Evaluation of a Continuous Blood Glucose Monitoring System Using Central Venous Microdialysis

Fanny Schierenbeck, M.D., Anders Franco-Cereceda, M.D., Ph.D., and Jan Liska, M.D., Ph.D.

Abstract

Background:
Glycemic control in critically ill patients has been shown to be beneficial. In this prospective study, we evaluated the accuracy and technical feasibility of a continuous glucose monitoring system using intravascular microdialysis.

Method:
Fifty patients undergoing cardiac surgery were monitored using a 4 Fr intravenous microdialysis catheter (Eirus SLC™, Dipylon Medical AB, Solna, Sweden) percutaneously placed with the tip of the catheter positioned in the superior vena cava. The catheter was connected to the Eirus™ monitoring system, and the patients were monitored for up to 48 h postoperatively in the intensive care unit (ICU). As reference, arterial blood samples were taken every hour and analyzed in a blood gas analyzer.

Results:
Data were available from 48 patients. A total of 994 paired (arterial blood gas microdialysis) samples were obtained. Glucose correlation coefficient ($R^2$) was 0.85. Using Clarke error grid analysis, 100% of the paired samples were in region AB, and 99% were in region A. Mean glucose level was 8.3 mmol/liter (149 mg/dl), mean relative difference was 0.2%, and mean absolute relative difference was 5%. A total of 99.2% of the paired samples were correct according to International Organization for Standardization (ISO) criteria. Bland–Altman analysis showed that bias ± limits of agreement were 0.02 ± 1.1 mmol/liter (0.36 ± 20 mg/dl).

Conclusions:
Central venous microdialysis using the Eirus monitoring system is a highly accurate and reliable method for continuous blood glucose monitoring up to 48 h in ICU patients undergoing cardiac surgery. The system may thus be useful in critically ill ICU patients.

J Diabetes Sci Technol 2012;6(5):1365-1371

Author Affiliation: Department of Molecular Medicine and Surgery, Karolinska Institutet, Section of Cardiothoracic Surgery and Anaesthesiology, Karolinska University Hospital, Stockholm, Sweden


Keywords: critically ill patients, glucose monitoring, glycemic control, microdialysis

Corresponding Author: Fanny Schierenbeck, M.D., Department of Molecular Medicine and Surgery, Karolinska Institutet, Section of Cardiothoracic Surgery and Anaesthesiology, Karolinska University Hospital, S-171 76 Stockholm, Sweden; email address fanny.schierenbeck@ki.se