Assessment of Diagnosis for Diabetic Ketoacidosis
Using StatStrip Blood 3-Hydroxybutyrate Meter.

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Objectives: Current diagnostic criteria for the diabetic ketoacidosis (DKA) include pH and bicarbonate (HCO₃⁻) ion. However, these parameters are relatively nonspecific. For better specificity of the criteria, laboratory based quantitative measurement of 3-Hydroxybutyrate (3HB) were reported to be used for the diagnosis of the DKA. This study was undertaken to determine whether quantitative measurement of a bedside blood 3HB using POC blood ketone monitoring system (BKMS) could be used to diagnose DKA in Japanese population.

Materials and Methods: Leftover specimens from blood gas analysis were used from emergency adult patients who were clinically suspicious acidosis in Tsukuba Medical Center (n=41). Blood 3HB was measured using StatStrip Ketone (Nova Biomedical, MA, USA). Plasma glucose was used by Hexokinase (HK) method (Kainos, Tokyo, Japan). Blood bicarbonate (HCO₃⁻) ion and pH were measured by RAPID Point 500 Blood Gas Systems (Siemens, Munich, Germany). The 3HB values were compared with HCO₃⁻ using regression analysis, to determine the HB value that corresponded with a serum HCO₃⁻ level of 18, 15, 10 mmol/L for the definition of DKA. Moreover, Area under the curve (AUC) for 3HB and HCO₃⁻ ion, pH were calculated using ROC analysis in these specimens.

Results: Regression analysis between blood 3HB and HCO₃⁻ ion were demonstrated a correlation(\(y = 0.091x^2 - 2.728x + 23.76, r^2= 0.779\)). HCO₃⁻ level of 18, 15, 10 mmol/L corresponded with 3HB levels of 2.1 and 3.4, 6.0 mmol/L. Moreover, AUC of 3HB and HCO₃⁻, pH were 0.974 and 0.904, 0.776, respectively.

Conclusions: The 3HB value for diagnosis of DKA was 2.1 mmol/L in Japanese population, and lower than previously reported (3.8 mmol/L). These results might be cause by the ethnic difference. AUC suggested that 3HB is more specific biomarker than HCO₃⁻ ion for DKA. Further study with more patients is required.