Effect of Dialysis Modality on Bone Disease in patient with End Stage Renal Disease

Thesis

Submitted for partial fulfillment of Master Degree in Internal Medicine

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2020

تأثير طريقة غسيل الكلى على أمراض العظام في المرضى الذين يعانون من الفشل الكلوى

رسالة

توطئة للحصول علي درجة الماجستير في الأمراض الباطنة

مقدمة من

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سورة البقرة الآية: ٣٢

Acknowledgement

First and foremost thanks to ALLAH, the Most Merciful.

I wish to express my deep appreciation and sincere gratitude to ***Prof. Dr. Saeed Abd Alwahab Saeed,*** *Professor of Internal Medicine, Nephrology, Ain Shams University, for his close supervision, valuable instructions, continuous help, patience, advices and guidance. He has generously devoted much of his time and effort for planning and supervision of this study. It was a great honor to me to work under his direct supervision.*

I wish to express my great thanks and gratitude to ***Prof. Dr. Waleed Anwar Abd Almohsen,*** *Professor of Internal Medicine, Nephrology, Ain Shams University, for his kind supervision, indispensable advice and great help in this work.*

I wish to express my great thanks and gratitude to ***Dr. Mostafa Abd ELNassier AbdElgawad,*** *Lecturer of Internal Medicine, Nephrology, Ain Shams University, for his kind supervision, indispensable advice and great help in this work.*

Last and not least, I want to thank all my family, my colleagues,, for their valuable help and support.

Finally I would present all my appreciations to my patients without them, this work could not have been completed.

Contents

List of Abbreviations

ACEI: ..... Angiotensin Converting Enzyme Inhibitor
ALP: ..... Alkaline phosphatase
AVF:……..Arterio-Venous Fistulae
BP: ..... Blood Pressure
β2 m: ..... Beta-2 microglobulin
BUN: ..... Blood Urea Nitrogen
Ca: ..... Calcium
CAVH: ..... Continuous arteriovenous hemofiltration
CBC: ..... Complete Blood Count
Ccr: ..... Creatinine Clearence rate
CHF: ..... Congestive Heart failure
CKD: ..... Chronic Kidney Disease
CVD: ..... Cardiovascular Disease
CVVH: ..... Continuous venoovenous hemofiltration
CVVHDF: ..... Continuous venovenous hemodiafiltration
CAVHDF: ..... Continuous arteriovenous diafiltration
DBP: ..... Diastolic Blood Pressure
EPO: ..... Erythropoietin
ESRD: ..... End Stage Renal Disease
GFR: ..... Glomerular Filtration Rate
GH: ..... Growth Hormone
GN: ..... Chronic glomerulonephritis
HB: ..... Haemoglobin
HCT: ..... Hematocrit
HD: ..... Hemodialysis
HDF: ..... Hemodiafiltration
HTN: ..... Hypertesion
ISH: ..... Intradialytic symptomatic hypotension
K/DOQI: ..... Kidney Disease Outcome Quality Initiative
Kt/V: ..... Dialyzer Urea Clearance (K) X Duration of the Dialysis (t) / Urea Volume of distribution (V)
NKF: ..... National Kidney Foundation
OH2 D3: ..... 1,25 Dihydroxy Cholecalciferol
PTFE: ..... Polytetrafluro ethylene Teflon
PTH: ..... Parathormone

QUF: ..... Ultra-filtration flow rate
RBC: ..... Red Blood Cell
rHEPO: ..... Recombinant Human Erythropoietin
rHGH: ..... Recombinant Human Growth Hormone
RRT: ..... Renal Replacement Therapy
SBP: ..... Systolic Blood Pressure
TSAT: ..... Transferrin Saturation
UFc: ..... Ultra-Filtration coefficient
b-ALP: ..... Bone alkaline phosphatase

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ABSTRACT

Background: The kidney has a vital role in the metabolism of minerals and bone metabolism. It is the target organ of several regulating hormones such as parathormon (PTH) and fibroblast growth factor-23 (FGF-23) and it has an important role in vitamin D activation. Calcium and phosphorus are very important for the biological functions. Abnormalities in calcium, phosphorus, parathyroid hormone (PTH), and vitamin D metabolism are common in patients with (CKD).

Aim of the work: To compare the effect of online hemodiafiltration (HDF) dialysis versus hemodialysis using high flux dialyzer on bone markers.

Patients and Methods: The study was performed on 50 patients in Ain Shams University Specialized Hospital with end-stage renal failure who was on regular hemodialysis using high flux dialyzer and they erer divided into 2 groups , first group (group1) : 25 patients who continued on regular hemodialysis with high flux dialyzer. second group (group 2): 25 patients who were shifted to online HDF. **Inclusion criteria** were patients with end stage renal disease on regular hemodialysis for > 6 months, their age> 18 years old , no recent infection (normal CRP) , no cardiac or vascular access complication , none of the patients had history of bone disease e.g. fracture or malignancy. Also, patients should have no history of blood transfusion or history of drug intake that can affect bone metabolism as aluminium containing antiacids.

Results: patient who were on dialysis using high flux dialyzer had significantly higher marker (b-ALP) and serum phosphorus than patients who were on online HDF.

Conclusion: patients on dialysis by online Hemodiafiltration (HDF) has significantly lower levels of bone specific alkaline phosphatase than patients on dialysis with high flux dialyzers which indicates better bone metabolism in patients on online HDF. Also ,online HDF dialysis shows better clearance of phosphorus ,potassium and BUN.

Keywords: *Hemodiafiltration, Hemodialysis, Parathormon, bone specific alkaline phosphatise, Phosphorus*

INTRODUCTION

The kidney plays a vital role in the metabolism of minerals and bone health. It is not only the target organ of several regulating hormones such as parathormon (PTH) and fibroblast growth factor-23 (FGF-23), but it is also the main organ that activates vitamin D ***(Pavlovic, et al., 2015)***

Calcium and phosphorus are fundamentally important in a wide array of biological functions. Abnormalities in calcium, phosphorus, parathyroid hormone (PTH), and vitamin D metabolism are common in patients with (CKD) ***(Block, et al., 1998).***

Chronic kidney disease (CKD) is a systemic condition affecting about 10% of the general population, although estimates of CKD prevalence vary widely, both within and between countries ***(Hill, et al., 2016).***

Bone disease is highly prevalent in patients with chronic kidney disease on dialysis (CKD-5D) ***(Ketteler, et al., 2017).*** It can induce serious bone health problems, especially fragility fractures. Bone disease in patients with CKD-5D is the result of bone turnover abnormalities and the decrease of bone mineral density (BMD).

Recently, the KDIGO (Kidney Disease: Improving Global Outcomes) conference group agreed that the definition of renal osteodystrophy should be only specific

to bone pathology found in patients with CKD ***(Moe, et al., 2006).***

It has been concluded that renal osteodystrophy is one component of the mineral and bone disorders that occur as a complication of CKD ***(Igor, et al., 2012).***

It has been proposed that the evaluation and definitive diagnosis of renal osteodystrophy requires performing a bone biopsy ***(KDIGO, Kidney Int. 2006).***

Based on all of this a new term has been proposed and coined "Chronic kidney disease – mineral and bone disorder (CKD-MBD)" willing to describe the systemic consequences of mineral metabolism disturbances in CKD patients which can no longer be considered restricted only to bone disease. CKD-MBD defines a triad of interrelated abnormalities of serum biochemistry, bone and the vasculature associated with CKD. The adverse effects of high serum phosphorus and an increase of serum calcium due to calcium overload which are present late in CKD are important component of CKD-MBD as well as vascular changes. Furthermore, to clarify the interpretation of bone biopsy results in the evaluation of CKD-MBD, it has been proposed to use three key histologic descriptors—bone turnover, bone mineralization, and bone volume (so called TMV system)— with any combination of each of the descriptors possible in a given specimen. The TMV classification scheme provides a clinically relevant

description of the underlying bone pathology, as assessed by histomorphometry, which, in turn, helps to define the pathophysiology, and, thereby, probably to guide the therapy ***(Moe, et al., 2006)***.

Aim of the work

The aim of this study is to Compare the effect of online hemodiafiltration (HDF) versus Hemodialysis using high flux dialyzer on bone markers at Ain Shams University Hospital..

CKD-MBD OVERVIEW

- **Definition:**

In 2003, the National Kidney Foundation proposed that renal osteodystrophy should be defined as a constellation of bone disorders present or exacerbated by CKD that lead to bone fragility and fractures, abnormal mineral metabolism, and extra skeletal manifestations ***(K/DOQI, 2013).*** Despite incorporating a triad of abnormal mineral metabolism, skeletal and extra skeletal manifestations this definition failed to be acceptable globally. Therefore, to ensure a widely acceptable definition, the second KDIGO controversies conference in 2005 came up with a broader term CKD-MBD. The conference participants agreed that CKD-MBD should be defined "as a systemic disorder of mineral and bone metabolism due to CKD manifested by either one or a combination of the following: (i) abnormalities of calcium, phosphorus, parathyroid hormone (PTH), or vitamin D metabolism; (ii) abnormalities in bone turnover, mineralization, volume, linear growth, or strength; or (iii) vascular or other soft tissue calcification" ***(Moe, et al., (KDIGO),2006),*** **as shown in figure 1** This internationally acceptable definition has led to ease of valid comparison of studies in the field of CKD-MBD.