PARENTERAL NUTRITION IN SURGICAL PATIENTS

ESSAY

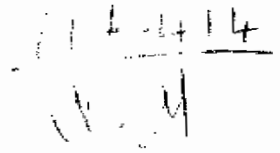
Submitted in Partial Fulfilment for the

Master Degree in General Surgery

BY

NABIL MOUSSA GENDY

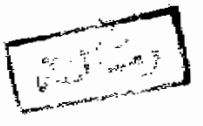
M. B. B. CH.



SUPERVISED BY

Prof. Dr. M.S. ZAKI

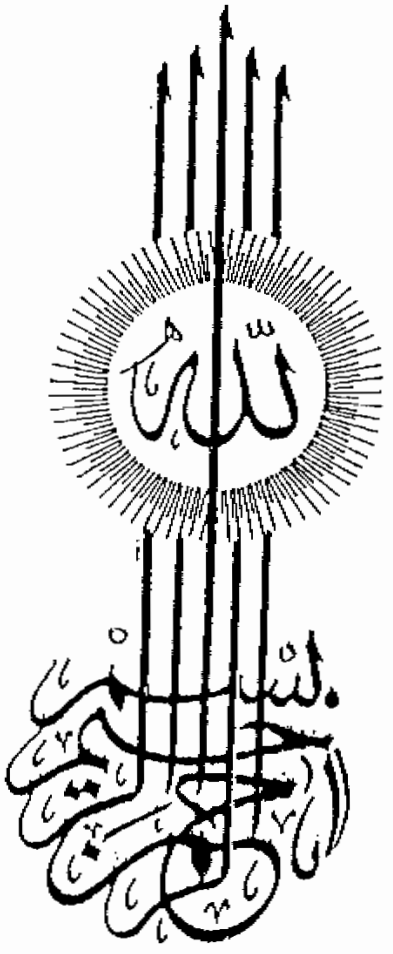
Professor of General Surgery

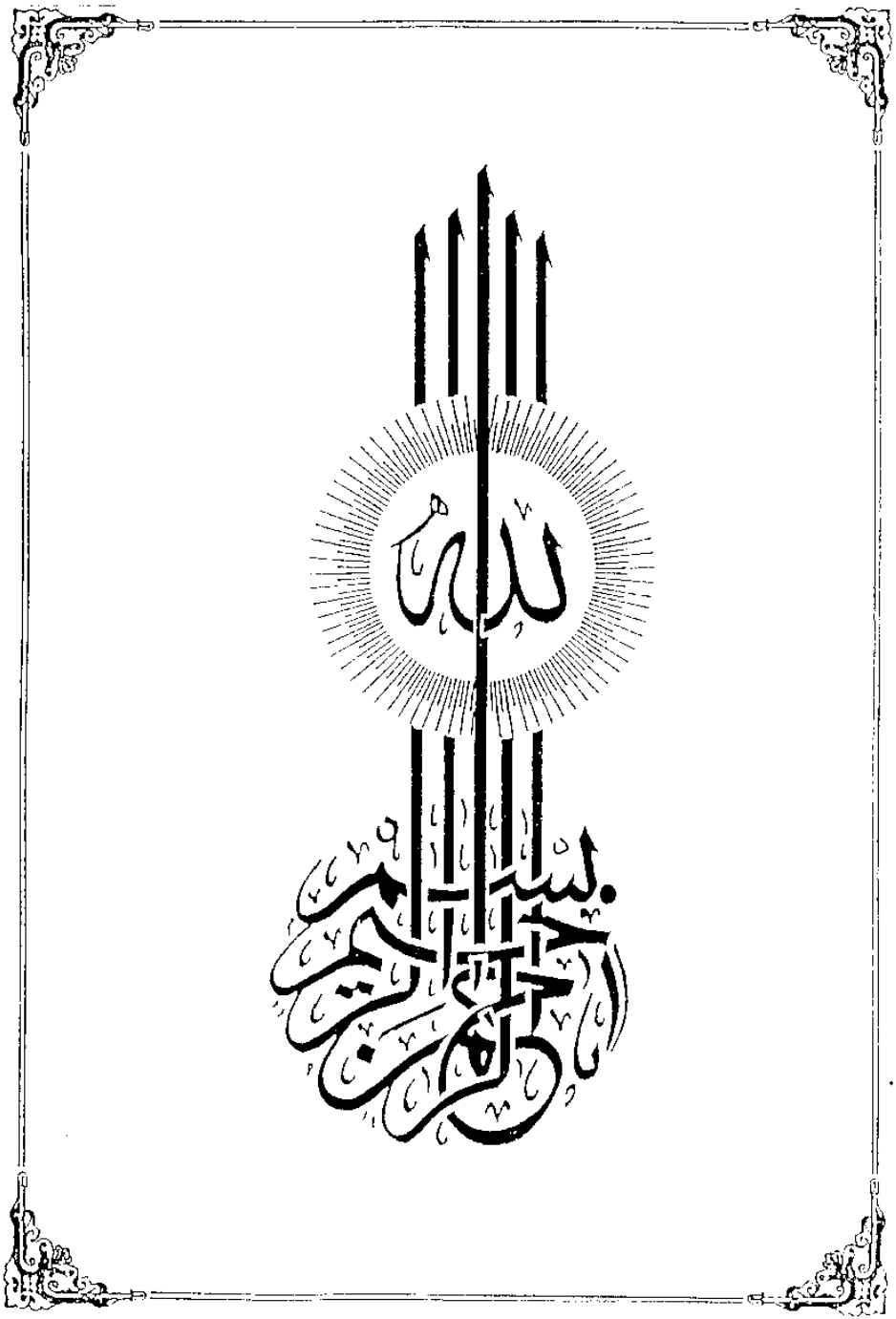


Faculty of Medicine

Ain Shams University

(1985)


الله
بسم الله الرحمن الرحيم



ACKNOWLEDGEMENT

I wish to express my deep gratitude and appreciation to Professor Dr. M.S. ZAKI Prof. of general surgery , AIN SHAMS University for his kind supervision,valuable advice and encouragement through this work it is an honour to work under his supervision and to enjoy his help.

CONTENTS

INTRODUCTION

INTRODUCTION

Parenteral nutrition is defined inclusively as any form of nutrition given by a parenteral or nongastro-intestinal tract route. It is an essential adjunct to modern surgery. The administration of such therapy may be approached on the basis of supplying either partial or total nutritional support. When used in conjunction with nutrients taken by mouth, it is partial; and when all of the nutritional needs of the patient are met via a non oral route, it is total.

Initially it should be pointed out that this therapeutic modality has sometimes been referred to as (Hyperalimentation).

While parenteral nutrition does indicate the giving of nutriment (alimentation), it does not imply a situation which may be described as "hyper", or greater than something, or the use of the alimentary tract. Although other synonyms, such as parenteral alimentation, intravenous alimentation, total parenteral nutrition (TPN) and the like, have also been used variously in the literature, the most acceptable term remains parenteral nutrition.

The successful outcome of all major surgical procedures depends to a considerable extent upon the good nutritional status of the patient and the provision of balanced, nutrients for maintenance following surgery.

A good nutritional status or partial replacement of nutritional deficiencies pre operatively is associated with rapid convalescence and reduced morbidity and mortality rates in the surgical patient.

When feeding via the gastro intestial tract is inadequate, ill advised, impractical, or impossible, it is necessary to provide nutrients parenterally. Although parenteral implies by any other means than the alimentary tract, the only avenue by which total nutrition is currently feasible is the intravenous route.

Intravenous feeding is an old concept, milk was given intravenously to combat the wasting in cholera by Hodder in Toronto in 1973. Henriques and Anderson (1913) carried out the first successful intravenous feeding using goat muscle digested with pancreatic extract and combined with Glucose, Sodium and Potassium. Surgical patients who have suffered starvation and are nutritionally depleted will gain body weight and increase their muscle mass and subcutaneous fat during adequate intravenous feeding provided That they are not acutely stressed or septic (Dudrick, Wilmare and Vars, 1967).

Tissue synthesis during total intravenous nutrition is certainly one of the most significant therapeutic developments of recent years.

Many patients have benefited greatly from careful intravenous feeding while others have developed complications during treatment.

A number of questions, however remain to be answered in connection with parenteral nutrition. What patients are likely to gain most from this form of treatment? When is intravenous feeding both meddlesome and unnecessary ? What are the exact calarie and nutrient requirements in various acute and chronic situations ? What is the most effective technique for long term intravenous feeding ? How can the biochemical complications be detected, managed and even prevented ? There have been a number of advences made in the search for answers to the questions which have been posed and these form the basis of this Essay.

PHYSIOLOGY & METABOLISM

PHYSIOLOGY & METABOLISM

- Surgical Physiology :

The aim of the science of nutrition is the determination of the kinds and amounts of nutritive agents that promote health and well-being. The essential dietary components, includes, in addition to sufficient water, adequate calories, protein, fat, minerals and vitamins.

- The caloric value of the dietary intake must equal the energy expended as heat and work if body weight is to be maintained.

- A daily protein intake of at least 1 g / kg / body weight to supply the 8 essential amino acids and other amino acids is now regarded as desirable.

- Fat is the most compact form of food, since it supplies 9.3 Kcal/g. However, it is also the most expensive .
- Carbohydrate is the cheapest source of calories and provides 50% or more of the calories in most diets.

- Mineral requirements and a variety of different trace elements should be included. Trace elements are defined as elements found in tissues in minute amounts.

- Sodium & Potassium are also essential minerals, but listing them is academic, because it is very difficult to prepare a Sodium free or a Potassium free diet.

- Vitamins were discovered when it was observed that diets adequate in calories, essential amino acids, fats and minerals failed to maintain health.

BODY WATER

(1) Content and Distribution :

Water comprises 60% of the body weight (from 44 to 73% of the weight of adults). Which corresponds to 42 litres in the average adult of 70 Kgm Body weight.

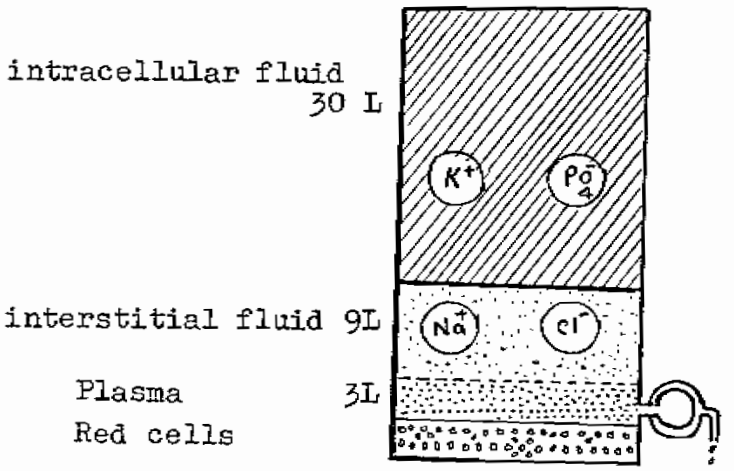
These are contained in 3 compartments :

A. The intravascular fluid or blood plasma 3 litres.
B. The interstitial fluid between the cells 9 litres.
C. The intracellular fluid inside the cells 30 litres.

The semipermeable capillary membrane between the intravascular and the interstitial compartments retains the plasma proteins within the vessels, but allows free exchange of all solutes so that apart from its high protein content, plasma is almost identical with the interstitial fluid and both are known as the "Extracellular fluid" in contrast to the intracellular fluid.

On the other hand, the cell membrane which separates the extracellular from the intracellular fluids, is impermeable to ions, so that the electrolyte patterns of these two fluids are very different where as the chief ions in the extracellular fluid are Sodium, Chloride and

Bicarbonate, the predominant ions in the intracellular fluid are Potassium, Phosphate and proteins. The cell membrane is, however freely permeable to water and non-ionizable substances e.g.urea and glucose, which are freely diffusible throughout the entire Body water



Distribution of Body Water

(2) Water Balance (Water metabolism) :

Under normal conditions, the water content of the body is maintained at a fairly constant level because the normal water intake is balanced by a normal output.

(a) Water Intake : Normally water is derived from 2 sources.

(i) Exogenous Water : Which is either drink on fluid or ingested in solid food. It amounts to about 2.5 litres.

(ii) Endogenous water : Which is produced during the oxidation of foodstuffs. It is about 250 C.C./day which represents the only available water supply when water intake is stopped for any reason.

(b) Water Output : Normally water is lost from the body in 3 ways :

(i) Vaporization from the skin (about 600 c.c.) and lungs (about 400 C.C.)

Since this loss is invisible it is known as the (insensible water loss). It is essential for life as it plays an important role in dissipating the heat produced by metabolism and regulating the temperature of the body.

(ii) Urine formation which is essential for the excretion of the daily waste products (35-40 gm) through normal kidneys can excrete these products in a maximally concentrated form in only 500 C.C. of water, the average urine output is about 1500 C.C.

(iii) Stools: the gastrointestial secretions amount to 8-10 litres/day, but they one almost completely absorbed, leaving about 250 C.C. to be lost in the stools. From this it will be seen that the normal daily requirement of water for an adult is 2000 - 3000 C.C. with 1500 C.C. as the minimum (1000 C.C. for the insensible loss and 500 C.C. for the urine).