

Hemodialyser

Hemodialysis, also called dialysis, is the most common treatment for kidney failure.

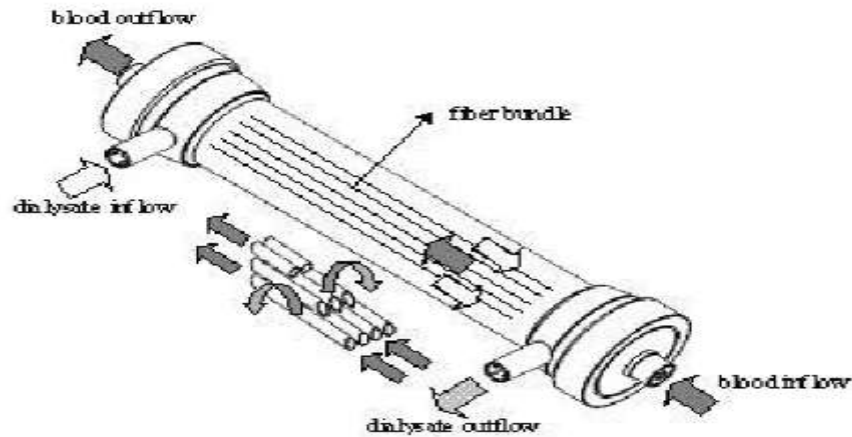


Fig 3.3.1: Dialyser Internal Diagram

[Source: Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology]

During dialysis, blood is drawn from the patient into the dialysis machine, circulated through the machine, and then returned to the patient. Two needles are inserted into the patient's bloodstream to allow this process to occur.

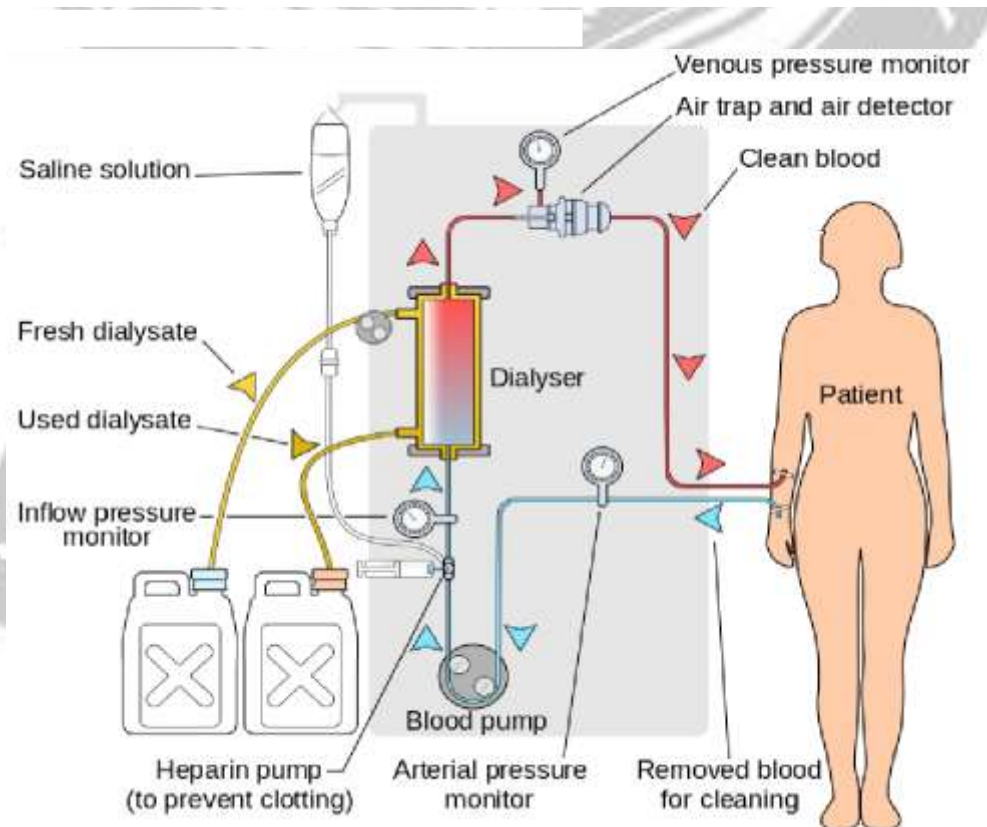


Fig 3.3.2: Simplified Hemodialysis Circuit

[Source: Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology]

Hemodialysis is normally performed three times a week and the purpose of vascular access is to provide reliable sites where the bloodstream can be easily accessed each time. There are three major types of vascular access: arteriovenous fistula, arteriovenous graft, and venous catheter. The great majority of vascular accesses are created in the arm, but they can also be created in the leg.

Types of Vascular Access

The three most common types of access are: ,,

- Internal arterio-venous fistula (AV fistula) ,,
- Internal arterio-venous graft (AV graft) ,,
- Central venous catheter (also called central venous –line| or hemodialysis catheter)
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1. Arteriovenous Fistula

A surgeon creates an arteriovenous fistula by making a connection between an artery (which carries blood away from the heart) and a vein (which carries blood back to the heart). This artificial connection allows the vein to become larger and for the walls of the vein to thicken, a process termed maturation. A mature fistula makes it easier for the vein to be punctured repeatedly for dialysis. Maturation typically takes three to six months to occur, but in rare cases, can take up to a year. This makes advance planning for an arteriovenous fistula important. When a patient is felt to be approximately a year away from requiring dialysis, the patient should be referred for evaluation for possible creation of an arteriovenous fistula.

An arteriovenous fistula is the preferred type of vascular access due to lower rate of infection and clot formation, resulting in greater longevity than other types of vascular access. However, not everyone is a good candidate for an arteriovenous fistula, particularly older patients and patients with small veins.

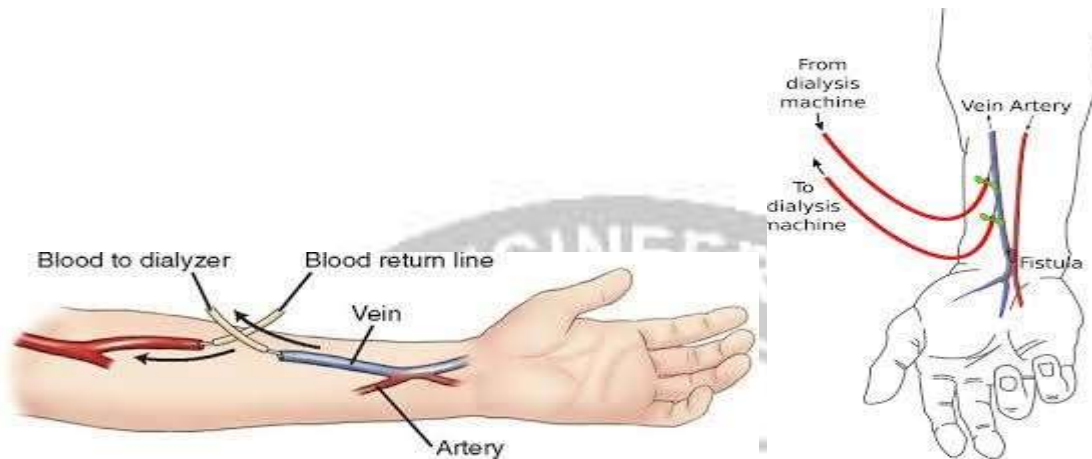


Fig 3.3.3: Arteriovenous Fistula

[Source: Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology]

2. Arteriovenous Graft

If a patient is not a good candidate for an arteriovenous fistula, an arteriovenous graft is considered. An arteriovenous graft is a piece of artificial tubing, generally made out of Teflon or fabric, that is attached on one end to an artery, and on the other end to a vein.

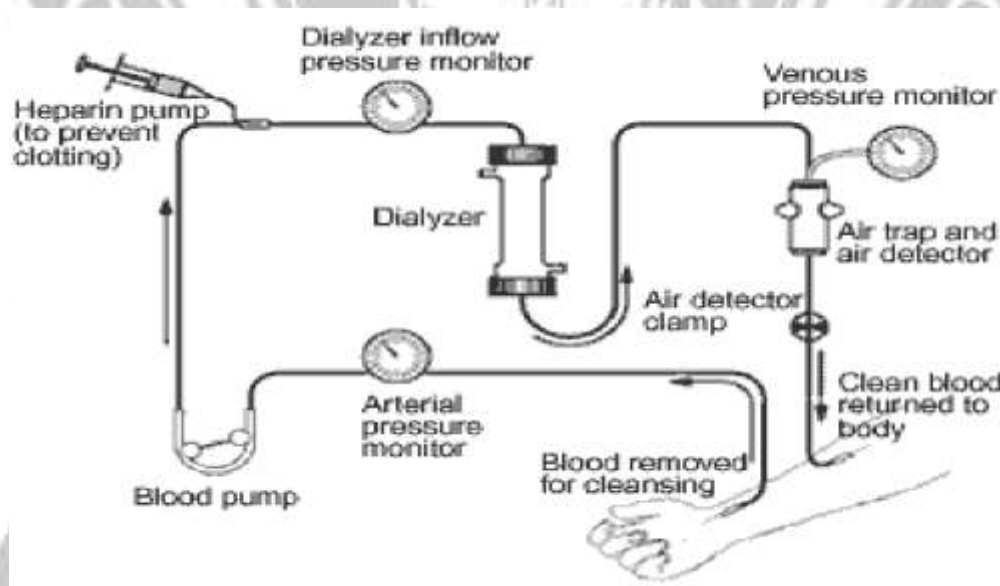


Fig 3.3.4: Arterio-Venous Graft (AVG)

[Source: Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology]

The tube is placed entirely under the skin and the tube itself is punctured during dialysis. An arteriovenous graft can in general be used two to three weeks after the operation. However, arteriovenous grafts are more prone to infection and clotting than fistulas. The lifespan of an arteriovenous graft is approximately two to three years.

3. Venous Catheter

A third type of vascular access is a venous catheter. A venous catheter is a plastic tube which is inserted into a large vein, usually in the neck. An external portion of the catheter is exposed on the chest wall that allows the tubing for the dialysis machine to be connected. Because the catheter is not entirely under the skin, it is prone to infection. Venous catheters also have a high rate of becoming clogged and do not provide for as efficient dialysis as fistulas and grafts.

Venous catheters are generally considered temporary vascular accesses, and are usually only placed when urgent dialysis is needed. In rare cases, a venous catheter may be used as long-term vascular access if no other options are available

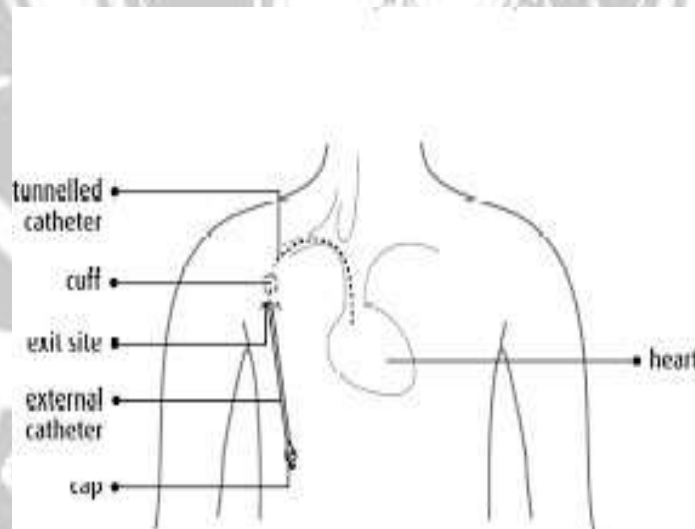


Fig 3.3.5: Tunneled central Venous Catheter

[Source: Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology]

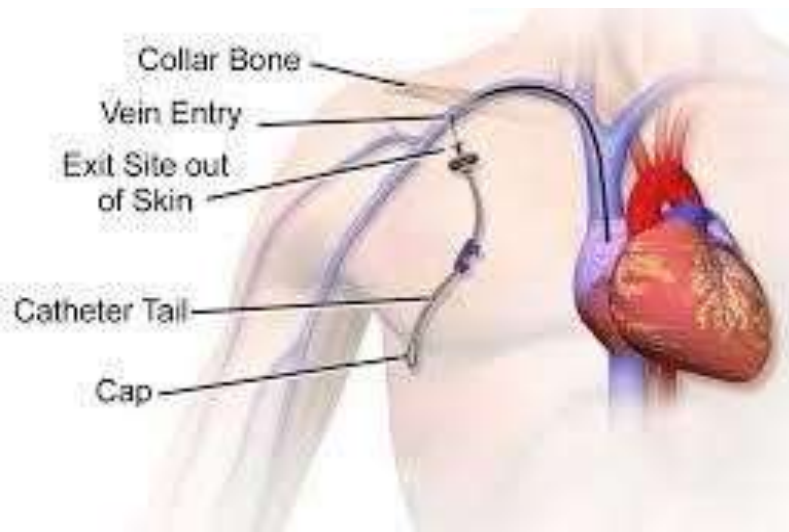


Fig 3.3.6: Non-Tunneled Central Venous Access Device

[Source: Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology]

