Impact of Residual Kidney Function on Mineral Bone Disorders in Hemodialysis Patients

Thesis

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Ahmed Ra'fat Yuosif

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List of Abbreviations

Abb.	Full term

Ca ..... *calcium*
HD..... *hemodialysis*
ESRD..... *end stage renal disease*
FGF23 ..... *fibroblast growth factor 23*
MBD..... *mineral bone disease*
RKF..... *residual kidney function*
PD..... *peritoneal dialysis*
PTH..... *parathormon*
PO..... *Phosphorus*

Introduction

INTRODUCTION

Residual kidney function (RKF) may confer a variety of benefits to patients on maintenance dialysis. RKF provides continuous clearance of middle molecules and protein-bound solutes. Whereas the definition of RKF varies across studies, interdialytic urine volume may emerge as more appropriate calculations. ***(Mathew AT, Fishbane S, Obi Y, 2016).***

Observational studies have shown that preservation of residual renal function (RRF) in dialysis patients is an independent prognostic factor in patient survival and quality of life ***(Plantinga LC et al,2010) .***

There is an increased focus on preserving RRF in hemodialysis patients ***(Perl J, Bargman JM,2009).***

Whereas the role of residual renal function for survival is well recognized in the peritoneal dialysis population, it has not received much attention in the hemodialysis population. Another study showed that residual renal function contributes significantly to improved outcomes in hemodialysis patients and that efforts to preserve it are warranted ***(Vilar et al 2009),***.

The benefits of RKF are hypothesized to be mediated by improved control of volume, minerals, and electrolytes; less inflammation; and greater clearance of protein-bound solutes and middle molecules.

HD is used only intermittently whereas native kidney function is continuous. For this reason, even a small amount of residual function reduces plasma levels of solutes cleared poorly by HD, such as low molecular weight proteins like B2-microglobulin and protein-bound solutes.

In HD patients, RKF allows for lower ultrafiltration volumes during each dialysis session, resulting in less intradialytic hypotension and myocardial stunning. Recurrent myocardial stunning with HD has been shown to predict chronic heart failure, cardiovascular events, and mortality ***(*Mathew AT, Fishbane S, Obi Y, *2016),.***

Mineral and bone disorder (MBD) affects the majority of patients with chronic kidney disease and is characterized by imbalances in serum levels of parathyroid hormone (PTH), calcium (Ca), and phosphorus (PO) . ***(Mark D, Vasily Belozeroff ,Karen Smirnakis , 2008),.***

Preserving residual kidney function in hemodialysis patients may contributes to more control of MBD and good outcomes of hyperphosphatemia hence , reducing calcification and mortality among hemodialysis patients . ***(John T. Daugirdas , Glenn M. Chertow , Brett Larive ,et al 2012),.***

RKF contributes to overall clearance in both PD and HD patients, with related better patient survival and quality of life. Clinical management and research efforts should consider a

focus on strategies to preserve RKF. Based on a critical literature review, suggestion of the following considerations for the preservation of RKF in all patients newly started on HD as avoiding nephrotoxic drugs, control blood pressure, avoid intradialytic hypotension and adjustment of hemodialysis prescription***, (Mathew AT, Fishbane S, Obi Y, 2016).***

Aim of the Work

AIM OF THE WORK

The aim of the present work is to evaluate the impact of residual kidney function on biomarkers of mineral bone disorders mainly (Ca, Po and iPTH) in chronic hemodialysis patients.

Research question:

In chronic hemodialysis patients , does the residual kidney function improve bone mineral disorder ?

Review of Literature

Chapter One

Chronic Hemodialysis

CHRONIC HEMODIALYSIS

Fifty years ago, Belding Scribner and his colleagues at the University of Washington developed a blood-access device using Teflon-coated plastic tubes, which facilitated the use of repeated hemodialysis as a life-sustain in treatment for patients with uremia. The introduction of the Scribner shunt, as it became known, soon led to the development of a variety of surgical techniques for the creation of arterio-venous fistulas and grafts. Consequently, hemodialysis has made survival possible for more than a million people throughout the world who have end-stage renal disease (ESRD) with limited or no kidney function. The expansion of dialysis into a form of long term renal replacement therapy transformed the field of nephrology and also created a new area of medical science, which has been called the physiology of the artificial kidney.

(J . Himmelfarb, and T. Alp Ikizle , 2010)

- **Goals of hemodialysis**

Goals are defined as the diffusion of molecules in solution across a semipermeable membrane along an electrochemical concentration gradient. The primary goal of hemodialysis is to restore the intracellular and extracellular fluid environment that is characteristic of normal kidney function. ***(Depner TA. 2001).***

This is accomplished by the transport of solutes such as urea from the blood into the dialysate and by the transport of solutes such as bicarbonate from the dialysate into the blood. Solute concentration and molecular weight are the primary determinants of diffusion rates. Small molecules, such as urea, diffuse quickly, whereas compartmentalized and larger molecules, such as phosphate, β2-microglobulin, and albumin, and protein bound solutes diffuse much more slowly. In addition to diffusion, solutes may pass through pores in the membrane by means of a convective process driven by hydrostatic or osmotic pressure gradients, a process called ultrafiltration. ***(Locatelli F & Manzoni C et al 2002)***

During ultrafiltration, there is no change in solute concentrations; its primary purpose is the removal of excess total body water. For each dialysis session, the patient's physiological status should be assessed so that the dialysis prescription can be aligned with the goals for the session. This is accomplished by integrating the separate but related components of the dialysis prescription to achieve the desired rates and total amount of solute and fluid removal. By replacing kidney excretory function, dialysis is intended to eliminate the symptom complex known as the uremic syndrome, although ascribing particular cellular or organ dysfunction to the accumulation of specific solutes in uremia has proved to be difficult hemodialysis . (***Meyer TW & Hostetter 2007)***