forearm.
Arterio-venous fistula PTFE using at forearm and arm (shoulder)

Polytetrafluoroethylene (PTFE) is a synthetic fluoropolymer of tetrafluoroethylene = teflon
DISADVANTAGES

* destruction of material through a plurality of injection.
* the possibility of infection of the vascular prosthesis.
Arterio-venous fistula
COMPLICATIONS

- Narrowing.
- Thrombosis.
- Infection.
- Aneurysms.
- Hemorrhage and hematoma.
- Peripheral limb (fingers) ischemia.
- Lymphocele.
- Venous hypertension, edema of the limb.
In 90% of cases, the cause of malfunctioning shunt dialysis is the stenosis, which may result in:

* lack of proper maturation of the fistula.
* loss of flow (lack of opportunities for dialysis).
* dialysis fistula thrombosis.
* formation of aneurysms in vessels draining.
* edema and the formation of collateral vessels.
Stenosis of arteriovenous fistula

CLINICAL SINGS

- Weakness murmur fistula.
- The appearance of ripple fistula.
- Aspiration of blood clots in puncturing the stoma.
- Dialysis fistula thrombosis.
- Swelling of the arm.
- Development of collateral circulation.
- Prolonged control of bleeding after puncture of the fistula.
Stenosis of arteriovenous fistula

**SYMPTOMS ASSOCIATED WITH HEMODIALYSIS**

- reducing the flow at the time of dialysis.
- increased blood pressure in the dialysis fistula.
- increased recirculation.
- reduction in the dose of dialysis (Kt / V).
- abnormal imaging studies fistula.
STENOSIS OF ARTERIOVENOUS FISTULA DIAGNOSTIC IMAGING
SKIN RUPTURE ABOVE ARTERIOVENOUS FISTULA
Focus of necrosis over extended Basilic vein displaced
Hiperkinetic arteriovenous fistula (too much blood flow) can cause:

- onset or exacerbation of heart failure.
- cause ischemia of the hand.
Swelling of the arm: vein stenosis arm, subclavian or brachiocephalic fistula with running arterio-venous fistula on the arm on the same side.
Subclavian vein stenosis
BRACHIOCEPHALIC VEIN STENOSIS
* The coexistence of diabetes in patients on dialysis a poorer functioning fistulas arterio-venous forearm.

* In dialysis patients with diabetic nephropathy, in the case of questionable status vessels on his forearm, perform fistula for hemodialysis primary on arm vessels.
The tactics of the production of vascular access is a critical period before the start of dialysis - appropriate treatment of upper limb veins.

The decision to manufacture fistula t-f should be made early so that the first dialysis was performed to a functioning fistula.

Avoid setting up a temporary catheter for dialysis, because there is a substantial likelihood of venous thrombosis of the subclavian or brachiocephalic.
Primary arteriovenous fistula should be made of the patient's own veins in the peripheral parts of the upper limb.

The best type of vascular access is a fistula radial-cephalic.

Using of the fistula has a significant impact the period of its life.

Production of vascular access on the lower limbs is recommended only after exhaustion of the feasibility of access to the upper limbs.
VASCULAR ACCESS

* First puncture the fistula should occur 4-6 weeks after surgery.

* Each injection site should be changed especially in fistulae with an artificial graft, as this prevents the formation of aneurysms.

* Puncture should be consistent with the direction of blood flow, as this reduces the possibility of hematoma formation and the formation of aneurysms.

* Must observe the principles of antisepsis and asepsis.

* Be the right force to press fistula after finished dialysis.

* Dialysis fistula trombosis should be treatmened by surgeon or radiologist or using fibrinolysis.
Tenckhoff catheter – children
PERITONEAL DIALYSIS

* 1 – intraperitoneal part
* 2 – peritoneal cuff
* 3 – subcutaneous cuff
* 4 – exit site
Indications for use of a catheter in children:

* young age
* use diapers
* uretero-cutaneous fistula, vesico-cutaneous
* laxity of the abdominal wall
* obesity
* recurrent infections of the external orifice at using conventional abdominal catheters.
Swan Neck Presternal Catheter
Tenckhoff catheter - children
Tenckhoff catheter - children
PERITONEAL DIALYSIS
Chronic peritoneal dialysis (advantages)
* therapy at home.
* Automated peritoneal dialysis (APD) method - at night.
* relatively liberal diet.
* continuous treatment.
* adequate control of volume depletion and uremic poisoning.
Chronic peritoneal dialysis (disadvantages)

* Weight loss.
* Create a hernia
* Infections of the ostium/lumen catheter
* The risk of peritonitis
* Hypercoagulability
* Premature atherosclerosis
* Time constraints - the effectiveness and adequacy of decreases with time (> 2 to 3 years) - remodeling of the peritoneal membrane, overhydration, atherosclerosis, abdominal complications.
Tenckhoff catheter - adults
Tenckhoff catheter - adults
Tenckhoff catheter - adults

IMPLANTATION TENCKHOFF CATHETER:
1 / cover initial implantation - the inner end of the catheter in the left iliac fossa.
2 / The shape of the subcutaneous channel (tunnel)
   - Catheter (Swan-neck) - in accordance with the curvature
   - A simple catheter - mildly distorted
3 / The inner end of the tunnel facing downwards – prevention shipments
4 / The outer end of the tunnel facing downwards – Prevention infection of the external
5 / Plan of the external space before the operation - in position sitting - on top of the fold of skin, NOT between the folds in trough
6 / external muff dacron at least 2-3 cm from the outlet catheter to the skin
7 / routine antibiotics - to prevent early infection - 3 hours before surgery - Cephalosporin alternatively I gene. 1 g iv or Vancomycin 1 g i.v.
CATHETER CARE

Beauty catheter after implantation:
• assessment of catheter function even during implantation.
• First day - rinse the catheter (rinsing the blood and fibrin)
• Large dressing - changes every 7 days
• Prevention: contamination of the outlet he tunnel and traumatization catheter
• using catheter after 2 - 4 weeks.

Care of chronic dialysis catheter
• showering
• sterile dressing every other day
• washing with iodine, OCTENISEPT or salt physiological external orifice of the catheter to the skin.
• application of mupirocin on outlet catheter to the skin

Tenckhoff catheter - adults
CONTINUOUS AMBULATORY PERITONEAL DIALYSIS (CAPD) dialysis fluid exchange
Lumbal access

Ultima ratio access for hemodialysis is lumbal access by lumbal catheter (permanent catheter is inserted in vena cava inferior in lumbal region) during scopy (Rtg-scropy) = translumbar central venous catheters for long-term haemodialysis.
AUTOMATED PERITONEAL DIALYSIS (APD) USING TERMOCYCLER
Three basic methods of renal replacement therapy:
- 1 / kidney transplantation
- 2 / hemodialysis
- 3 / peritoneal dialysis

can successfully be used in the same patient.

Each of the treatments provides survival patient.

The choice of a particular method of treatment requires take into account the overall clinical situation of the patient.
Hemodialysis (HD) can be used whenever you are indications for renal replacement therapy, taking into account absolute contraindications:

- impossible to obtain vascular access, active anticoagulation to prevent bleeding - especially - open intracranial bleeding (but you can use a local anticoagulation)
- haemorrhagia,
- hemodynamic instability in a patient with severe heart failure (but the technique may be used continuous).
Changing HD TO PD:
* lack of vascular access for HD.
* patient preference.
WHEN peritoneal dialysis (PD)?

* If HD is practically for all this should be used when PD?
1) age less than 5 years of age (infants and young children; dialysis Peritoneal is still the method of choice in children with AKI and CRD)
2) age over 65rz (elderly, incapacitated physically)
3) lack of vascular access for HD,
4) hemodynamic instability during HD,
5) advanced cardio – vascular particularly with left ventricular hypertrophy and leading to overhydration and the need for pre-emptive treatment dialysis
6) diabetes
7) persons wishing to continue working, learning.
Why start treatment renal replacement of PD and not HD?

- Improve the initial survival
- Protection of residual renal function (RRF)
- Protection of vascular access
- Reduce delay of graft function kidneys
- Reducing the incidence of blood-borne infections.
AWAK - automatic personal portable artificial kidney works by peritoneal dialysis.
The dialysis fluid, obtained by means of pumps from the peritoneal cavity is regenerated after passing through the sorbent system.
Dialysate back to the peritoneal cavity and the excess water coming from the ultrafiltration is collected in a separate container.
AWAK