Handgrip strength: A tool of nutritional assessment, The possible effect of high protein diet and L-carnitine in Hemodialysis Patients

Thesis submitted in partial fulfilment of the requirements for the degree of

Master of Internal Medicine

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2016

استخدام قوة قبضة اليد كأداة مستقلة للتقييم الغذائي والتأثير المحتمل للغذاء عالي البروتين وتناول الكارنيتين في مرضي غسيل الكلي

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2016

ACKNOWLEDGMENT

First of all, all gratitude is due to **GOD** almighty who guided and aided me to bring to light this work

I would like to express my deep gratitude and sincere thanks to Dear Professor**Dr.Tareq Mahmoud Hussein**, Professor of internal medicine and nephrology, Faculty of Medicine, Cairo University for his sound advise and guidance

Iam also really honoured to express my deepest gratitude and indebtedness to**Dr.Noha Adel Ibrahim,** Associate professor of Internal Medicine and nephrology, Faculty of Medicine Cairo University for her kind help, guidance, enthusiasm and encouragement for accomplishing this work

Finally i thank my family for their patience and forbearance during this work

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AVF	Arteriovenous fistula
BCAA	Branched- chain amino acid
BF	Body fat
BIA	Bioelectrical impedance analysis
BMI	Body mass index
BUN	Blood urea nitrogen
CANUSA	Canada-USA
CAPD	continuous ambulatory peritoneal dialysis
CHD	Continuous hemodialysis
CKD	Chronic renal disease
CNI	Composite nutritional index
CRF	Chronic renal failure
CRP	C reactive protein
CTD's	cumulative trauma disorders
CVD	Cardiovascular disease
DMS	Dialysis Malnutrition Score.
DOPPS	The Dialysis Outcomes and Practice Patterns Study
DOQI	Dialysis Outcomes Quality Initiative
DPI	Dietary protein intake
DXA	Dual-energy radiograph absorptiometry
ESRD	End stage renal disease
FA	Free Amino acid
GFR	Glomerular filtration rate
GH	Growth hormone
Hb	Hemoglobin
HD	Hemodialysis

HGS	Handgripstrength
HPT	Hyper parathyroidism
IGF-1	Serum insulin-like growth factor
IL	Interleukin
IR	Insulin resistance
ISRNM	International Society of Renal Nutrition and Metabolism
K/DOQI	Kidney Disease Outcomes and Quality Initiative
MAMC	Mid-arm muscle circumference
MF	Muscle function
MIS	Malnutrition-inflammation score
NHANES II	National Health and Nutrition Examination Surveys
NKF	National Kidney Foundation
nPNA	protein equivalent of nitrogen appearance
PCR	Protein catabolic rate
PD	Peritoneal dialysis
PEM	Protein–energy malnutrition
PEW	Protein energy wasting
PNA	Protein equivalent of total nitrogen appearance
PTEE	Polytetrafluoroethylene
SGA	Subjective global assessment
TIBC	total iron-binding capacity
TN	Total Nitrogen
TNF	Tumor necrosis factor
TSFT	Triceps skin fold thickness

Introduction

Protein–energy wasting (PEW) is common in patients with chronic kidney disease and is associated with increased morbidity and mortality **(Avesani CM et al., 2006), (Fouque D et al., 2008)**.There are several clinical, nutritional, and biochemical parameters that may be indicative of PEW in patients using hemodialysis (HD).

According to the International Society of Renal Nutrition and Metabolism (ISRNM) expert panel, PEW is diagnosed if there are low serum levels of albumin, transthyretin, or cholesterol, a decreased body mass (low or decreased body/fat mass or body mass loss with low intake of protein and energy), and decreased muscle mass (muscle wasting or sarcopenia, decreased mid arm muscle circumference) **(Fouque D et al., 2008)**. Decreased muscle mass appears to be the most valid criterion for the presence of PEW**(Axelsson J et al., 2006)**.

However, it is often difficult to diagnose decreased muscle mass or muscle loss accurately **(Mak RH et al., 2006)**. In this setting, functional tests may be the most sensitive and relevant indicator of nutritional status alterations **(Normam K et al., 2005)**.

An ideal method for assessing the nutritional status of patients should include dietary intake, nutritional requirements, functional status and body composition **(Barbosa et al., 2006)**.However, in the absence of a gold standard, scientists tried to identify new methods capable of accurately diagnosing malnutrition **(Furstenberg A, Davenport A, 2010), (Leal VO et al., 2011)**. Many tools have been used however; their validity is still controversial **(World Health Organization, 2008)**. Handgrip strength (HGS), a measurement of the maximal voluntary force of the hand/arm, has been described as a useful tool in assessing muscle function (MF) because it is a noninvasive, rapid, objective, and inexpensive procedure **(Schlussel MM et al., 2008)**. This technique has been related to mortality and complications in surgical patients **(Bohannon RW et al., 2001)** and in the elderly **(Stalenhoef PA et al., 2002)**.

Handgrip strength is not influenced with dialysis variables, so it can be used easily with hemodialysis patients **(Viviane O et al., 2010)**.

L-Carnitine supplementation, levocarnitine is an amino acid derivative which is an essential cofactor of fatty acid metabolism, may improve several situations, such as cardiac performance, intradialytic hypotension, muscle symptoms, and impaired exercise and functional capacities in hemodialysis patients. On the other hand, it could have a positive impact on nutritional status of uremic patients by positive protein balance induction, insulin resistance reduction, and chronic inflammation amelioration **(Calvani M et al., 2004)**. So it seems that L-Carnitine administration might be rational in hemodialysis patients. However, there is still a big controversy surrounding L-Carnitine supplementation in dialysis patients **(CampistolJM,2002)**, and limited data is also available on possible benefits of L-Carnitine supplementation in uremic patients **(Horl WH et al., 2005)**.

Aim of the work

The aim of the work is to evaluate handgrip strength as a tool of assessment of nutritional status before and after the commitment to a nutritional program to increase protein content (1.2- 1.4 g/kg/d) in diet and receiving L-Carnitine in hemodialysis patients, and to correlate the Handgrip Strength as a single independent indicator of the functional status, serum albumin, lipid profile, Anthropometric measures and Subjective Global Assessment as other methods of assessment of the nutritional status of hemodialysis patients with normalized protein catabolic rate (nPCR).