Thesis title : Plasma Ketone Body Levels and Protein Status in Surgical Patients

Author : Mariam Puengthomwatanakul

Degree : Master of Science (Nutrition)

Major Advisor : Prof. Dr. Vichai Tanphaichitr

Department : Graduate Program in Nutrition

Faculty : Faculty of Medicine, Ramathibodi Hospital, Mahidol University

Date of Graduation : August 31, 1982

ABSTRACT

The specific aims of the study were to determine the effect of nutritional management on plasma ketone body levels and protein-calorie status in surgical patients. The study was carried out in 2 groups of adult patients : 45 patients with gallstones and 15 patients with carcinoma of larynx. Plasma ketone body levels in 12 normal adults were used as a control.

All of the patients with gallstones underwent cholecystectomy. Before operation (D-1) the patients consumed regular diet. On the date of operation (DO), the patients received intravenous infusion of Lactate-Ringer and 5% dextrose solutions. The mean (±SEM) energy intake on DO was 350±18 kcal. During the first 5 days of postoperative period (D1-D5), each patient received a daily supply of 1200 kcal derived from 10% dextrose. Starting from D6, they

received oral feeding. After 5 days of partial parenteral nutrition, the patients developed inadequate protein-calorie status evidenced by significant decrease in body weight, triceps skinfold thickness, mid upper arm circumference as well as significant decrease in serum albumin level. Their total lymphocyte count also decreased postoperatively but it did not reach statistical significance. Serum albumin level and total lymphocyte count were significantly increased after reoral feeding for 5 days (D6-D10). Their blood glucose level at D2 was significantly higher than D-1 whereas the opposite results were observed for plasma ketone body levels. This was due to the increase in insulin secretion stimulated by glucose administration. This inturn prevented lipolysis of adipose tissue partially. The partial inhibition of adipose tissue lipolysis by infusion of 10% dextrose was evidenced by the findings that (a) there was no significant difference in plasma ketone body levels between D6 and D-1; the determination of plasma ketone body levels at D6 was done at 1 to 1.5 hours after cessation of infusion. (b) blood glucose level at D6 was significantly lower than that at D2, and (c) triceps skinfold thickness at D6 was significantly lower than that at D-1. Their inadequate energy intake (<1500 kcal/d) during D6-D10 could lead to increase adipose tissue lipolysis. This was evidenced by (a) the significantly higher plasma ketone body levels at D11 than those at D-1, D2 and D6 and (b) significant negative correlations between plasma ketone body and blood glucose levels at D11. Since there was no significant change in upper arm

muscle circumference during receiving partial parenteral nutrition and oral feeding these indicated the sparing of somatic protein status by the exogenous energy intake and endogenous energy supplied by adipose tissue lipolysis.

All of the patients with carcinoma of larynx underwent laryngectomy. Before operation (D-1) the patients consumed regular diet. On the date of operation (DO), the patients received intravenous infusion of Lactate-Ringer and 5% dextrose solutions. The mean (±SEM) energy intake on DO was 477 34 kcal. During the first 5 days of postoperative period (D1-D5), they received a daily supply of 30.4 g of amino acids and 600 kcal derived from 10% maltose. During D6-D12 they received Pregestimil through nasogastric tube feeding. The energy supply at D6, D7 and D8-D12 was 1084, 1626 and 2168 kcal, respectively. After 5 days of partial parenteral nutrition, the patients developed inadequate protein-calorie status evidenced by significant decrease in body weight, triceps skinfold thickness as well as significant decrease in serum albumin and total protein levels. Besides, there were significant decrease in hemoglobin and hematocrit levels. Serum albumin and total protein levels were significantly increased after tube feeding for 7 days. The significantly higher plasma D-(-)-3-hydroxybutyrate and total ketone body levels in patients at D-1 than normal adults could be due to their inadequate energy intake. The significant increase in blood glucose levels during maltose infusion indicated the biotransformation of maltose to glucose. Insulin was secreted to

a certain extent during maltose infusion. This was evidenced by the findings that within 1-1.5 hours after cessation of infusion at D6, there was significant increase in plasma ketone body levels. This indicated that glucose was more potent to stimulate insulin secretion than maltose. The influence of insulin secretion on adipose tissue lipolysis in the patients was supported by (a) significant negative correlations between plasma ketone body and blood glucose levels at D3 and D6 and (b) significant decrease in triceps skinfold thickness at D6. During period of tube feeding, patients had significantly higher plasma D-(-)-3-hydroxybutyrate and total ketone body levels than in normal adults. This indicated the inadequate energy intake. Since there was no significant change in upper arm muscle circumference during receiving partial parenteral nutrition and tube feeding these indicated the sparing of somatic protein status by the exogenous energy intake and endogenous energy supplied by adipose tissue lipolysis.

The study presented here shows that there should be a refinement of parenteral nutrition formula to improve the protein-calorie status in patients with gallstones as well as in patients with carcinoma of larynx. Besides, plasma ketone body levels can be used as an index of adipose tissue lipolysis and inadequate energy intake.

BIOGRAPHY

Name : MARIAM PUENGTHOMWATANAKUL

Date of Birth : September 17, 1958

Place of Birth : Bangkok, Thailand

Institutions Attended :

Satree Srisuriyothai School, Bangkok

March, 1976.....Certificate of Mathayomsuksa V

Mahidol University, Bangkok

Faculty of Nursing

March, 1980.....B.Sc. in Nursing (Hons.)