Mechanisms of nutritional repletion during total parenteral nutrition

E PULICINO AND M ELIA

Total parenteral nutrition (TPN) is a valuable form of treatment for patients with severe diffuse Crohn’s disease, or those with intestinal fistulae. In many cases TPN is used for nutrition rehabilitation as well as nutritional support. The mechanisms of intermediary metabolism during rehabilitation including the changes in fuel selection, energy expenditure, and mechanisms of nutrient deposition are poorly understood. Therefore the following study was undertaken to improve knowledge in this respect.

Case history

SS, a 28 year old man with Crohn’s disease of the small and large intestine presented in 1980 to his local hospital with diarrhoea, cramping abdominal pain, and weight loss. He was treated with salazopyrine and prednisolone until 1983 when he developed intestinal obstruction and came to laparotomy. Approximately 100 cm of mid small intestine were resected. This relieved the obstruction but the abdominal symptoms recurred. In 1986 the patient was referred to the Gastroenterology Department, Addenbrooke’s Hospital for advice. Initially he did well on treatment with an elemental diet but 18 months later he was readmitted to Addenbrooke’s with increasing abdominal pain, weight loss, and diarrhoea. He had a course of intravenous antibiotics during the week before his transfer from another hospital.

Examination

The patient was thin and weak (weight 52 kg, height 191 cm) with little subcutaneous fat and reduced muscle bulk. There were no external stigmata of Crohn’s disease, and systemic examination was normal apart from the abdomen where there was ill defined mass rising out of the pelvis. Investigations showed: Hb 12.6 g/100 ml, platelets 346 x 10^9/l, white cell count 14.5 x 10^9/l, albumin 25 g/l; ultra-sound of abdomen: multiple loops of matted bowel; barium follow through examination: at least five strictures in the small intestine and probable ileocolic fistula which was confirmed on enema examination.

Management

The patient was 35% below his ideal body weight and unable to eat a normal diet because of anorexia and abdominal pain. He was started on total parenteral nutrition (TPN) and he agreed to a detailed study of his nutritional progress. The TPN was given at night from 6 pm to 9 pm to give him maximum freedom during the day. The initial intravenous solution contained 300 g of Dextrose (4.7 MJ), 12.8 g nitrogen (1.4 MJ), and 500 ml of 20% Intralipid (4.2 MJ). Ninety five per cent of the total energy content of the feeding bag (10.3 MJ) was infused to give the patient 9.8 MJ/day. This was well tolerated and the carbohydrate intake was increased progressively to 1000 g giving a final energy intake of 20 MJ/day. Progress was monitored by repeated measurements of body weight, skinfold thicknesses (measured at 4 standard sites), and bioelectrical impedance which provides a measure of lean body mass. Energy expenditure was assessed on 48 occasions using an automated indirect calorimeter attached to a ventilated hood. Measurements were made both during the ‘on feed’ and ‘off feed’ periods. Twenty four hour losses of nitrogen in urine and faeces were measured after each increment of energy intake.

Standard haematological and biochemical tests for a patient on TPN were carried out. The white cell count and the circulating acute phase protein concentrations (C-reactive protein and α1-antichymotrypsin) which were initially raised, returned to normal within a few days of commencing TPN.

Progress

This patient’s general condition improved markedly during the period of TPN. The inflammatory mass subsided and he was discharged home to continue intravenous feeding.

Results

During the seven week period of nutritional repletion, body weight increased linearly with time from 53 to 72 kg. Estimates of skinfold thickness showed an increase in body fat from less than 5% body weight to approximately 15% body weight. Lean body mass, assessed by anthropometry also increased progressively from about 50 to 61 kg. Sequential measurements of bioelectrical impedance confirmed...
During the course of the study repeated measurements of respiratory quotient provide another observation of interest. As expected the respiratory quotient was high during the infusions of high caloric feeds, but remained persistently above 1·0 up to nine hours postfeed. This suggests continued lipogenesis from carbohydrate, with glycogen as the unusual substrate, during the post-feeding period.

These data provide information regarding nutritional repletion in a patient who showed no evidence of active inflammatory disease after the first week of intravenous feeding.

We wish to thank Dr J O Hunter for allowing us to study his patient.

**MRC Dunn Clinical Nutritional Centre, 100 Tennis Court Road, Cambridge CB2 1QL**

**References**


Mechanisms of nutritional repletion during total parenteral nutrition.

E Pullicino and M Elia

*Gut* 1989 30: 69-70
doi: 10.1136/gut.30.Spec_No.69

Updated information and services can be found at:
http://gut.bmj.com/content/30/Spec_No/69.citation

These include:

Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/