

Pseudohyperphosphatemia resulting from hyperlipoproteinemia

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We report two patients whose serum samples presented severe hyperphosphatemia due to their high blood lipid levels. The patients had no clinical complaints owing to hyperphosphatemia, and there was no other reason to explain these patients' hyperphosphatemic laboratory results. As a result of further sophisticated investigation, we revealed that their hyperphosphatemia was due to hyperlipoproteinemia and the method which was used to measure lipid profile. Therefore if a clinician encounters such a condition, he/she should consider hyperlipoproteinemia is a factor which may cause a misleading blood phosphorus level.

KEY WORDS Pseudohyperphosphatemia, hyperlipidemia

Introduction

Hyperlipidemia can cause a variety of errors in the biochemical analysis of serum. "Pseudohyponatremia" of serum from lipemic patients is the classic example, and as recently emphasised; this type of effect is entirely dependent on the measurement technique (1,2). We have disclosed that excess lipids can lead to technique-dependent error in measuring serum phosphorus level, producing hyperphosphatemia. We present two cases whose biochemical analyses showed severe hyperphosphatemia due to technique-dependent error.

Cases

Markedly elevated serum inorganic phosphorus levels in the blood chemistry of two female patients who were 40 (case 1), and 46 (case 2) years of age were determined while checking the high blood lipid levels in an outpatient examination. The initial analysis of the blood chemistry of case 1 disclosed that total cholesterol was 406 mg/dl (normal range; 125-200 mg/dl), triglyceride level was 1574 mg/dl (normal range; 35-165), and serum inorganic phosphorus levels were 21 and

22 mg/dl (normal range; 2.5-4.5). And the results of the blood chemistry of case 2 showed that total cholesterol was 375 mg/dl, triglyceride was 1500 mg/dl, and serum inorganic phosphorus levels were 16 and 18 mg/dl (twice controlled). Serum calcium, blood urea nitrogen, creatinin, parathormone, and growth hormone levels of both patients were normal. The patients' had no history of administration of any medication such as anabolic steroids, vitamin D or its analogue, or drugs containing phosphorus, which can lead to hyperphosphatemia. After performing ultrasaturation on the patients' lipemic serum samples, the serum inorganic phosphorus level of case 1 decreased to 2.8 mg/dl, and the phosphorus level of case 2 decreased to 4.0 mg/dl (reversed to the normal ranges).

Laboratory Studies

Serum triglyceride and cholesterol levels were analyzed by the methods of enzymatic-colorimetric technique (GPO-PAP, Randox; CHOD-PAP, Boehringer; for triglyceride and cholesterol, respectively). Serum inorganic phosphorus levels were measured by photometric UV test (66042-Olympus). Inorganic phosphorus levels were screened in the supernatants which were obtained after ultracentrifugation of the serum samples containing high lipoproteins.

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CASE REPORT

Discussion

Elevated measurements of the serum phosphorus of both patients led to diagnostic confusion. Our findings suggest that if the lipemic serum is not dialysed before calorimetric analysis technique-dependent overestimation of the serum phosphorus level can occur. Our findings are consistent with the reports of Wentz et al (3) and Leehey et al (4), who claimed that a high serum lipid value could interfere in the direct calorimetric measurement of inorganic phosphorus.

Spurious elevation of the serum phosphorus concentration has also been reported in serum samples that have been kept in a refrigerator or left at room temperature for a long period. (5). Other causes interfering with serum phosphorus measurements are serum samples containing sodium-heparin, hemolysis (due to release of organic phosphorus from red blood cells), usage of glassware contaminated with detergents, and existing hyperbilirubinemia (5). None of these other factors were determined in our extended investigations for the patients.

In conclusion, we recommend that, if a clinician encounters a patient with a hyperphosphatemic serum analysis result, he/or she should keep in mind that hyperlipoproteinemia may interfere with phosphorus measurement making it appear higher than normal. Conversely, a patient with hyperlipidemia may also hide true hypophosphatemia by presenting a normal serum phosphorus result.

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