

Original Article

Bedside monitoring of nutritional metabolism in the persistent vegetative state

Kazuhiko Kudoh¹ MD, PhD, Hideo Yamada² MD, Shigeru Ishikawa² MD and Yumi Nishimura² RN

¹Kagawa Nutrition University, Department of Clinical Physiology, Kagawa Nutrition University

²Orimoto Hospital of Tokyo, Department of Internal Medicine, Saitama, Japan

The basal metabolism and daily energy consumption of eight cases of the persistent vegetative state were low. Some received excessive energy and inappropriate essential nutrient infusions.

Key words: energy measurement, enteral nutrition, persistent vegetative state.

Introduction

In order to understand and evaluate the nutritional metabolism of patients in a persistent vegetative state (PVS), eight such patients given enteral nutrition (ETN) were studied with the approval of the Kagawa Nutrition University ethics committee. The relationship between energy intake and consumption was assessed.

Patients and methods

The patients were five men and three women (20–64 years of age with an average age of 43 years) who had been in this condition for between 1 and 7 years. All patients had a tracheotomy and received ETN by gastrostomy. None had diabetes mellitus or other diseases of a primary nutritional or metabolic type. The weight range for this study group was between 40.1 and 60.2 kg with an average of 46.4 kg. The BMI (Body Mass Index) range for this study group was between 14.7 and 23.1 with an average of 18.2.

Weight changes during the month prior to the study month ranged between +800 and –800 g (increase and decrease). The total volume of enteral nutrition intake on a day to each patient during the period of this study was fixed between 4200 and 5400 kJ and the total volume of water except for enteral nutrition was fixed between 1000 and 1400 mL.

The indirect measurement of energy consumption was performed by oxygen consumption calculated from a knowledge of inhaled O₂ and the measurement of exhaled O₂ using a magnetic expiration gas analysis device (WESTRON 2000, WESTRON; Chiba, Japan). Carbohydrate and lipid utilization were determined from the respiration quotient (RQ). Protein metabolism was determined by the measurement of urinary urea nitrogen collected over a 24-h period, as an index of nitrogen excretion and turnover. All measurements were carried out when patients were not engaged in any physical activity such as being bathed or undergoing physiotherapy. Enteral nutrition was given three times per day at 07.00, 12.00 and 17.00 hours. Total daily energy intake for each patient was between 4200 and 5400 kJ and was guided by reference to the Japanese values for energy requirements

in the *Recommended Dietary Allowance for the Japanese* (fifth edition), supervised by the Japanese Ministry of Health and Welfare.¹

Results

Basal metabolism for the eight cases ranged between 85 and 125 kJ per hour with an average of 49.5% of that for a low activity healthy Japanese of the same age and gender. Energy consumption over a 24-h period was between 2000 and 2879 kJ and averaged 2468 kJ. Average energy consumption per 1 kg of body weight was 52.3 kJ per day. Total energy expenditure per day was low at 54–78% with an average of 61.2% of ETN given. Calculated carbohydrate energy consumption was lower than that administered (average 60.1% of given enteral nutrition) and lipid energy consumption was variable. Protein energy consumption varied between 6.0 and 13% (average 8.9%) of that administered.

Discussion

All patients in this study were in a persistent vegetative state and were under palliative care. The major ethical consideration in the palliative care stage of long-term enteral nutrition in the vegetative state is to respect a patient's prior decision if recorded, and to liaise with the legal guardian, balancing the benefits and burdens of particular treatment options and reviewing resources available.²

Methods used in this study to assess energy balance and protein status did not include direct measures of lean mass and fat mass, but BMI was used as an indicator of these tissue states. We considered energy consumption could be more accurately measured using the RQ than by using the analysis of enteral nutrition as the latter is not as accurate or precise a measuring gauge as the former.

Correspondence address: Dr Kazuhiko Kudoh, Department of Clinical Physiology, Kagawa Nutrition University, 3-9-21, Chiyoda, Sakado, Saitama 350–088, Japan.
Tel: 81 492 823 702; Fax: 81 492 823 702
Email: kudo@sak.eiyo.ac.jp
Accepted 20 December 1999

Conclusion

Basal metabolism and daily energy consumption were low, some patients having been supplied with excessive energy. Some of the patients who had excessive energy had a slightly increased body mass index. For this study, we considered energy utilization could be more accurately measured using the RQ than by using the analysis of enteral nutrition given that the latter is not as accurate or precise as the former. The differences in intestinal absorption rate encourage this decision.

Bedside measurement of nutritional metabolism in the PVS is useful in the formulation of relevant daily energy intake and its nutritional components.

References

1. Health Promotion and Nutrition Division, Health Service Bureau, Ministry of Health and Welfare. Recommended Dietary Allowance for the Japanese, 5th edn. Tokyo: DAI-ICH SHUPPAN, 1998
2. Dietitians Association of Australia. Dietitians Association of Australia background paper. Nutrition priorities in palliative care of oncology patients. *Aust J Nutr Diet* 1994; 51: 88–93.