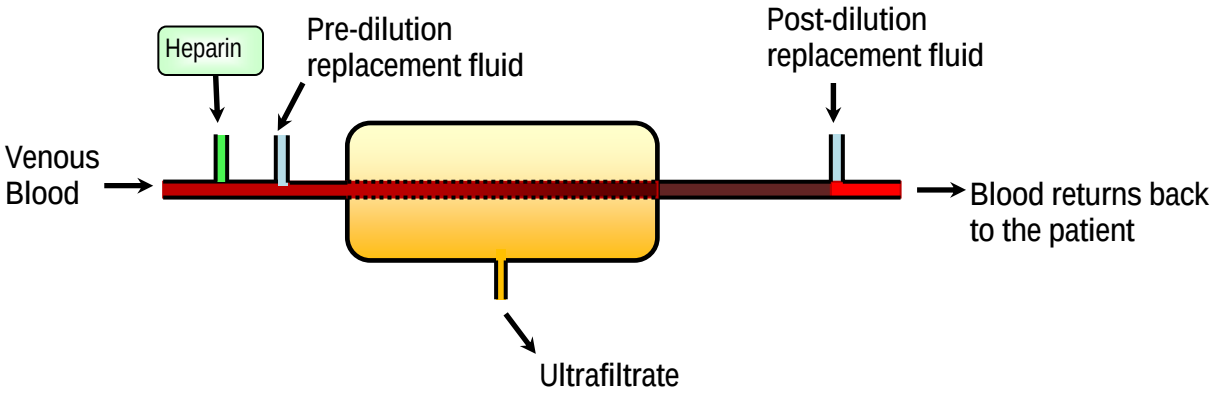
CVVH: Continuous Veno-Venous Hemofiltration



Venous blood is forced through a filter which resembles the glomerular basement membrane. Bellomo et al compared this to CAVHD and found it no worse in terms of solute clearance or even survival – but obviously with far fewer vascular access complications. Initially here was some resistance to this method, because of the need for numerous extra pumps and pressure gauges (which at this early stage were not available as a single unit; in fact some of the pumps were pure and simple drug infusion pumps, set to run at 999ml/hr to pump dialysate or replacement fluid). Because of the prevailing opinion (that femoral aneurysms and arteriovenous fistulae are a generally negative thing and are to be avoided) the venous form of access has since become the dominant. Companies have since produced numerous fully automated units featuring increasing simplicity of use. These days, in Australian intensive care units people will laugh at you if you suggest a arteriovenous mode of dialysis with a straight face.

Getting back to hemofiltration;

- Because of **convective clearance**, middle molecules are cleared well
- However, small molecules are not cleared as well ; urea removal suffers

Blood flow rate is around 12,000 ml/hr
Ultrafiltrate flow rate is about 1500 ml/hr
Replacement fluid flow rate is therefore also around 1500ml/hr

REPLACEMENT FLUID :

In order to achieve a good rate of solute clearance, one ought to have good rates of convection. With this method, you can only do that if you allow the patient to leak large amounts of dirty dialysate. This means the blood exiting the filter has an unacceptably high hematocrit. You could literally dry your patient to death with this method; thus, some of the fluid volume you ultrafiltrate out needs to be replaced. Naturally this results in cleaner blood: what you replace is usually some sort of crystalloid with the desired amount of potassium, bicarb, and so on.

Post-dilution is the standard : after the ultrafiltration is complete, you replace some amount of crystalloid, and return the blood. Depending on how much fluid removal you want, you alter the volume of replacement fluid (so, say you ultrafiltrate 300ml/hr, and you want to take off 100ml/hr ; so you achieve this if you only replace 200ml)

Pre-dilution is also possible; but it dilutes the blood before the filter – which reduces the solute concentration gradient, which is one of the forces which drives solutes across the membrane. So the solute removal rate is decreased, and your dialysis is less efficient. However, it may lead to improved filter lifespan (dilute blood means there is less filter clotting).

Both pre and post dilution is possible on some machines, which is good because ideally, you would like to have the benefits of both.

- Needs higher flow rates than hemodialysis
- Filter life is shorter than hemodialysis if you use post-dilution
- 100% better clearance of middle molecules and uremic toxins
- Similar clearance or small solutes with post-dilution
- 20% poorer clearance of small solutes with pre-dilution

For a definitive treatment of all of this, you ought to pay homage to the "Critical Care Nephrology" by Ronco Bellomo and Kellum (2009)