

## THE TREATMENT OF CHRONIC RENAL FAILURE

DR. ALAN MACLEOD, M.D., C.M. (Dal.)<sup>1</sup>

*Halifax, Nova Scotia*

Chronic renal failure is a common clinical condition. Its early diagnosis and intelligent management has always proven rewarding to both physician and patient. Today we are making rapid progress towards the practical application of methods which can compensate for total loss of a patient's own kidney tissue. Therefore we must manage patients in chronic renal failure with the purposes of sparing as much functioning tissue as possible and promoting the patient's well-being at the highest level. Optimum therapy may mean survival until definitive effective kidney substitution or replacement is possible and practical.

Chronic renal failure is characterized by weakness and fatigue, gastro-intestinal tract symptoms, especially nausea and vomiting, and normochromic, normocytic anemia. With further advance, marked metabolic, cardiovascular and neurological disorders occur. The pathophysiological disorders seen are due to loss of nephrons, the vasculotubular micro-organs, that collectively carry on the kidney's functions of fluid and electrolyte balance and elimination of protein wastes. Effects on the kidney's roles in blood pressure control and hemopoiesis are less clearly understood.

Loss of nephrons is usually relentlessly progressive unless significant precipitating factors such as obstruction, infection, ischemia and toxins are removed. Progression is accelerated by distortion of renal architecture with consequent tubular and vascular occlusion. Processes which destroy any part of a nephron are said to cause atrophy of the whole unit in a short time. Therefore any measures which delay progression are very worthwhile. It is important to search for and correct any gross anatomical disorders of the lower urinary tract.

The diagnosis of chronic renal failure may be made by the presence of the above mentioned clinical features, together with fixed urine specific gravity (approximately 1.010), albuminuria and a rising blood urea nitrogen. The centrifuged urine sediment frequently shows casts and cells. The patient's endogenous creatinine clearance will give a reasonable approximation of the glomerular filtration rate and functioning nephron mass.

Conservative medical management is the foundation and beginning of all other forms of therapy. Experience in its methods will enable the physician to prepare patients intelligently for more radical procedures. Clinical phenomena observed at the bedside or in the laboratory must be related to disordered function and from sound correlations proper therapy will result. Because complex pathophysiological processes cannot be discussed herein the following suggestions are didactic. The principles below have been found useful, but are not necessarily in order of importance because this may vary from one patient to another.

The patient should obtain extra rest and avoid physical, metabolic and other stresses. He should be kept in water balance as guided by thirst and daily weighing. Some authorities suggest that he should look for and maintain his maximum daily urine volume. Blood pressure must be well controlled by dietary and pharmacological methods. There must be a diligent search for and attempt to control urinary infection. The hemoglobin is perhaps best maintained at 7 to 9 grams percent by careful transfusion of packed red blood cells. Dietary protein restriction is usually started when the creatinine clearance is below 20 cc's per minute. Slight to moderate electrolyte abnormalities are probably best left alone—they are surprisingly mild until failure is very marked. Nausea and vomiting are best treated with chlorpromazine or other anti-

<sup>1</sup>Department of Medicine, V.G. Hospital, Dalhousie University.

emetics together with careful selection of foods and feeding times. Terminal renal failure requires judicious and adequate use of opiates, barbiturates and chlorpromazine.

**Dialysis** — dialysis of body fluids was first performed experimentally in the aspirin-poisoned dog early in the twentieth century. It was established as a practical medical technique by Dr. Willem Kolff in German-occupied Holland during World War II while treating patients with acute renal failure. During the past decade it has rapidly progressed in numbers of cases treated and technical efficiency. It is life-saving in severe cases of acute renal failure and certain types of poisoning.

The principle of dialysis calls for the separation of two solutions by a semipermeable membrane. Small molecular and ionic particles will pass through the membrane pores from an area of high concentration to one of lower concentration. Two semipermeable membranes may be of practical value for the dialysis of human blood plasma - the abdominal peritoneum and the cellophane membrane of a hemodialyzer or artificial kidney. In each case the patient's abnormal blood plasma is separated from an artificially prepared solution of solutes and electrolytes (dialysis fluid) closely resembling normal protein-free blood plasma, by a semipermeable membrane. Metabolites or poisons present in excess in the patient's plasma will therefore pass into the dialysis fluid which can be discarded after a suitable interval and replaced with a fresh solution. In peritoneal dialysis, 2000 cc's of dialysis fluid are instilled into the abdominal cavity and left for one hour. It is then discarded and replaced at hourly intervals thereafter for approximately thirty-six exchanges. During this time considerable undesirable metabolic waste can be removed. In hemodialysis the patient's blood is pumped through a tube-like device of small volume but large surface area, made of cellophane, and surface washed by a dialyzing fluid of the composition mentioned before. Again metabolic wastes pass into the dialysis fluid. For this more complex process, blood leaves the patient's artery, goes through a pump, through the dialyzing tube (or tubes, as they may be multiple) and returns to the patient's vein. Thus each method will tend to make the patient's plasma approach the composition of the dialysis fluid which, as said before, is constituted to resemble closely normal protein

free blood plasma in osmolarity and electrolyte content. Dialysis is always favored by a high concentration gradient of a solute or ion across the membrane.

Dialytic methods of treatment, although widely publicized, are still looked upon as experimental by some renal authorities. Others regard them as proven therapeutic measures to be applied as widely as possible as soon as possible. These methods are time-consuming, expensive and require the constant supervision of trained personnel. The world experience in chronic dialysis is still only a few hundred patient years. The highest aim of chronic dialysis is to rehabilitate patients with chronic renal failure to useful living. Patients who do best on such programmes are usually between fifteen and fifty years of age and COOPERATIVE. Most authorities agree on these two important factors. It is said that approximately thirty persons per million population will require starting dialysis each year in the western world. Thus if survival time is three years, about one hundred people will be on the programme continually for each one million of population. Costs per patient per year vary between five thousand and ten thousand dollars. Ultimate aims call for the development of small, efficient, disposable units for overnight use in the home.

Chronic peritoneal dialysis does not have as good a survival record as chronic hemodialysis and is said to have a higher incidence of complications. It is perhaps best used on an intermittent basis to tide patients over sudden aggravations of chronic renal failure due to intercurrent medical or surgical disorders - for example, infections, heart failure, gastrointestinal hemorrhage, hypertensive crisis, operations, trauma, etc. However, it has been used on a periodic basis with some success. The chief complication is recurring peritonitis. The use of a fresh abdominal puncture for each dialysis appears to be safer than the use of a permanently inserted abdominal wall cannula (or access valve) which was favored for a while.

**Hemodialysis** is two to five times as efficient as peritoneal dialysis, but it requires expensive machinery, a special room for operation, and supervision by highly skilled personnel. For repeated access to the patient's artery and vein, high quality plastic cannulas (or tubes) are permanently inserted into these vessels. Between dialyses these tubes are con-

nected by a removable U-tube thus creating an artificial shunt or arterio-venous fistula. During operation, the patient's blood must be rendered non-coagulable, else it would clot in the dialyzing tubes. Also, strict asepsis must be practised to prevent infection at the sites of the permanent vessel cannulas. In recent years, co-operative patients have survived comfortably up to five years, and many have worked while on twice weekly hemodialyses of several hours each. All the while they have been kept in acceptable metabolic balance with the aid of suitable diet control. Many of these patients have been completely without functioning renal tissue; that is, anephric. Complications, however, are still common and include infection, episodes of thrombosis and peripheral nerve disorders. In a few patients suicide has occurred. It must be remembered that many problems still exist in both forms of chronic dialysis.

Kidney transplantation is still highly experimental. Technical and operative prob-

lems have been pretty well conquered but immunological rejection has not. A kidney may be donated by an identical twin (isograft); it will be accepted although it frequently acquires the disease process which destroyed its predecessor. Homografts are kidneys of the same species and usually obtained from a living donor or fresh cadaver. A large number of laboratory tests are presently being used to assess degrees of compatibility—without much success. Powerful drugs in high dosage are required to suppress the immunological rejection and they themselves lead to complex problems. Nevertheless a number of patients have functioned for a year or more on single homotransplants and progress is slowly being made.

Authorities differ in opinions as to whether dialysis or transplantation will be the mainstay of the future. The fact remains, that a combination of several techniques now offers the patient with chronic renal failure health and hope undreamed of a decade ago.

---

## Learn to be a Flying Doctor on Floats, Wheels and Skis.

For Further Details

Call:

**THE HALIFAX FLYING CLUB**

Waverley, N. S.

Phone 835-2392