



So you have kidney disease

CAUSE OF CHRONIC RENAL FAILURE

Most of the causes of chronic kidney failure are diseases which are not usually accompanied by symptoms until late in the progress of the disease.

The major causes of chronic kidney failure are:

- Glomerulonephritis (inflammation of kidney filters).
- Diabetic nephropathy (kidney damage resulting from "sugar" diabetes).
- Analgesic nephropathy (kidney damage from misuse of pain killing powders or tablets
– in Australia these were usually headache powders. These days, non-steroidal anti-inflammatory drugs can cause a similar condition).
- Hypertension (high blood pressure).
- Polycystic kidney disease (cysts in both kidneys, not usually detected until adolescence and generally running in the family as an inherited condition).
- Reflux nephropathy (kidney damage caused by a leaking valve in the bladder allowing urine to gush back into the kidney often accompanied by infection).

SYMPTOMS OF KIDNEY FAILURE

There are no symptoms of renal failure until late in the course of renal disease. Problems which contribute to progressive renal disease often have no symptoms. These include high blood pressure, biochemical abnormalities such as raised cholesterol and abnormal calcium, phosphate and bicarbonate concentrations, and even urinary infections. Regular check-ups and blood tests are essential to detect and control these problems and prevent or delay

renal failure. The important clues to the presence of kidney disease and kidney failure are abnormal urine tests, high blood pressure, and reduced kidney function –which can be judged by a blood test. Abnormal kidney function may cause the patient to get up at night to pass urine on a regular basis (nocturia) as the kidney loses its ability to concentrate the urine adequately.

MEASUREMENT OF RENAL FUNCTION

The progression of kidney damage is marked by rises in two important chemical substances in blood; creatinine and urea. Creatinine is produced from muscles and is excreted through the kidneys. Urea comes from the protein in food (such as red and white meat) and is also excreted into the urine by the kidneys. Thus progressive kidney damage with loss of kidney filters and filtration plus damage to the small kidney tubules where urine is 'processed' results in increases in blood creatinine and urea levels. The normal level for blood or serum creatinine in males is up to 0.12mmol/L (or 120 μ mol/L) and around 0.09mmol/L in females (90 μ mol/L). These normal upper values will vary slightly from laboratory to laboratory and with the body weight of the person being tested. Males usually have higher serum creatinine levels than females because males have greater muscle mass. Kidney function is more accurately measured by doing a blood test for creatinine and a 24 hour urine collection and calculating the amount of creatinine filtered into the urine by the kidneys. In normal individuals this figure, the creatinine clearance, is between 90 and 140ml/min (also sometimes written in ml/second). This is referred to as 100% of kidney function. As kidney disease progresses, the clearance, or removal, of creatinine by the kidneys from the blood falls. Thus the numerical value for the creatinine clearance also falls. The amount of creatinine left in the blood – the serum creatinine – will then start to rise. Most people will require artificial kidney treatment once the creatinine in the blood rises towards 1mmol/L (1000 μ mol/L). A rise in the serum creatinine level is also accompanied by increases in the blood urea level and the level of other waste products such as potassium, uric acid and phosphate. A high blood potassium level may lead to abnormal heart rhythms, a high uric acid level may lead to gout and retention of phosphate and abnormal calcium and bicarbonate can lead to bone disease.

PROGRESS OF RENAL DISEASE

The stages of kidney failure may be conveniently divided into five levels of severity.

Stage 1 – (Kidney function 50–100% of normal)

In Stage 1, the serum creatinine level is usually normal. These patients commonly have no symptoms and the other blood tests are usually normal. However such patients are susceptible to dehydration or toxicity by drugs, e.g. antibiotics, pain killing (anti-inflammatory) drugs and digoxin (a heart tablet). Older patients may have problems with their renal arteries which make them susceptible to further renal impairment by some antihypertensive drugs or anti-inflammatory agents. If in any doubt about starting new medications consult your doctor or renal unit. Good blood pressure control and possibly dietary modification, will delay and sometimes prevent progression to the next stages.

Stage 2 – (Kidney function 20–50% of normal)

The serum creatinine level rises from around 0.10 to 0.40mmol/L. However the rest of the blood tests are often normal. Patients usually have no symptoms. At this stage blood pressure may be elevated and urine abnormalities reflect the nature of the underlying kidney disease. Good blood pressure control and possibly dietary modification will delay and sometimes prevent progression to the next stages.

Stage 3 – (Kidney function 10–20% of normal)

The serum creatinine rises from 0.40 to 0.80mmol/L and there are more widespread abnormalities in blood tests, including increases in levels of uric acid, phosphate and acidity. The earliest symptoms of kidney failure become apparent, often in retrospect. These include nocturia (when patients get up at night to pass urine because they cannot concentrate urine), vague or mild symptoms of malaise, lethargy, swelling and a dislike for some foods. Blood pressure usually starts to rise in this phase unless there is a tendency to lose salt in the urine which is uncommon in most renal diseases. Increased medication may be required to control blood pressure and serum levels of phosphate and acid. The practical aspects of starting dialysis should be considered – e.g. attend seminars re options for treatment, organise vascular access to connect the circulation for dialysis, etc.

Stage 4 – (Kidney function less than 10% of normal)

Stage 4 is the stage of uraemia where the kidney function falls to below 10% and serum creatinine exceeds 0.80mmol/L. The biochemistry shows typical changes of kidney failure: the serum potassium tends to rise and the blood becomes more acidic. These patients are at risk of further rises in serum potassium from some diuretics and blood pressure medications. There is a wide range of abnormalities of hormones and enzymes in the serum as well as the routinely measured biochemistry. Anaemia has appeared and may become quite severe. The symptoms during this stage may become quite generalised, including morning nausea, pins and needles in the hands or feet, or chest pain due to pericarditis which is inflammation of the lining around the outside of the heart. These are all indications to start dialysis. Other signs may involve most parts of the body; twitches and tremor may go on to convulsions and coma if neglected. Bleeding and bruising may become more prominent. Patients are often prone to infection and develop fluid retention with ankle swelling and shortness of breath. As these symptoms may indicate quite dangerous underlying problems, the aim is to commence dialysis before these symptoms occur .

Stage 5 – (Kidney function less than 5% of normal)

This is the stage of dialysis dependency where kidney function is less than 5% of normal and serum creatinine is above 0.80mmol/L. Generalised symptoms requiring hospitalisation develop unless dialysis is commenced. Dialysis improves most of the symptoms of kidney failure with the exception of anaemia, some bone problems and sometimes itch, although itch is generally improved with good biochemistry control. The anaemia can now be improved by the use of a drug called erythropoietin which is exactly the same as the hormone produced by healthy kidneys. Erythropoietin stimulates the bone marrow to produce red blood cells. After around 10 years of dialysis some new symptoms may develop related to the inefficiency of dialysis in comparison to normal kidney function. These may include arthritis and carpal tunnel syndrome (pain in the hands) due to amyloid deposits.

OTHER OBSERVATIONS

1 . The rate of progress from one stage to the next may be unpredictable and not all patients who lose some renal function will go on to develop total renal failure. This often depends on the extent of damage if there is an acute initial problem (e.g. glomerulonephritis, hypertension) or before the diagnosis is made

(e.g. analgesics, reflux). Even in disorders where progression is usually inexorable, good blood pressure control, diet and biochemical control can delay the process for years, e.g. with polycystic kidney disease. Conversely, acute events such as severe infection, dehydration from vomiting, or very high blood pressure can accelerate the development of renal failure.

2. As indicated, medications can influence kidney function throughout the course of renal failure. Indeed the level of kidney function may determine whether or not ordinary doses of medications become toxic. Some drugs such as cortisone and tetracycline will increase the level of urea, even if the serum creatinine level remains unchanged; this can induce nausea, vomiting and dehydration, ultimately making renal function worse. The doses of other drugs such as digoxin (a heart tablet), co-trimoxazole (Bactrim or Septrim), etc., may need to be reduced because they are excreted by the kidneys. Other drugs including anti-inflammatory agents and some blood pressure medication should be used very carefully in patients with raised serum creatinine levels and biochemistry should be checked one to two weeks after starting them if there is any doubt about their safety. Again, please consult your doctor or renal unit if you have any questions regarding drug therapy.