JOJ
Urology & Nephrology
ISSN: 2476-0552

Juniper Publishers
key to the Researchers

Opinion
Volume 6 Issue 4 - March 2019
DOI: 10.19080/JOJUN.2019.06.555692

JOJ uro & nephron

The Importance of the Volume Status, Dry Weight and Residual Renal Function in Hemodialysis Patients

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Submission: March 25, 2019; **Published:** April 08, 2019

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Keywords: Hemodialysis; Renal function recovery; Dry weight; Residual renal function; Chronic kidney disease

Abbrevations: ESRD: End stage renal disease; CKD: Chronic kidney disease; AKI: Acute kidney injury; RFR: Renal function recovery

Introduction

End stage renal disease (ESRD) represents the most severe form of chronic kidney disease (CKD) and characterized by an estimated glomerular filtration rate of < 15mL/min per 1.73m2 and requires maintenance dialysis or renal transplantation [1]. Renal function recovery (RFR), defined as the discontinuation of dialysis after 3 months of renal replacement therapy, and the development of sufficient kidney function allowing for complete discontinuation of dialysis [2]. Patients with acute kidney injury (AKI) who are initiated on long-term hemodialysis have significantly higher rates of RFR. Over 50% of patients with AKI recover kidney function within 6 months [2-4]. However, an ESRD patient who is in long-term chronic hemodialysis programmed can only withdrawed from dialysis by renal transplantation. Despite this, functional recovery is possible in some hemodialysis patients. Data from largescale registries show us that RFR occurs in 0.2% to 8% of dialysis dependent ESRD patients [5-8]. It is possible that the increasing rate of RFR may due to attention to fluid management and avoidance of intradialytic hypotension. There are guidelines for the initiation of hemodialysis and for the care of patients on maintenance dialysis, but little is known about the indicators of RFR for the cessation of dialysis.

In recent years, the proportion of patients initiating dialysis with higher levels of residual renal function and early initiation of dialysis has increased significantly, especially among the elderly [9,10]. Nephrologists categorize renal failure events at hospital discharge as either ESRD or AKI. Many patients with CKD may develop AKI and get erroneously labeled to have reached ESRD and become dialysis dependent [2,4]. On the other hand, the start of hemodialysis is accompanied by a rapid reduction in residual renal function, urine output [11]. In most hemodialysis patients the urine output declines after the dialysis sessions and a large amount of them becomes anuric after six months of being on hemodialysis. If we can calculate the real fluid and stop the excessive fluid depletion that may help us to maintain kidney function and give patients whose kidney that have the potential to recover an opportunity of being able to discontinuation of hemodialysis.

There is a great problem in assessment of the real fluid status in hemodialysis patients. Probing for dry weight and making high amounts of ultrafiltration in dialysis sessions make dialysis patients hypovolemic and the urine output decrease promptly, secondary to hypotension and decreased renal perfusion, after beginning to dialysis in most hemodialysis patients. Furthermore, the inflammatory response associated with bio-incompatibility contribute to a progressive deterioration in renal function [4,11,12]. In clinical practice, many patients that may have a potential for RFR missed because of wrong measurement of dry weight or excessive use of diuretics or excessive fluid drawn in hemodialysis sessions. In most dialysis units' dry weight is defined primarily based on clinical criteria. However, we can use bioelectrical impedance vector analysis to establish dery weight

and avoiding excessive volume depletion [13]. On the other hand, diuretics are commonly used in hemodialysis to avoid excessive weight gain and to facilitate a more natural water intake and maintaining diuresis. However, excess amount of diuretics may decrease the residual renal function due to hypovolemia and renal hypoperfusion in patients on hemodialysis [11].

Those patients who had symptoms such as muscle cramps, lethargy and extreme weakness immediately following dialysis, intolerance to dialysis procedure, requested a reduction in dialysis time, hypotension, experiencing better health the following day, but again worsening after dialysis should be alert us. Most of the symptoms are secondary to excessive ultrafiltration on dialysis, especially in patients with AKI superimposed on advanced CKD. Also, patients with decreasing values of the pre-dialysis serum creatinine and urea should prompted the nephrologist and healthcare providers to re-evaluate their renal functions to the possibility of renal recovery. However, low urea and creatinine can also be an indicator of poor nutritional status and reduced muscle mass. This is often attributed to inadequate dialysis, and the patient therefore can be subjected to more aggressive dialysis, which is poorly tolerated and can make the patient more miserable.

Probably there are more patients who are not subjected to significant fluid removal during dialysis, and therefore may not exhibit symptoms on dialysis. Such patients may continue to receive dialysis for undetermined period of time that they do not need. A periodical checkup of residual renal function is important to identify those patients. Patients on hemodialysis should be evaluated for possible RFR and should be closely monitored for residual renal function to avoid unnecessary, complicated and expensive dialysis and to minimize patient harm. A key factor among most who were able to discontinue, or limit dialysis treatments is that they were still able to urinate.

Conclusion

Patients may recover renal function and may stop dialysis, even after a relatively long time on dialysis. In patients with preserved diuresis, fall in periodical urea or creatinine measurements, and those who are symptomatic on dialysis might be a sign of renal recovery and we should be aware of possible kidney function improvement. We should re-evaluate the volume status and estimate the residual renal function of this patient and if necessary, decrease the dialysis sessions or discontinue the dialysis. Residual renal function should be checked in hemodialysis patients and especially in ESRD patients with AKI to avoid further renal injury.

Conflict of Interest

The authors declare that they have no conflict of interest.

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How to cite this article: Omer T, Emel AB, Ugur E, Mehmet NK. The Importance of the Volume Status, Dry Weight and Residual Renal Function in Hemodialysis Patients. JOJ uro & nephron. 2019; 6(4): 555692. DOI: 10.19080/JOJUN.2019.06.555692

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