Letter To The Editor

Evaluation of Glucose and Energy Expenditure in the Acute Care of Severe Head Injury Patients: Indirect Calorimeter versus Harris Benedict Formula

Saiful Razman Mohd Noor

Submitted: 6 Dec 2011
Accepted: 11 Dec 2011

Department of Neurosciences, School of Medical Sciences, Universiti Sains Malaysia Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia

Dear Editor,

I read with interest the paper by Rahmat Harun @ Haron titled "An Observational Study of Blood Glucose Levels during Admission and 24 Hours Post-Operation in a Sample of Patients with Traumatic Injury in a Hospital in Kuala Lumpur" published in the *Malaysian Journal of Medical Sciences*, Volume 18, Issue 4, 2011. The study reported associations between mild, moderate, and severe traumatic brain injuries and increased blood glucose levels during admission, and that the increases were based on the severity of the injuries. The blood glucose levels were not significantly changed after surgical intervention. I would like to highlight the value of glucose level and calorimetric measurements in monitoring traumatic head injury.

We recently did a prospective observational study in which severe head injury patients admitted to the Neuro Intensive Care Unit, Hospital Universiti Sains Malaysia, were selected for the measurement of energy expenditure by indirect calorimetry in an acute setting. A total of 31 severe head injury patients in Kelantan, Malaysia, who fulfilled the inclusion criteria were selected for this study from January 2009 to March 2010. The indirect calorimeter (Deltatrac II, Datex Division Instrumentarium Corp., Helsinki, FI) was connected to each patient's ventilator and the patient's energy expenditure was measured for 24 hours (2). The value of the measured energy expenditure (MEE) was compared with the value predicted from the Harris Benedict equation (3).

The patients were categorised into 4 groups according to the severity of the injury, as determined by Marshall's computed tomography grading (grades 1–4). The MEE of the patients in each groups were analysed and compared to see whether there were differences among them (4). In addition, the MEE of operated (major or minor surgery) and non-operated (conservative) patients were documented and analysed using specific statistical tests.

The means (SDs) MEE in the Marshall's grades 1, 2, 3, and 4 groups were 1440 (42), 1484 (349), 1358 (308), and 1595 (277) kcal/day, respectively. By using the Kruskal–Wallis test, there was no significant difference in the MEE among the severity groups in the acute setting ($P = 0.343$). The mean (SD) energy expenditure in the major operation group was 1535 (265) kcal/day, whereas the values in the minor operation and the conservative groups were 1113 (365) and 1565 (305) kcal/day, respectively. By using the one-way analysis of variance test, there was no significant difference in the MEE among the treatment groups in the acute setting ($P = 0.055$).

In this study, the lowest blood glucose level was 3.6 mmol/L and the highest was 9.2 mmol/L. The mean (SD) blood glucose level was 6.4 (1.4) mmol/L. Pearson correlation showed no association between blood glucose level and MEE ($r = 0.013$, $P = 0.943$). The Kruskal–Wallis and the one-way analysis of variance tests showed no significant difference in blood glucose level among the severity groups ($P = 0.432$) and among the treatment groups ($P = 0.830$).

In the absence of fever and sepsis, the MEEs in severe head injury patients who were fully sedated and immobilised were brought down to the basal levels equivalent to the basal energy expenditures calculated using the Harris Benedict equation (6,7). With respect to our specific objectives, we found no significant difference in the MEE among patients with Marshall's grading of 1, 2, 3, or 4. Similarly, there was no significant difference in the MEE among patients who underwent major operation, minor operation, or conservative treatment. Through this findings, we understood that the patients with severe head injury (Glasgow Coma Scale ≤ 8) were already in a homogenous group in whom the metabolic rate has reached its plateau, despite being subdivided into groups based

on severity of injury as demonstrated by brain computed tomography (Marshall's grading). As for the blood glucose level, there was no significant association between the blood glucose level within 24 hours post-injury and the MEE, and there was also no significant difference in the blood glucose level among the Marshall's grading groups and among the operative/conservative groups.

Correspondence

Dr Saiful Razman Mohd Noor
MBBS, MS Neurosurgery (USM)
Department of Neurosciences
School of Medical Sciences
Universiti Sains Malaysia Health Campus
16150 Kubang Kerian
Kelantan, Malaysia
Tel:+609-767 6300
Fax:+609-767 3833
Email: malimjaya_8@yahoo.com

References

1. Haron RH, Kamarul Imran M, Mohammed Haspani MS. An observational study of blood glucose levels during admission and 24 hours post-operation in a sample of patients with traumatic injury in a hospital in Kuala Lumpur. *Malays J Med Sci.* 2011;**18(4)**: 69–77.
2. Haugen HA, Chan LN, Li F. Indirect calorimetry: A practical guide for clinicians. *Nutr Clic Pract*. 2007;**22(4)**:377–388.
3. Mann S, Westenskow DR, Houtchens BA. Measured and predicted caloric expenditure in the acutely ill. *Crit Care Med*. 1985;**13(3)**:173–177.
4. Marshall LF, Marshall SB, Klauber MR, Van Berkum Clark M, Eisenberg HM, Jane JA, et al. A new classification of head injury based on computerised tomography. *J Neurosurgery*. 1991;**75(Suppl)**: S14–S20.
5. Liggett SB, Renfro AD. Energy expenditures of mechanically ventilated nonsurgical patients. *Chest*. 1990;**98(3)**:682–686.
6. Bruder N, Raynal M, Pellissier D, Courtinat C, Francois G. Influence of body temperature, with or without sedation, on energy expenditure in severe head-injured patients. *Crit Care Med*. 1998;**26(3)**: 568–572.
7. McCall M, Jeejeebhoy K, Pencharz P, Moulton R. Effect of neuromuscular blockade on energy expenditure inpatients with severe head injury. *JPEN J Parenter Enteral Nutr*. 2003;**27(1)**:27–35.