

Dialysis for Kidney Disease

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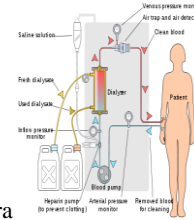
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The kidneys are two bean-shaped organs located on both sides of the spine. They rest against the back muscle of the abdominal cavity. Although the human body has two kidneys, we only need one to live. These kidneys work as a magnet extracting waste from blood, body fluids, urine and other acid in the body to refresh the blood. But what happens when the kidneys can no longer function regularly? When the kidney can no longer function the way that it should people start to develop diseases like Chronic Kidney Disease. Chronic Kidney Disease is caused by the failure of the kidney being not able to function by itself (Acute kidney failure). Chronic Kidney disease is usually the result of diabetes and high blood pressure. There are five stages in which the doctor can determine how severe the failures of the patient's kidneys are. The first three stages are not really known until the patient is being tested for diabetes or high blood pressure. At stage 1, 2, and 3 the kidney can still function by itself. Once a patient reaches stage 4 or 5 they have to be put on dialysis while they wait for a new kidney transplant.

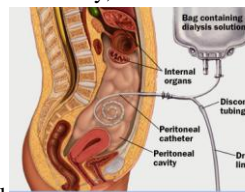
Dialysis is a treatment that replaces filtering function of the kidneys when they reach end stage renal disease (stage 4 and 5) through a mechanical structure known as dialyzer or cyclor. The first dialyzer was created by Dr. Willem Kolff, a Dutch physician who used sausage casing, beverage cans, washing machine and other available items. For the first two years Dr. Kolff tested the dialyzer on 16 patients, but it did not work. Two years after that he did a retrial on a 67 year old woman who was able to live for 7 more years after she had gone through 11 hours of dialysis every day. In 1968, Henry Tenckhoff invented a dialysis treatment that could remain in patient's abdomen permanently, instead of being inserted for every treatment. In present day, there are two types of dialysis; hemodialysis and peritoneal dialysis.

The process of hemodialysis uses dialyzer that is made up of thousands of tiny synthetic hollow fibers which acts as the semipermeable membrane. The Patient's blood is pumped through the blood compartment of a dialyzer, exposing it to a partially permeable membrane. The blood flow through the fiber and the dialysate solution flows on the outside of the fiber. The blood travels to and from the dialysis machine in large volume and high speed so that



toxins, waste and extra fluid can be removed from the body. The clean blood then flows back into the body. The procedure of hemodialysis is usually done two to three times a week in a hospital, but since 2007 over 25,000 patients have been doing the treatment at home.

During the process of peritoneal dialysis, "a sterile solution containing glucose is run through a tube into the peritoneal cavity, located around the intestine where the



peritoneal membrane acts as a semipermeable membrane". Peritoneal dialysis, like hemodialysis help to remove harmful fluids from the body by using a solution called dialysate. The peritoneal cavity is connected to a machine called cyclor and the rest of the tube is connected in the patient's body. Most patients prefer peritoneal dialysis because it is performed in the comfort of home four to five days of the week. For about eight hours each day.

Some pros of being on dialysis are that it keeps you alive while you wait for a new kidney transplant. Second the entire treatment is covered by the patient's private health care holder. The cons are the process of dialysis is very long and if patients want to live they must always remember to stick to the plan of repeating treatment four to five times a week. Patients are also put on a straight diet and they cannot drink alcohol.

"A Brief Overview of Peritoneal Dialysis - DaVita." *Kidney Disease and Dialysis Information - DaVita*. Web. 23 Oct. 2011. <<http://www.davita.com/treatment-options/home-peritoneal-dialysis/what-is-peritoneal-disease-/a-brief-overview-of-peritoneal-dialysis/t/5483>>.

"Dialysis." *Wikipedia, the Free Encyclopedia*. Web. 23 Oct. 2011. <<http://en.wikipedia.org/wiki/Dialysis>>.

"Kidney Function, Location & Area | Body Maps." *Medical Information for Healthy Living | Healthline*. Web. 23 Oct. 2011. <<http://www.healthline.com/human-body-maps/kidney>>.