International Journal of Advanced Multidisciplinary Research
ISSN: 2393-8870
www.ijarm.com
DOI: 10.22192/ijamr Volume 5, Issue 4 -2018

Review Article

DOI: http://dx.doi.org/10.22192/ijamr.2018.05.04.002

CKD treatment -A Review

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Keywords

CKD,
Treatment,
Review

Abstract

With the progression of CKD to renal failure, preparation for the initiation of replacement therapy in the kidneys is important. Patients with relatively advanced kidney disease (CKD stage 4) should be referred to a nephrologist for management and control. This may include assessing the risk of progression of the CKD, estimating the time to failure, and introducing and preparing for renal replacement therapy. Late referral (three months before ESRD) to the nephrologist is associated with a high risk of death after the start of renal replacement therapy .Results of the Literature review were exported to Endnote. Prior to the formal screening process, a calibration exercise was undertaken to pilot and refine the screening. Formal screening process of titles and abstracts were conducted by two researchers according to the eligibility criteria, and consensus method was used for solving controversies among the two researchers. The full text was obtained for all titles that met the inclusion criteria. Additional information was retrieved from the study authors in order to resolve queries regarding the eligibility criteria. The reasons for the exclusion criteria were recorded.Blood dialysis**:**Blood is pumped through a permanent or temporary vascular access to tubes that lead to a large number of capillaries in the dialysis device. Peritoneal dialysis: is a type of RRT in which peritoneal capillaries act as a semi-permeable membrane similar to the dialysis blood filter. Peritoneal dialysis is a type of RRT in which peritoneal capillaries act as a semi-permeable membrane similar to the dialysis blood filter. Renal transplantation is the preferred method of RRT; however, blood transfusion or peritoneal dialysis is often required before, during, and after transplantation.

Introduction

With the progression of CKD to renal failure, preparation for the initiation of replacement therapy in the kidneys is important. Patients with relatively advanced kidney disease (CKD stage 4) should be referred to a nephrologist for management and control (1). This may include assessing the risk of progression of the CKD, estimating the time to failure, and introducing and preparing for renal replacement therapy. Late referral (three months before ESRD) to the nephrologist is associated with a high risk of death after the start of renal replacement therapy (2).A plan for the process of RRT should be discussed early in the course of renal failure and before the onset of urinary symptoms. Two main and primary treatments for ESRD include dialysis and transplantation. There are two types of dialysis: blood dialysis and peritoneal

dialysis (3). The kidney transplants might come from dead or alive donors. In the United States, in 2006, 306,011 initiated blood dialysis, while only 67.58% (6%) of patients selected peritoneal dialysis. Initially, kidney transplant was performed for 15,918 people, although most of these patients (83%) had been dialyzed before the transplant. This way of distributing patients is different for receiving treatment in other countries. Chronic dialysis usually starts when GFR Ml is 15 or less in minutes and there is no obvious reversible cause for renal failure. Nevertheless, chronic dialysis can be initiated at any time when ESRD complications, such as fluid balance and potassium levels, are not controlled by medication (4). The choice of dialysis therapy depends to a great extent on the patient's physical characteristics, community support and patient education in the pre-ESRD period and his lifestyle. Patients who are physically qualified will be encouraged to have kidney transplants due to better quality of life, increased survival and greater chance of rehabilitation (5).

1.1.Search strategy

Searches were conducted by two independent researchers in international (PubMed, Web of science, Scopus and Google scholar) and national (SID, Magiran) databases for related studies from the inception of the databases to September 2017 (without time limitation) in English and Persian languages. To ensure literature saturation, the reference lists of included studies or relevant reviews identifed through the search were scanned. The specifc search strategies were created by a Health Sciences Librarian with expertise in systematic review search using the MESH terms and free terms according to the PRESS standard . After the MEDLINE strategy was finalized, it was adapted to search in other databases. Accordingly, PROSPERO was searched for ongoing or recently related completed systematic reviews. The key words used in the search strategy were “CKD treatment and CKD” which were combined with Boolean operators including AND, OR, and NOT.

1.2 .Study selection

Results of the Literature review were exported to Endnote. Prior to the formal screening process, a calibration exercise was undertaken to pilot and refine the screening. Formal screening process of titles and abstracts were conducted by two researchers according to the eligibility criteria, and consensus method was used for solving controversies among the two researchers. The full text was obtained for all titles that met the inclusion criteria. Additional information was retrieved from the study authors in order to resolve queries regarding the eligibility criteria. The reasons for the exclusion criteria were recorded. Neither of the review authors was blinded to the journal titles, the study authors or institutions.

Blood dialysis

Blood is pumped through a permanent or temporary vascular access to tubes that lead to a large number of capillaries in the dialysis device. Capillaries are made of semisynthetic materials that are compatible with the body. This membrane is semi-permeable and able to exchange small molecules through diffusion (6). Move in the opposite direction to the blood is facilitated through a dialysis solution that moves outside the capillaries and allows the flow of opposite flow. This solution contains sodium chloride, bicarbonate and variable concentrations of potassium. The propagation along the membrane allows low molecular weight materials such as urea, potassium, and organic acids to move based on the concentration gradient. The liquid is removed by ultrafiltration, which is produced by applying the hydrostatic membrane pressure in the dialysis device (7).

In the context of ESRD, patients undergoing chronic intermittent hemodialysis require an average of 4 hours of dialysis three times a week for adequate toxic substances. Treatment requires a blood flow of about 400 mL / min through the dialysis device. Major complications associated with hemodialysis include hypotension and muscle cramps. Avoiding weight gain (more than 2 to 3 kilograms) between treatments can reduce these complications (8).

The recommended way to achieve dialysis is through a permanent pathway such as an intravenous artery fistula (AVF) with an intravenous catheter can be used for blood dialysis. Although the goal for at least 66% of dialysis patients is the use of AVF as the entry, many patients continue to use AVGs with counterparts. Temporary catheters, such as central venous tubes, are embedded in internal jugular veins, subclavian or femoral veins (9). Temporary catheters have a cuff before entering the internal jugular vein around the outer wall of the tube and tunnel under the chest wall. This cuff causes localized fibrosis in the subcutaneous tissue, thus closing the flora entry to the catheter and reducing the rate of infection. However, catheters, compared with AVF and AVG, have a much

higher rate of infection with lower blood flow and higher risk of death (10).

Peritoneal Dialysis

Peritoneal dialysis is a type of RRT in which peritoneal capillaries act as a semi-permeable membrane similar to the dialysis blood filter. This method has several advantages over dialysis; it does not require long periods of time in dialysis units and does not require dietary restrictions, as it is required in blood dialysis, and the level of rehabilitation is better and patients are more likely to work full time after coming back (11). When a patient receives peritoneal dialysis, the remaining kidney function is maintained for a longer period (1 to 2 years), and thus the mortality rate decreases. In an outpatient continuous peritoneal dialysis, a 2 to 3-liter diuretic solution is connected via a peritoneal catheter to the continuous peritoneal cavity of the patient into a device called a cycler, which allows less volumes of dialysis solution and shorter overnight stays during the night during sleep (12). This process allows patients to have activity during the day and can be tailored to different patients in order to achieve a sufficient discharge of toxic and fluid modifications in their diet. The amount of removal of different soluble materials depends on the slope of the concentration, surface area and penetrability of the peritoneal membrane to the soluble materials (13).

Smaller molecules move easily through the peritoneal membrane and are affected by ultrafiltration. Ultrafiltration is achieved by increasing the concentration of dextrose in the dialysis solution (14). Two complications of peritoneal dialysis include peritonitis and difficulty in achieving sufficient clearance in patients with excess weight of peritonitis which could be treated with peritoneal antibiotics often in the outpatient setting (15). The catheter is excreted in some cases of peritonitis, including bacterial peritonitis that does not respond to antibiotics, and fungal peritonitis. Additionally, the membrane permeability is gradually reduced, especially after one or more cases of peritonitis, which leads to inadequate dialysis and ultimately requires the change in RRT's method, the final outcome of which is blood dialysis (16).

Management of complications in dialysis

Like CKD, patients who receive dialysis treatment experience similar anomalies in many of the organs involved. The risk of cardiovascular disease and cardiovascular events is very high in these patients. Efforts to minimize cardiovascular risk, such as the treatment of hypertension and screening, are recommended to find evidence of cardiac ischemia (17). Smoking cessation is one of the important issues in reducing cardiovascular risk. Recent studies on dialysis patients do not suggest that lowering fat with statins reduces cardiovascular risk and mortality. However, the greater the effect of lowering fat can be detected in CKD patients before reaching ESRD. Anemia, hyperphosphatemia and hyperparathyroidism are common in patients receiving dialysis treatment, and the treatment is similar to the recommended method for patients with CKD, although with minor differences in dosage and level (18).

Kidney transplant

Renal transplantation is the preferred method of RRT; however, blood transfusion or peritoneal dialysis is often required before, during, and after transplantation (19). When silicopurine was introduced in 1983, the rate of kidney transplantation from dead donors improved significantly with a 1-year survival rate of 85 to 95%, compared to 65% with azathiubrin and steroids (20). Reduction in acute rejection and improvement in the long-term survival of allograft after the introduction of newer immunosuppressive agents including Rapamycin, Mycophenolate Mofetil, Tacrolimus, and Interleukin-2 Anti-Recurrent Antibodies (Daclizumab and Basilix Mab) have been commonly reported (21).

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Quick Response Code

DOI:10.22192/ijamr.2018.05.04.002

How to cite this article:
Ali Alidadi, Elham Taheri. (2018). CKD treatment -A Review. Int. J. Adv. Multidiscip. Res. 5(4): 6-10.
DOI: http://dx.doi.org/10.22192/ijamr.2018.05.04.002