

18870 / P

**Musculoskeletal complications related
to long term hemodialysis.**

**Thesis Submitted To The Faculty of Medicine
Ain Shams University**

By

enien
**Viviane M. Mishriky
M.B., Ch.B (Ain Shams)**



**In partial fulfillment of the requirements for
the degree, M.Sc. Physical Medicine**

1615.8043
V.M

Under the Supervision of

30370

Prof. Dr.

HATEM MOHAMAD EL EBIARY

Head of Phys. Med. Dept.

Ain Shams University.

Asst. Prof.

DR. FATMA KAMEL

Asst. Prof. of Phys. Med.

Ain Shams University.

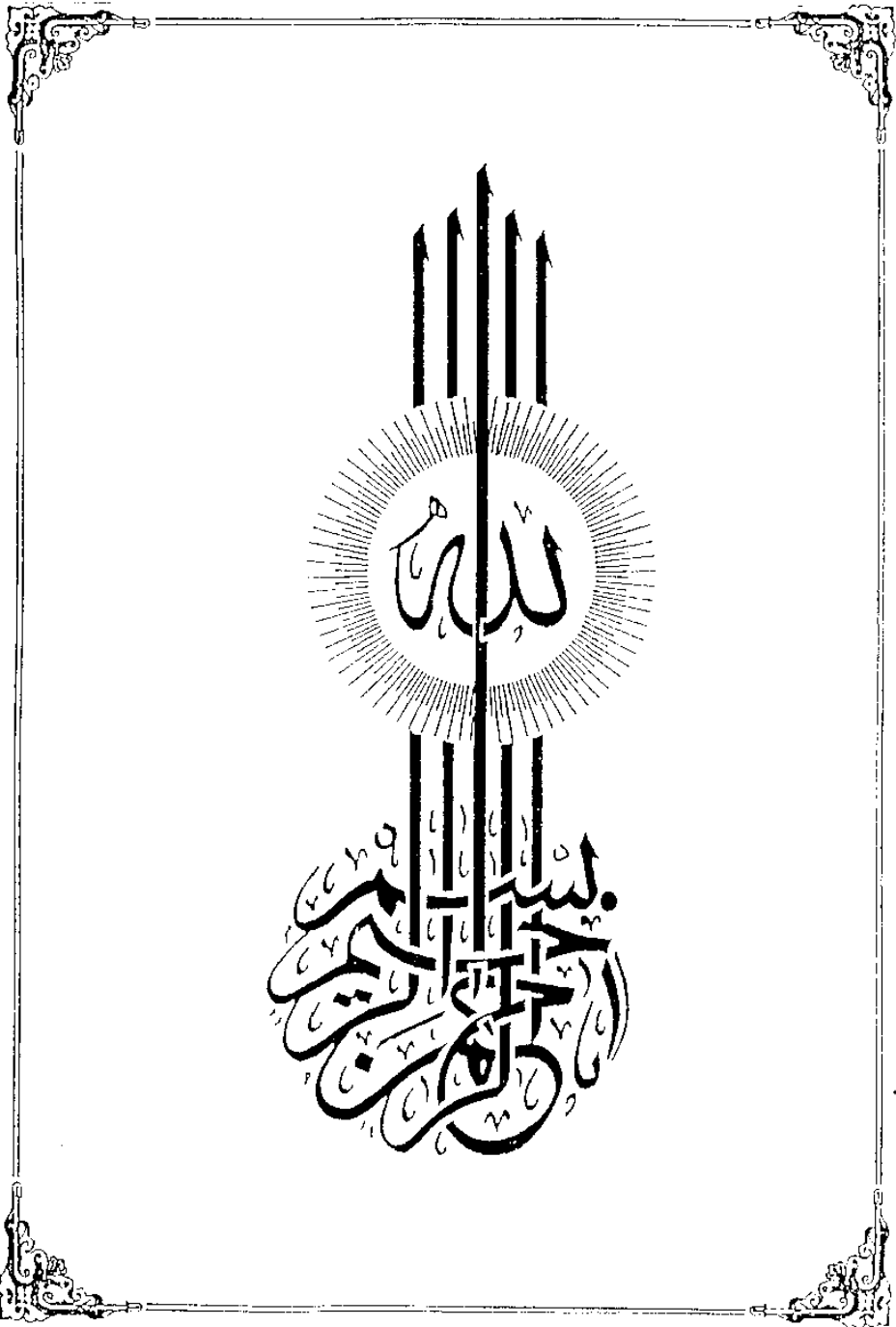
AIN SHAMS UNIVERSITY.

1989

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to Prof. Dr. HATEM EL EBIARY, Chairman of the Physical Medicine Department, Ain-Shams University, for his close supervision and fruitful criticism which led to the successful accomplishment of this thesis..

I am also deeply grateful to Dr. FATMA KAMEL, Ass. Prof. of Physical Medicine, Ain-Shams University, for her sound guidance and valuable advice throughout the whole work.



CONTENTS

•	Introduction and aim of the work	1
•	Systemic manifestations of chronic renal failure	4
•	Hemodialysis	12
•	Renal osteodystrophy	18
•	Other musculoskeletal complications related to long term hemodialysis	60
•	Summary	98
•	References	103
•	Arabic summary	

***INTRODUCTION
AND AIM OF THE WORK***

MUSCULOSKELETAL COMPLICATIONS RELATED TO LONG TERM HEMODIALYSIS.

INTRODUCTION

When diseases cause kidney failure or otherwise compromise the ability of the kidneys to remove toxic products from the blood and Body fluids, electrolyte and acid base balance therapeutic modalities such as dialysis, hemoperfusion, hemofiltration and kidney transplantation may be resorted to.

Because of its complexity and because of the underlying metabolic abnormalities, extracorporeal hemodialysis is associated with potentialities for multiple complications.

Hemodialysis has been successful in increasing the life of patients with chronic renal failure. The mean five years survival rate for patients on hospital hemodialysis is now between 27 and 66% depending on the age of the patient. A large number of the surviving patients are crippled by bone disease.

In general problems and complications resulting from long term

chronic hemodialysis can be divided into :

- Problems related to the circulating system (infection, thrombophlebitis etc...)
- Problems with the kidney machine and dialyzer (blood loss, hemodialysis, air embolism etc...)
- Complications associated with the dialysate (copper, aluminium intoxication, hemodialysis, acidosis etc...)
- Complications of dialysis disequilibrium syndrome (dialysis encephalopathy, psychoneurological problems, microembolization etc...)
- Complications of inadequate dialysis (neuropathy, pericarditis etc...)

Musculoskeletal problems associated with long term hemodialysis are considered to be well known established complications. Although chronic renal failure in itself is known to cause many pathological disturbances in bones, joints and muscles for example osteodystrophy, yet chronic hemodialysis was expected to preserve or at least ameliorate this condition. On the one hand this is true for some of the pathological conditions but on the other hand, hemodialysis has its own problems due to dialysate (aluminium deposits in bones and joints), due to dialysis itself, or to the use of certain drugs in the process such as steroids

AIM OF THE WORK

The aim of this work is to review the complications which may occur in the musculoskeletal system following long term hemodialysis and their causative factors with a view to avoid such complications in patients undergoing this procedure.

***SYSTEMIC MANIFESTATIONS OF
CHRONIC RENAL FAILURE***

SYSTEMIC MANIFESTATIONS OF CHRONIC RENAL FAILURE

All the organ systems of the body are affected by chronic renal insufficiency. Failure of the kidneys can cause severe problems with the cardiovascular system, gastrointestinal tract, bones and many other organs. The appropriate management of patients with chronic renal insufficiency requires an understanding of the pathogenesis and treatment of these abnormalities. It is not ment to be an exhaustive review of all changes which occur in the body secondary to renal insufficiency but a brief review of the various abnormalities.

Abnormalities in Calcium, phosphorus and vitamin D metabolism:

Abnormalities in Calcium (Ca^{++}), Phosphorus (P) and vitamin D metabolism are one of the earliest changes to occur in progressive renal insufficiency. If appropriate treatment is begun early enough it is usually successful, but if not, abnormalities in Calcium and phosphorus metabolism will lead to bold type with severe bone pain and pathologic fractures, soft tissue calcification with severe paucity and vascular calcification which can lead to ischemic or even gangrene of the extremities. There are three primary abnormalities affecting Ca^{++} metabolism which occur in renal insufficiency. These are P retention

from a decrease in phosphorus excretion, decreased Ca^{++} absorption secondary to abnormalities of Vitamin D activation and resistance to the action of the parathyroid hormone (P.T.H) (Van stone, 1983).

Renal osteodystrophy:

The term renal osteodystrophy is used to describe the bone abnormalities which occur with chronic renal failure. It is a combination of different processes. These are osteomalacia, osteitis fibrosa cystica, osteosclerosis, osteoporosis and subchondral resorption.

Osteomalacia is characterized by a deficiency in the mineral content of the bone with a relatively normal amount of the non-mineral matrix material present.

Osteoporosis is characterized by a lack of both the mineral content of the bone along with a lack of the matrix.

Osteitis fibrosa cystica is caused by an increase in reabsorption of the bone. It is frequently seen in the cortex of the phalanges and the clavicles. Osteitis fibrosa cystica is usually caused by excessive secretion of parathyroid hormone.

Osteosclerosis is manifested by an increase in bone density. It occurs most commonly in the vertebrae, ribs, clavicles and pelvis.

Osteosclerosis appears to be due to an abnormal arrangement of the bone matrix which takes a woven pattern rather than the laminal pattern (Avioli et al., 1976).

Hematologic abnormalities in chronic renal failure:

Anemia: This is the primary hematologic abnormality found in the patient with chronic renal failure and is multifactorial. A major factor appears to be the decreased production of erythropoietin, a hormone produced by the kidney which stimulates the bone marrow to increase erythrocyte synthesis. Erythropoiesis is also inhibited by toxins present in the plasma of these patients. In addition to the lack of erythropoietin and the presence of erythropoiesis inhibitors, the life span of red cell is also slightly decreased in chronic renal failure (Van Stone, 1983).

Immunological abnormalities in chronic renal failure:

There is a decrease in the number and function of lymphocytes in chronic renal failure patients (Quadracci et al ,1976). Cell mediated immunity is decreased in chronic renal failure as manifested by a high incidence of cutaneous anergy and decreased blastogenesis after immunologic stimulation. The anergy appears to be more pronounced in hemodialysis patients treated for greater than one year than in patients treated for less than one year (Hanicki et al., 1979).

Platelet function: Abnormal platelet function is the most consistent and severe hemostatic abnormality in chronic renal failure and is the major cause of the hemorrhagic diatheses seen in uremia. There is reduction in both platelet adhesiveness and platelet aggregation in response to various stimuli (Hereroits Harowitz et al., 1970).

Cardiovascular abnormalities:

There are four major cardiovascular abnormalities which have been found to be associated with chronic renal failure: hypertension, increased atherosclerosis, myocardial dysfunction and pericarditis. These abnormalities are not completely independent of each other, but are inter-related.

Hypertension: Hypertension is extremely common in renal insufficiency. Clinically, it is the most important cardiovascular abnormality because appropriate treatment will prevent the grim consequences of uncontrolled hypertension. The mechanisms causing hypertension in patients with renal insufficiency are increased extracellular volume, increased renin secretion, increased sympathetically mediated vasoconstriction and possibly decreased production of vasodilatory prostaglandins. The most important mechanism is probably an increase in extracellular fluid volume (Lee, 1969).

Myocardial dysfunction: It has been suggested that uremia itself can cause myocardial dysfunction (uremic cardiomyopathy) possibly through a direct effect of some uremic toxins. Between 25 and 40% of chronic dialysis patients have evidence of left ventricular dysfunction. There are many factors which may contribute to this dysfunction. First of all they have higher than normal cardiac overload. The primary factors causing this increased workload are anemia, hypertension and in hemodialysis patients the arteriovenous fistula. Hypertension in addition to increasing cardiac workload also causes myocardial hypertrophy which decreases myocardial function (Hung et al., 1980).

Pericarditis: It is now apparent that there are two different types of pericarditis which usually occur prior to the onset of dialysis and dialysis associated pericarditis, while occurs in patients on dialysis therapy. Uremic pericarditis occurs before the initiation of dialysis therapy and is usually associated with other signs of uremia and respond to dialysis. Systemic symptoms such as fever and chest pain are less prominent or absent in uremic pericarditis which they can be very severe in dialysis associated pericarditis. Finally cardiac tamponade is very rare with uremic pericarditis, but is not uncommon with dialysis associated pericarditis (Van Stone, 1983).

Gastrointestinal manifestations of chronic renal failure:

Gastrointestinal symptoms are common and include anorexia, hiccup with nausea, vomiting and often an unpleasant taste in the mouth. Diarrhea and intestinal bleeding occasionally occur. These symptoms are usually related to the level of nitrogenous waste products in the body and can often be alleviated by careful dietary control and dialysis (Van Stone, 1983).

Neurologic abnormalities of chronic renal failure:

There are many neurologic syndromes which occur in patients with chronic renal failure. They can involve the central, peripheral and autonomic nervous system or the muscles themselves.

The central Nervous System:

There are three major CNS syndromes which occur in patients with renal insufficiency: uremic encephalopathy, the disequilibrium syndrome and dialysis dementia.

Uremic encephalopathy is usually a sign of severe, advanced renal insufficiency. The earliest manifestation is a decreased ability to concentrate. As uremia advances, the uremic encephalopathy progresses from an inability to concentrate, to clouding of