

Pathophysiology of Chronic Kidney Disease (CKD)

Kidney disease is considered chronic when it lasts for more than 3 months and is characterized by pathologic abnormalities, decreased Glomerular Filtration Rate (GFR) and functional downregulation of the kidney (Matovinovic, 2009). It is also characterized by extensive glomerular scarring known as glomerulosclerosis, which serves to bring down the GFR especially in older people. Other concluding characteristics include persistent proteinuria, hematuria, and a GFR of less than 60 ml/min/1.73 m². Mr. Goodpasture's age, history of hypertension and smoking are major contributors to his chronic kidney disease (Lewis, 2009).

Kidneys are exposed to a number of toxic substances in the blood every day and its major function is to separate these toxins from the blood and excrete them from the body. When a person has high blood pressure, the increased pressure of the blood forces the glomeruli to function faster, thus increasing the risk of damage. Mr. Goodpasture's history of hypertension is an important precipitating factor in his CKD. Other causes of tissue injury could be exposure to immune-mediated complexes, and hemodynamic, metabolic and mechanical stress factors (Matovinovic, 2009). These factors contribute to damage to the kidneys which gets accumulated over time and results in a decrease in function of the kidneys (Lopez-Novoa et al., 2010).

The underlying kidney damage manifests as damage to the tissues, inflammation and scarring. This damage triggers inflammatory and fibrotic responses in the body which further lead to irreversible damage to the kidneys. Hence, the units of the kidneys that are responsible for filtration of the blood – the nephrons – are progressively replaced by damaged tissue (Lopez-Novoa et al., 2010). Chronic kidney failure develops into end stage kidney disease where a

person cannot stay alive without a kidney transplant or dialysis (Carolinas HealthCare System, 2007).

Due to malfunctioning of the kidneys, the sodium, potassium and magnesium balance of the body may be disrupted. This is evident from Mr. Goodpasture's biochemistry results where there is an increased potassium level indicating hyperkalemia. His sodium and magnesium levels, however, are in the normal range. His results show acidosis due to the increased excretion of bicarbonate ions in the urine. The level of calcium is also low and phosphate level is high indicating hyperphosphatemia. His hematological results reveal anemia and an increased white blood cell count. The anemia is usually a result of decreased renal erythropoietin production and reduction in the life of the red blood cells due to the presence of toxins (Milner, 2003).

Hypertension and Chronic Kidney Disease (CKD)

Hypertension and diabetes are considered two very important contributors to CKD. Mr. Goodpasture's hypertension accounts for his CKD in multiple ways. High blood pressure results in a decrease in the supply of blood to vital organs such as the kidneys. It also damages the nephrons, thus destroying the ability of the kidneys to properly filter the blood. The toxic waste products that are not excreted from the body serve to further raise the blood pressure, making it a vicious cycle of damage (National Kidney Foundation, 2010).

The vascular damage caused by hypertension plays an important role in determining the rate of glomerular damage. In a number of instances, lowering the blood pressure has been shown to slow down the rate of development of kidney disease (Lewis, 2009). The effect of hypertension-induced kidney disease is often not seen on the GFR initially as the increased glomerular capillary pressure forces the glomeruli to work harder and faster to filter the blood. A

decrease in GFR finally occurs when a large number of nephrons in the kidney are damaged (Lopez-Novoa et al., 2010).

Management of end stage kidney disease

The progression of chronic kidney disease to end stage kidney disease provides an ultimatum that the kidneys have become completely non-functional. The two most management strategies at this stage include kidney transplant and peritoneal dialysis (Phoon, 2012).

1. Kidney transplant

A kidney transplantation involves replacing the damaged kidney with a healthy kidney from a suitable donor. Compared to dialysis, a kidney transplant offers a better prognosis for patients with end stage renal disease (Ganesh & Lee, 2011). Psychologically, however, it takes time for a patient who has had a kidney transplant to accept the new organ and the fact that he/she no longer has end stage renal disease. Hence, the body image is disturbed in the mind of the patient and it takes time to reconstruct it all over again (de Pasquale et al., 2014). There are also a number of other risks involved in transplantation. The kidney might get rejected by the body despite all precautions and the patient might have to go back on dialysis and on the waiting list for another kidney. The immunosuppressants that need to be taken after the surgery can bring down the immunity leading to infections (NIDDK, n.d.).

2. Peritoneal dialysis

Peritoneal dialysis is performed by injecting dialysis fluid into the peritoneal cavity and then draining it out a few hours later. There are two methods for doing this – Continuous Ambulatory Peritoneal Dialysis and Automated Continuous Cycling Peritoneal Dialysis. This method has a low risk of infections and death as compared to hemodialysis (Ganesh & Lee,

2011). Compared to kidney transplantation, however, peritoneal dialysis can lead to a number of life-threatening infections such as peritonitis, peritoneal membrane failure, exit-site infections and tunnel infections (Li et al., 2010). Regular sessions of peritoneal dialysis can lead to feelings of depression, anxiety, hopelessness, interpersonal distress, marital and sexual problems, and dependence on family. As compared to transplantation, these feelings last longer and increase in intensity as the years pass, whereas in case of transplantation, once the initial phase after the surgery is over, the patient grows used to the new organ and starts enjoying his/her life. Of all the psychosocial risks, depression is the most important and with Mr. Goodpasture's history of depression, this can appear as a full-blown condition. Feelings of depression and anxiety can worsen the prognosis of the management and lead to conditions such as anemia due to poor food intake (Lew and Piraino, 2005).

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