K35 Interpretation of Glucose and Lactate Levels in Postmortem Vitreous Fluid

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After attending this presentation, attendees will attain a more in-depth understanding of the interpretation of postmortem levels of glucose, lactate, and electrolytes.

This presentation will impact the forensic community and/or humanity by making the forensic scientist understand the advantages and the shortcomings with vitreous fluid analysis, and how hyperglycemia may be diagnosed postmortem.

Background: In order to identify an antemortem hyperglycemia in postmortem cases, it has been suggested that d-glucose levels could be used. Since one glucose molecule during anaerobic conditions is converted to two lactate molecules several investigators have proposed that the sum of the glucose and the double of lactate levels be used in postmortem cases. The authors decided to study the vitreous concentrations of glucose, lactate and potassium in a large number of cases to evaluate the use of this data in medicolegal investigations.

Material and methods: 0.15 mL vitreous fluid was gently aspirated from the center of the eye (Cloquets canal) from 374 consecutive cases as soon as possible after arrival of the body to the morgue. The fluid from both eyes was pooled. Glucose, lactate and electrolytes were analyzed with ionspecific electrodes, using a Radiometer AVL500 blood gas instrument. A separate study was conducted on whole-vitreous samples; the samples were vortex-mixed, and half of the fluid was then transferred to a separate tube containing NaF at a concentration of approx 1%. Both samples were centrifuged and analysis was carried out on the supernatant and the pellet. In addition, separate samples were treated similarly, but were also subjected to sonication before centrifugation.

Results: Mean postmortem glucose levels in the consecutive cases was 0.99 mmol/L, but the median was as low as 0.1 mmol/L. Lactate levels increased linearly with time after death, as assessed by the vitreous potassium concentration, except for a minor proportion of cases that still showed low lactate levels even after long postmortem intervals. There was no obvious drop in glucose levels with increasing potassium levels, suggesting that glucose stays stable after the initial phase. In three cases, very high glucose levels were found (57, 46, and 23 mmol/L), and the cause of death was certified as hyperglycemia. In additional cases hyperglycemia might have contributed to death. Regarding "whole-vitreous" samples, the addition or omission of NaF did not affect the concentrations of glucose, lactate, or potassium. Further, analysis of the supernatant and the pellet after centrifugation yielded the same results. Sonication of the samples before centrifugation did not affect the results either. Re-analysis of several samples after long periods of storage showed similar results as the primary analysis.

Conclusion: Vitreous fluid is a robust matrix, and suitable for postmortem chemistry. As to the analysis of electrolytes, glucose and lactate, it is not necessary to centrifuge the samples, or to add fluoride, to avoid further changes. To estimate the antemortemantemortem blood glucose levels, d-glucose alone should be used. Lactate is of no value for the diagnosis of hyperglycemia.

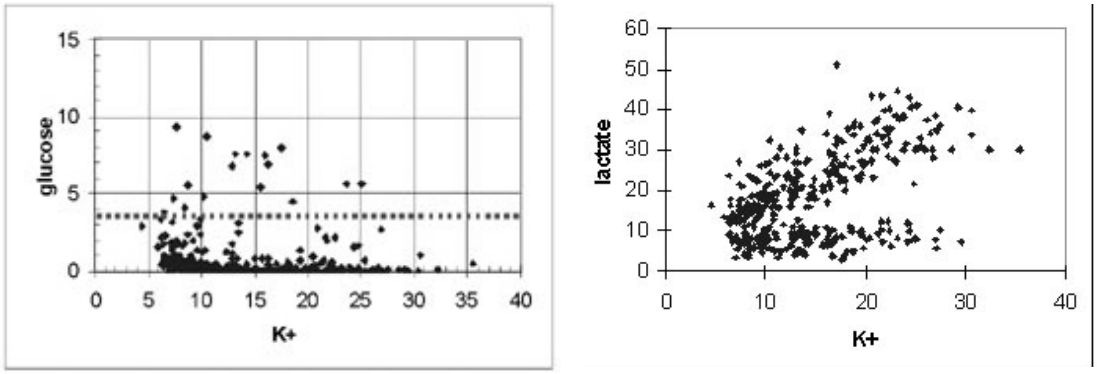

Fig 1. (left) Elevated glucose levels may be found even at long postmortem intervals (highest values not shown). (right) Lactate values do not assist in the diagnosis of hyperglycemia.

Postmortem Chemistry, Glucose, Fatal

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