﴿ بسم الله الرحمن الرحيم ﴾

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صدق الله العظيم

سورة البقرة

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Effect of cool temperature dialysate on the quality and patient perception of haemodialysis

Thesis

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Abstract

Key Words: **cool dialysate, haemodynamic stability, hypotensive episodes, standard dialysate, urea reduction ratio.**

The intradialytic hypotension is the most common problem during dialysis, resulting in reduced time of sessions and Led to less benefit from dialysis. This study tried to overcome this problem in an easy and safe way by using cool dialysate instead of standard dialysate, that resulted in reduced hypotensive episodes and haemodynamic stability during dialysis without impairing efficacy (urea reduction ratio) of dialysis or ultrafiltration and resulted also in good tolerability of patients to dialysis and they became more energetic and able to do their regular activities and there were no side effect or complications during treatment.

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Abbreviations

A-V fistula : Arteriovenous fistula.

alpha-ANP : atrial natriuretic peptide.

BP : Blood pressure .

BTM : Blood temperature monitor.

BUN : Blood urea nitrogen.

CBV : Central blood volume.

Eqs. : Equations.

ESRD : End stage renal disease.

HD : Hemodialysis.

HDF : Hemodiafiltration.

IDH : Intradialytic hypotension.

IDWG : Interdialytic weight gain.

Jv **:** Extra corporeal heat flow.

Jven **:** Amount of cooling provided by the venous line.

Kt\veq : Equlibrated **Kt\v**.

LDH : Lactate dehydrogenase.

NO : Nitric oxide

MAP : Mean arterial pressure.

PMMA **:** Polymethylmethacrylate.

PTH **:** Parathyroid hormone.

PVR **:** Peripheral vascular resistance.

Q_b **:** Blood flow.

REE **:** Resting energy expenditure in male.

REE_{female} **:** Resting energy expenditure in female.

T_{art} **:** Arterial temperature.

T_{dia} **:** Dialysate temperature.

T_{ven} **:** Venous temperature.

TPR **:** Total peripheral resistance.

UF **:** Ultrafiltration.

UFR **:** Ultrafiltration ratio.

URR **:** Urea reduction ratio.

List of figures

Page

List of tables

Page

Contents

Introduction

The intradialytic hypotension is a serious problem during observing and caring of haemodialysis patients.

Many causes are recognized some of them are related to patient as diabetes, autonomic neuropathy, left ventricular hypertrophy, high weight gain between sessions, arrhythmias, poor nutrition, ingestion of food on dialysis, septicemia, and antihypertensive agents. Other causes are related to managing of patient on haemodialysis as high U F rate, using antihypertensive agents during dialysis, using warm dialysate, low sodium dialysate and low dialysate osmolarity.

Less common causes are present as pericardial effusion, reaction to dialysate membrane, air embolism, (**Carmine Z. and George D. 2001).**

During standard hemodialysis and ultrafiltration, the combination of low blood volume and loss of peripheral vascular resistance causes hypotension **(Schneditz**, **2002).**

Cooling dialysate below 36.5°C has been recognized as an important factor contributing to haemodynamic stability of patients during haemodialysis, **Kaufman et al (1998), Schneditz *et al., (2001)*.**

Many studies show that cool dialysate improves cardiovascular tolerance of haemodialysis and reduces hypotension episodes during haemodialysis **Maggiore et al., (1981).**

Use of cool dialysate is associated with increased intradialytic blood pressure, but the hemodynamic mechanism is unknown whether changes in dialysate temperature affect muscle blood flow, which may alter the degree of urea compartmentalization.

The effect of cool dialysate on the urea reduction ratio (URR) in high efficacy haemodialysis has not been completely studied **(Abdelbasit Ayoub and Marry Finlayson 2004).**

Blood cooling is used to stabilize blood pressure (BP) during very high efficiency haemodialysis with a high ultrafiltration rate, and helps to maintain BP without compromising the efficacy of haemodialysis**, Meada et al., (1998).**

Increased BP associated with cool dialysate is due largely, if not entirely to increased total peripheral resistance and increased venous tone. **Levy et al., (1992).**

Use of cool temperature dialysate seems to be a great hope to treat this problem.

The procedure done by reducing dialysate temperature to **(35°C)** during dialysis and observing its effect on intradialytic hypotension.

Aim of the work

Determine the effect of cool temperature hemodialysis in decreasing or preventing episodes of hypotension during hemodialysis and its effect on the quality of hemodialysis by studying its effect on URR and spKt/v and by asking patients whether benefit from cool temperature hemodialysis or not. If yes, how they feel after it and if they want to continue on this treatment or not.

Hemodialysis

Definition:

It is a medical procedure that uses a special machine (a dialysis machine) to filter waste products from the blood and to restore normal constituents to it.

This shuffling of multiple substances is accomplished by the differences in the rates of their diffusion through a semipermeable membrane (a dialysis membrane).

Although hemodialysis may be done for acute kidney failure, it is more often employed for chronic renal disease.

Hemodialysis is frequently done to treat end-stage kidney disease.

Under such circumstances, kidney dialysis is typically administered using a fixed schedule of three times per week.

History of Hemodialysis:

The first human hemodialysis was performed in a uremic patient by Haas in 1924 at the University of Giessen in Germany **(Hess j and McGuigan., 1914 and 1925),** he used a tubular device made of collodion, cannulation of the radial and carotid arteries and the portal vein and hirudin for anticoagulation, later that year he added a blood pump. In 1937, the first flat hemodialysis membrane made of cellophane was produced (**Thalheimer W., 1937)**.

Willem Kolff from the Netherlands was one of the first investigators interested in the role of toxic solutes in causing the uremic syndrome.

In 1940, while taking care of casualties after the German invasion of the Netherlands, his interest in acute renal failure further increased and in 1943 he introduced the rotating drum hemodialysis system using cellophane membranes and an immersion bath and the first recovery of an acute renal failure patient treated with hemodialysis was reported (**Kolff WJ et al., 1943 and 1944)**.

This was the beginning of what was to become an important clinical reality artificial renal substitution therapy.

Significant improvements in dialyzer and equipment design occurred during the 1940's and 50's.

Nils Alwall developed a new system with a vertical stationary drum kidney and circulating dialysate around the membrane (**Alwall N., 1947).**