Anthropometric Measurements Its Value in Determination of Dry Weight of Dialyzed Patient

THESIS

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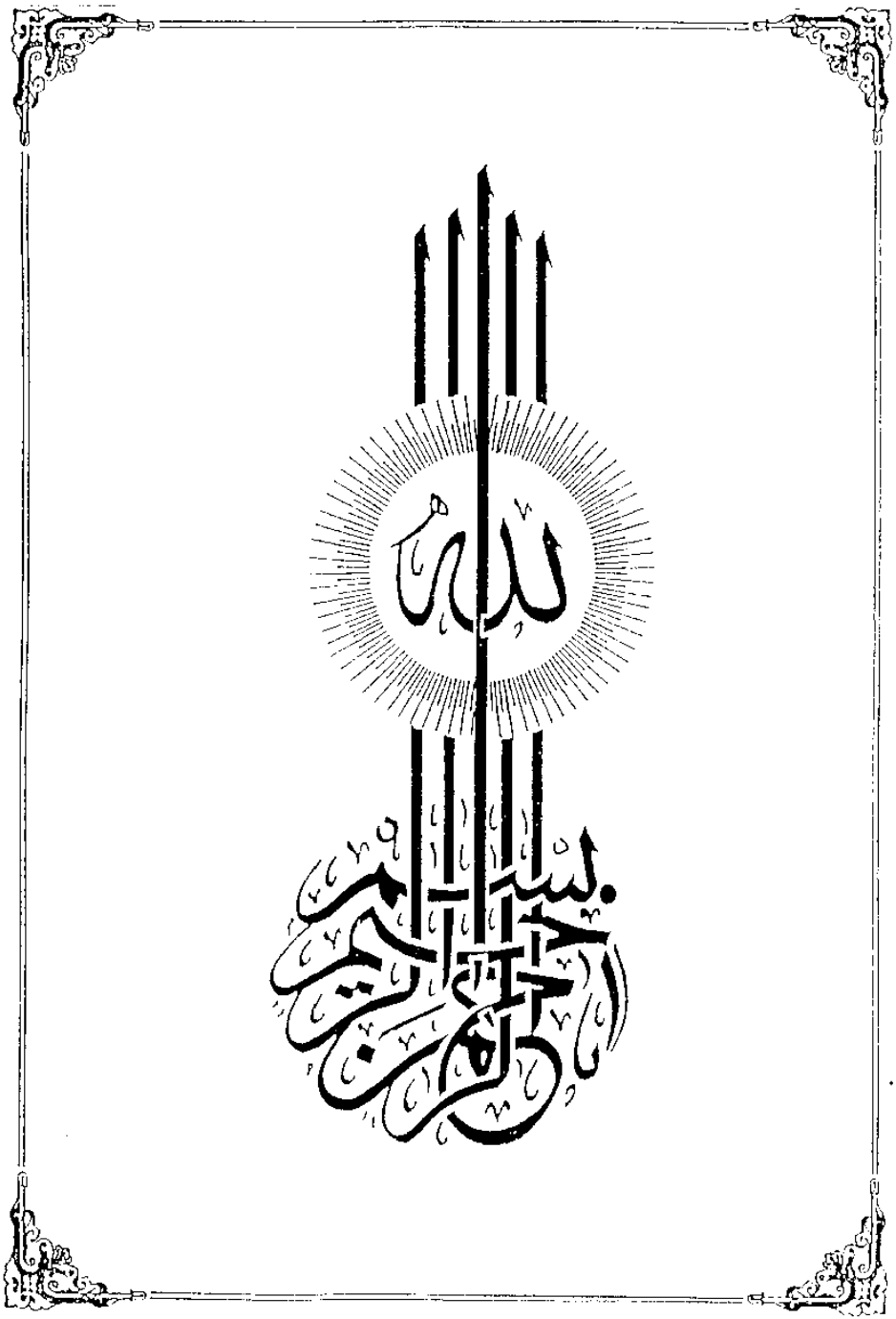

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INTRODUCTION

Patients treated by hemodialysis are trained in the concept of dry weight, which should be achieved at the end of a dialysis session. It is important that they should not have exceeded this dry weight by approximately 2 kg at the time of the next dialysis, thus avoiding fluid overload and the possible sequelae of this.

More recently,the innovation of continuous ambulatory peritoneal dialysis (CAPD) with fuid balance achieved by a mixture of isotonic and hypertonic glucose solutions has emphasized the need for more accurate assessment of dry weight. This has been obtained previously by ideal body weight for height, sex, age, clinical assessment (blood pressure, jugular venous pressure,edema,... etc.) and clinical impression. However, the insidious nature of fluid overload and changes in body weight which occur in these patients often mislead the clinician. A more accurate assessment of body weight is needed for continuous monitoring, and anthropometric indices performed quickly and simply in outpatients are of considerable value, as indicated by this work.

AIM OF WORK

A large percentage of patients of regular hemodialysis therapy maintain steady dry weights but problems arise when the patient either gains or loses weight. This reduction in flesh weight is often not appreciated and is mistaken for fluid depletion by the patients. They may drink more,or take less weight off on dialysis in order to achieve their previous dry weight thus risking pulmonary oedema (Paul,1982).Methods usually used to assess dry weight are not sensitive methods for detecting small changes in flesh weight (Bennett et al.,1986).

In order to try and assess dry weight more accurately, serial anthropometric measurements were taken on a number of patients on regular hemodialysis therapy, to see if there was any correlation with body weight.

ANTHROPOMETRIC MEASUREMENTS

Its Value in Determination of Dry Weight of Dialyzed Patients

Dry or ideal body weight:

One of the most difficult parameters to measure in the dialysis patient is the dry body weight.

Indeed, it is possible that the true dry weight is never known, as measurement of total body water and the extracellular space have to be related to a standard derived from a normal population [Keshaviah and Shaldon,1983].

This weight is a target to strive for and should be changed as the patient either gains or loses true body weight. It therefore must be reevaluated frequently. This is the weight the dialysis staff uses as a goal for ultrafiltration during dialysis [Corea et al.1984].

Dry body weight is usually defined as:

The body weight measured when the patient is normotensive and free of oedema. [corea et al.1984] i.e. the body weight in absence of signs of heart failure and postural hypotension [Bennett et al.,1983] i.e. the body weight below which hypotension and/or symptoms

such as muscle cramps particularly in the legs occur. Should the patient be upright, signs and symptoms of postural hypotension may be manifest. The patient's dry weight is only established after several weeks of conscious effort by hemodialysis staff to achieve an asymptomatic minimum weight level. Implied in this definition is the absence of clinically demonstrable fluid accumulation in tissues or body cavities unexplained by local derangements e.g. thrombophlebitis or pericarditis [Lee W. Henderson 1983, Levine & MacInnis, 1985).

Importance of accurate assessment of dry weight:

A large percentage of patients on long-term haemodialysis (HD) maintenance therapy maintain steady "dry weights" but problems arise when the patient either gains or loses weight. Loss of weight may occur slowly over several months due to inadequate dietary intake or quickly during intercurrent illness. This reduction in flesh weight is often not appreciated and is mistaken for fluid depletion by the patients. They may drink more, or take less weight off on dialysis in order to achieve their previous "dry weight", hence precipitate fluid overload. This is often insidious and the first manifestation may well be pulmonary oedema [Paul, 1982]. Conversely, an unrecognized flesh weight gain may lead to hypotension and cramps as excessive

fluid is removed in an attempt to regain dry weight [Bennett et al.,1986]. It is usual for patients undergoing continuous ambulatory peritoneal dialysis(CAPD) to gain weight,which may be due to an increase in muscle mass, fat, total body water, or a combination of all three [Lynch et al.,1983;Williams et al.,1981; Bennett, 1982]. The precise cause of weight gain is often difficult to assess.

Once the value of "dry weight" is established, this value is the basis for the judgement of excesses of total body water requiring removal[Lee W. Henderson, 1983]. The aim is to control the blood pressure by ultrafiltration (inducing weight loss) and avoid hypertension or orthostatic hypotension (Keshaviah and Shaldon,1983).

Causes of increasing weight in dialyzed patient:

While many uremic patients are emaciated, there are occasional individuals with end-stage renal disease treated by regular hemodialysis who are obese [Fearing & Freeman,1981). The gain in body fat observed by Comty,-1968 in few patients could have been due to a severe defect in intermediary metabolism, as yet undefined. Alternatively, it is possible that restriction of activities in these patients, caused by heart failure, weakness

or anemia, rather than uremic symptoms, may have facilitated some degree of calorie adequacy (Comty,C.M. 1968).

Interdialytic weight gains in chronic dialysis patients are related to sodium and fluid ingestion (Rupp et al.,1978; Coles, 1972).

Shortly after commencing long-term dialysis it is normal for appetite and health to improve with an associated gain in flesh weight [Comty, 1967;Borj,-1978; Bennett et al.,1986).

Studies of body composition in uremic patients treated by regular dialysis therapy were carried out by Coles,1972; and Comty,1968). They found that there was decreased body fat and lean body mass in nondialyzed uremic patients and total body water was increased largely due to an excess extracellular fluid. With the onset of hemodialysis, there was reduction in total body weight due to a fall in body water from both extracellular and intracellular spaces due to deliberate fluid removed by ultrafiltration in order to control hypertension and fluid overload. With time, body weight increases due to gains in body fat and fat free solids, indicating that some patients became anabolic during maintenance hemodialysis therapy [Cles,1972;Comty,1967].

The body composition in dialyzed patients was

studied by Comty,1967; who showed that severe depletion of body solids (body fat and fat - free solids), occur in the absence of significant weight loss. Extracellular volume expansion and true extracellular overhydration maintained the fat-free-solids and body fat. Although an increase in body fat was observed in some patients, this masked marked depletion of fat - free solids in patients who were treated by dietary protein restrictions [Comty,1967].

It is usual for patients undergoing continuous ambulatory peritoneal dialysis (CAPD) to gain weight, which may be due to an increase in muscle mass, fat, total body water or a combination of all three [Bennett,-1982).

A previous study by Williams et al.,1981, showed the increase in body weight may have been due to an increase in total body water and in the absence of oedema, this gain in body water may be due predominantly to a rise in intracellular water (Williams et al.,1981).

Serial measurements of total body potassium [Rubin et al.,1981] suggested that patients on CAPD tend to gain body fat and loose body cell mass.

Study of body composition and nutritional status

in patients on continuous ambulatory peritoneal dialysis (CAPD) suggested that cell overhydration was the distinctive feature in CAPD patients, and that the evolution of the nutritional status was variable, since the patients could remain stable, gain or loose body fat, and probably change their lean body mass [Panzetta et al,1985].

Recent observation suggest a marked anabolic effect of continuous ambulatory peritoneal dialysis, which may be explained in part by the 600-1000 Kcal/day of additional calories supplied from absorbed intraperitoneal glucose, and suggest that carbohydrate supplements may be useful in improving the nutritional status of hemodialysis patients and increasing their body weight [Lynch et al.,1983].

Causes of wasting and malnutrition in a patient undergoing maintenance dialysis:

Rapid weight loss occurring during the early months of treatment was due to fluid removal to control heart failure and hypertension. Studies of body composition suggest that only weight loss occurring during the first few weeks of treatment can be explained on this basis. Prolonged weight loss was directly attributable to loss of body solids. Clinically, prolonged weight loss paralleled difficulties in maintaining

a high calorie diet [Comty,1967; Coles,1972].

There are many causes of wasting and malnutrition in nondialyzed chronically uremic patients and patients undergoing maintenance dialysis. The causal role of some factors is well defined, for others the evidence is suggestive, but not definitive. The causes of wasting are more complex than simply impaired nutritional intake. Providing more nutrients may improve nutritional intake in chronically uremic patients, but this approach, by itself will often not eradicate wasting [Feinstein & Kopple,1985].

1. Inadequate dietary intake:

Inadequate intake is an important cause of wasting in patients with renal failure [Kopple, 1978].

In clinically stable maintenance dialysis patients, protein intake is often near the prescribed level, but energy intake is often reduced, usually tO 20-25% below values of normal individuals of the same age and sex. [Blumenkrantz et al,1980; Kopple ,1978; Kluthe et al.,1978; Wolfson et al.,1984].

This problem does not reflect a decrease basal energy requirement because resting, sitting, and postprandial energy expenditure appears to be normal in non-dialyzed chronically uremic and maintenance

hemodialysis patients. [Kopple et al.,1984].

The only group of uremic individuals who frequently gain weight and fat are patients who are undergoing continuous ambulatory peritoneal dialysis.These patients also receive several hundred calories each day from glucose absorbed from peritoneal dialysate [Grodstein et al.,1981]; after each exchange of dialysate containing 4.25% glucose, there is a rise in insulin which may further promote anabolism [Armstrong et al.,1981].

The dietary intakes of calcium and several vitamins by these patients are also often insufficient to maintain good nutrition, unless the patient takes nutritional supplements. [Kopple & Swendseid,1975; Kopple,1981].

Causes of inadequate dietary intake include:

1. Anorexia from :

   a) Uremic toxicity.
   b) Medications.
   c) Superimposed illness
   d) Psychological depression.
   e) Relatively unpalatable meals due to restricted intake of protein, purified sugars, minerals, and water. [Harvey et al.,1980).

2. Intercurrent illness causes a rapid weight loss [Coles,1972; Feinstein and Kopple,1985; Grodstein et al.,1980].

Acute and chronic superimposed illness may further impair the uremic patient's ability to:eat (e.g. extensive laceration and painful lesion of tongue....), digest, absorb, utilize nutrients. Diarrhea caused by various nutritional supplements also induce the patient to reject these foods. Some illnesses may simply depress mentation or induce anorexia; others may alter gastrointestinal function or metabolic processes. Diagnostic or therapeutic procedures may require the patient to fast, sometimes for many hours or, in the case of surgery, days.

3. Also, the hemodialysis procedure and some medicines cause anorexia, nausea, or vomiting. [Feinstein & Kopple,1985].

II. Trauma or Surgery:

Trauma or surgery e.g. kidney transplantation, gastrointestinal bleeding, surgical procedures, abscesses,.... promote wasting through a number of mechanisms:

* Food intake usually falls with these events. [Grodstein et al,1980].