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Blood and tissue glucose level in critically ill patients: a comparison of different methods of measuring interstitial glucose levels

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Sir: Tight glycemic control in critically ill patients may significantly decrease their mortality and morbidity. Mini-invasive techniques for continuous glucose monitoring [the Guardian Real Time (RT) continuous glucose monitoring system and the microdialysis technique] are promising methods for glucose management but clinical trials evaluating the correlation with plasma glucose levels in critically ill patients are missing.

To investigate whether the glucose values obtained by the Guardian RT system and microdialysis could be used instead of blood glucose sampling in mechanically ventilated, critically ill patients we performed a prospective study in which we enrolled 15 patients aged 18 and over, admitted to a multidisciplinary ICU and the preliminary results we presented at the 28th International Symposium on Intensive Care and Emergency Medicine and Euroanasthesia 2008 Congress [1, 2].

A microdialysis catheter (CMA 60, 0.5 × 30 mm membrane, 20 kDa cut-off, CMA Microdialysis, Solna, Sweden), inserted into the subcutaneous adipose tissue in the abdominal area was constantly perfused with normal saline at a flow rate of 0.3 μL/min. The dialysate was collected in hourly fractions. A sensor of the Guardian RT system, Medtronic, Inc. (NYSE: MDT), was inserted simultaneously subcutaneously in the abdominal area opposite to the microdialysis catheter. Arterial blood samples were collected from the arterial catheter in hourly fractions (at the time of microvial replacement), analyzed for plasma glucose in the Central Laboratory and paired with the microdialysis and Guardian RT values recorded at the time of microvial replacement. Experiment ran for 24 h. Two hundred and thirty-six arterial blood samples, microdialysate and Guardian glucose readings were analyzed. The data were described as the median ± IQR (interquartile range) and the Pearson coefficient of correlation and the Bland Altman plot were calculated. The P values <0.05 were considered as statistically significant.

The median arterial plasma glucose level was 6.2 (5.1; 7.8) mmol/L. The median Guardian RT glucose level was 5.75 (4.5; 7.2) mmol/L and the median microdialysis glucose level was 3.8 (2.5; 5.2) mmol/L. The correlation coefficient between arterial plasma glucose and the microdialysis interstitial glucose level was $r = 0.7044$. The correlation coefficient between arterial plasma glucose and Guardian RT readings was $r = 0.6938$. This was confirmed by the Bland Altman plot with broad limits of agreement.

According to the observed, clinically unacceptable broad limits of agreement, microdialysis and the Guardian RT system could not be considered equivalent to blood glucose measurement and our findings do not support their use for the tight glycemic control management in mechanically ventilated, critically ill patients.

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