EARLY VERSUS LATE PARENTRAL HYPERALIMENTATION IN SEVERELY BURNT PATIENTS

THESIS

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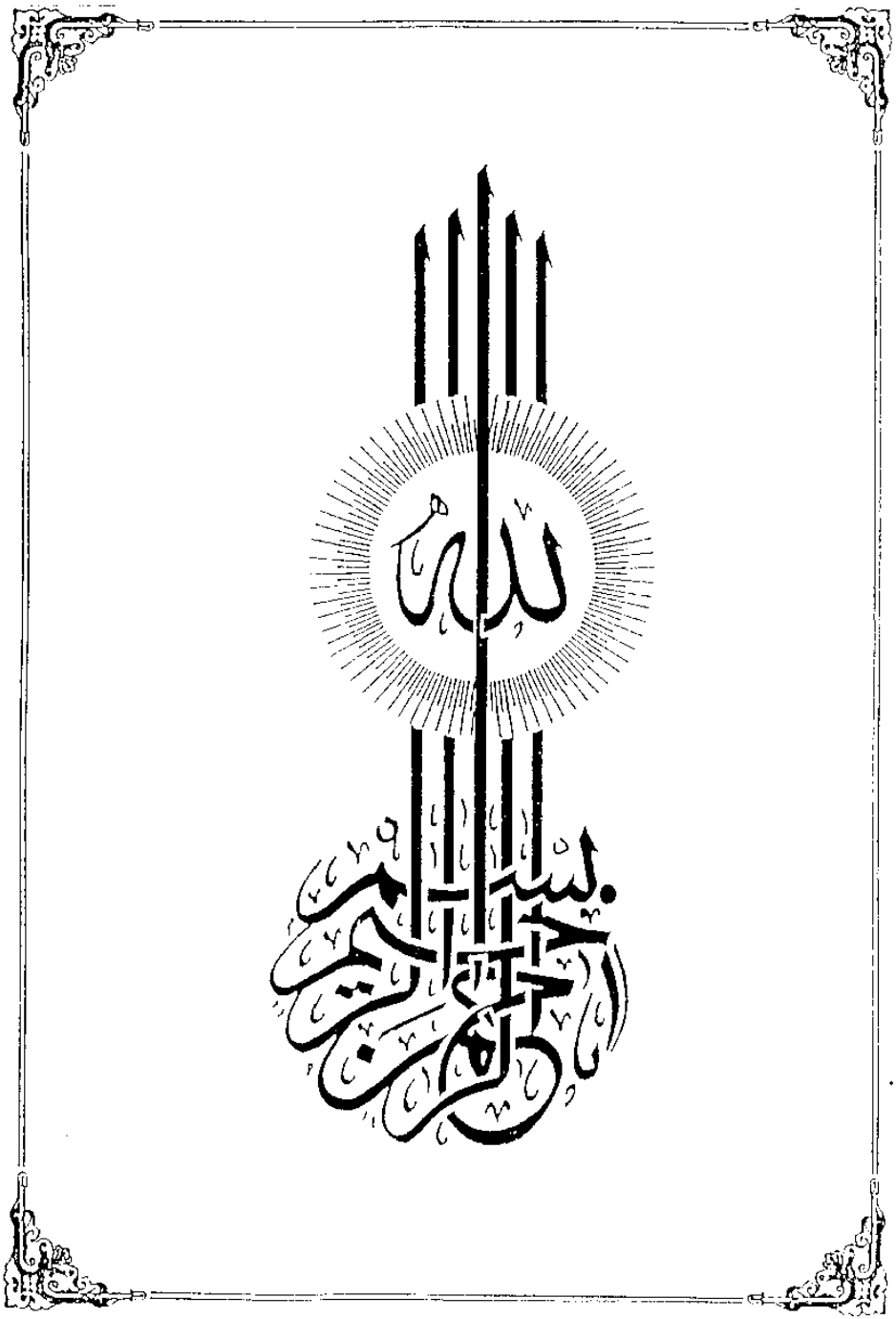

TO MY MOTHER AND FATHER

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REVIEW OF LITERATURE

WHAT IS PARENTRAL HYPERALIMENTATION ?

In recent years there has been a steady upsurge of interest in the role of nutrition in medicine. this role is not only restricted to defficiency diseases but also important in preventive and curative medicine specially in diseases where nutritional disorders are not the primary cause (Hill, 1977).

Muller (1982) added that a good state of nutrition is not only a necessary condition for optimal resistance to infection and trauma but also for optimal efficacy of medical and surgical treatment.

The majority of patients undergoing elective surgical operations withstand the brief period of catabolism and starvation without noticeable difficulty. However maintaining an adequate nutritional regimen may be of critical importance in managing serious ill patients with pre-existing weight loss and depleted energy reserves. Between these two extremes are patients for whom nutritional support is not essential for life but may serve to shorten the post-operative recovery phase and minimize the number of complications. (Sttephen, 1984).

Daily consumption of food and drink or an equivalent daily intake of nutrients in adequate quantities is the best way to maintain or build up an opoimal nutritional

status. it is easy to maintain good nutrition but it is difficult and time consuming to restore adequate nutrition in a malnourished patients.(Bozetti et al 1975).

Illness often entails higher nutritional requirement which are frequently neglected. Starvation in hospital or iatrogenic malnutrition is still a current reality in many coutries. the reasons for this unfortunate state of affairs is that clinical nutrition is a relatively young science and the products required for nutritional therapy have only become available during the last 20 years (Buzby, 1980).

the sequelae of starvation and under nourishment are not as dramatic as, for instance, disorders of the fluid and electrolyte balance. However, once the sequelae of protein and caloric depletion have appeared, it is often difficult to correct the deficiency subsequently (Dale et al 1977).

It should be as just natural to provide nutrients for patients who can not eat as it is to administer fluid to patients who can not drink. it should be considered unethical to deprive patients of adequate nutrition. Failure to supply nourishment must be regarded as a deliberate decision to starve the patients, a decision which, in the vast majority of cases, would be difficult to justify. (Mullen 1980).

Kaminsky (1975), added that in cases where the patients can not, or should not , take food via the gastrointestinal tract it is now possible to supply all the nutritional requirements of the body by complete parentral nutrition. By this way the risk of postoperative complication and infection, for instance, can be reduced. this intravenous feeding should not only be regarded as a substitute for oral nutrition but also as an essential element in the treatment of the disease.

In another word, when nutrition via the gastrointestinal tract is impossible or impaired, nutrients must be infused directly into the blood stream. Thus it is desirable from the medical and economic point of view to start intensive parentral nutrition as early as possible once it is needed.

Therfore, it is essential that the surgeons have a sound grasp of the fundamental metabolic changes associated with surgery, trauma and sepsis and an awareness of the methods available to reverse or ameliorate these events (Kinny J.M., et al 1979).

Dudick et al 1970 have demonstrated the clinical practice of providing complete nutrition needs for an extended period of time using high caloric parentral feedings.

Parentral alimentation involves the continuous infusion of a hyperosmolar solution containing carbohydrates,

proteins, fats, and other necessary nutrients through an indwelling catheter inserted into the superiro vena cava. In order to obtain the maximum benefit, the ratio of claories to nitrogen must be adequate (at least 100 to 150 k cal/g nitrogen) and the two materials must be infused simultaneously.

When the sources of calories and nitrogen are given at different times, there is significant decrease in nitrogen utilization. These nutrients cna be given in quantities considerably greater than the basic caloric and nitrogen requirements, and this method has proved to be highly successful in achieving growth and development, positive nitrogen balance, and weight gain required in a variety of clinical situations.

HISTORY OF PARENTRAL NUTRITION

The history of intravenous nutrition in short is a brief, recent chapter in the long history of intravenous therapy. Shortly after William Harvey's discovery of the blood circulation in 1628, Sir Charistopher Wren gave the first intravenous morphine injection to a dog. The practical application of intravenous nutrition has its roots in the work of Pasteur and Lister, and continues to rely on the modern development of chemistry and biochemistry. In 1913, Henriques and Anderson, realizing the allergic reaction that follows infusion of foreign protein, had hydrolysed casein and used the mixture to intravenously feed a goat., claiming that they had achived nitrogen equilibrium. However Dr Robert Elman, in 1936, reported the ifrst successful administration of protein hydrolysate in humans. (Elman et al 1939).

The first apparently successful case of parenteral nutrition in an infant was reported in 1944 from the Johns Hopkins Univerisity, where Helfrick and Abelson supported an infant with intractable diahrrhea by the intravenous administration of fat (coconut milk) and protein (Helfrick et al 1946).

A landmark in the development of intravenous nutrition was the work of W.C. Rose and his collegues, determinig the requirements of essential amino acids in man. (Rose W.C., et al 1955).

Additional experimental and clinical observations suggested that protein deficiency profoundly affects the outcome of surgery.

The classic works of Cuthbertson 1978., habif and associates, and the many important contributions from Dr. Jonathan Rhoads, stressed the nutritional importance of post-injury catabolism. Efforts to obtain nitrogen equilibrium at this time by intravenous nutrition were occasionly successful because of many limitations. The volume of fluid infused often 7.0 liters per day, could not be managed by the weak diuretics then available.

Large infusion volumes were required by the low caloric density of nutrients: 4 calories per grams of glucose or per gram of protein hydrolysate . Alcohol with caloric density of 7 calories per grams, was not available.

Finally, nutrients had to be infused in tolerable concentration A 5% dextrose solution, approximately isotonic, offers only 150 gm. or 510 calories/3 liters, which was he daily volume infused; a 10% solution of glucose, marginally tolerated by peripheral veins, yeilds

only 340 calories/liter. Clearly, fat emulsions or hypertonic dextrose solutions were necessary.

Emmett and Holt, in the 1930 when Intralipid, a soybean oil emulsion, become available in Europe, began systematic intravenous nutrition of proteins with intravenous fat, small amounts of glucose, and proteins via peripheral veins. (Dudrick, S.J. et al 1966).

In the United States, however, no fat emulsions were available and the use of 10% glucose required the infusion of 5 liters supplying the patients with 2000 calories a day, with an addition of 80 to 100 gm. of protein hydrolysate.

Dudrick in 1966 working in Rhoad's laboratory , realized that to achieve positive nitrogen balance, a calorie to nitrogen ratio of approximately 150 to 250 was necessary.

In order to administer such a concentrated solutions of glucose and amino acids, central venous access was essential.

The ground work for the central venous access was laid by a french surgeon, Aubiniac working in Vietnam , who perfected subclavian venipuncture as a mean of achieving rapid transfusion in battle casualities, Dudrick placed catheters centrally in young bagle puppies and demonstrated that normal growth and development could

be achieved by the use of total parentral nutrition alone. (Dudrick et al 1970).

The first human patient, a baby with almost no gastrointestinal tract, was successfully treated with parentral nutrition in the United States when it was first launched (Dudrick 1969).

After Durick frist publication many advances followed rapidly. Protein hydrolysate solutions were largely replaced by solutions of crystalline amino acids in more nutritionally efficient properties and thus better utilized. Fat emulsions reintroduced in the United States, and the technical aspects of catheter insertion and mintainance were improved.

The differentiation of parentral nutrition had begun, for example, patients with renal diseases and hepatic diseases currently recieve amino acid solutions specially formulated for their diseases states. the pediatric patient has differing nutritional requirements as does in all situations .

The regrowing, profoundly depleted adult patient, patients with burns cardiac failure, massive trauma, injury, and sepsis probably constitute special situations for which special solutions or special regimens should be designed administerated.