Hypophosphatemia and Encephalopathy in Alcoholics

A wide spectrum of neurologic and psychiatric disorders has been described in association with hypophosphatemia and/or phosphate depletion. In this issue of Internal Medicine, Funabiki et al (1) described a chronically alcoholic patient who had presented with disturbance of consciousness probably associated with hypophosphatemia.

See also p 958.

The 69-years old alcoholic man was admitted to their hospital with alcoholic ketoacidosis, rhabdomyolysis and acute renal failure, and was treated with intravenous glucose solution containing vitamin B1 as well as by continuous hemodiafiltration (CHDF). The disturbance of consciousness which persisted despite the general improvement was normalized by correcting his hypophosphatemia. In general, alcoholic patients are in the state of phosphate depletion because of poor intake of phosphorus, secondary hyperparathyroidism due to calcium and vitamin D malabsorption and other factors, and its depletion is exacerbated abruptly by the increase of renal phosphate excretion associated with alcoholic ketoacidosis (2). Importantly, the therapeutic intervention such as the administration of glucose for rehydration or refeeding could potentially precipitate marked hypophosphatemia by redistribution, namely a shift in phosphate from the extracellular to the intracellular compartment as a consequence of insulin-stimulated glycolytic activity. Therefore, a textbook (3) states that, for alcoholic patients with historical, physical, or biochemical evidence of malnutrition, intravenous fluids should contain phosphate to provide approximately 200 to 600 mg per day, even when these patients are normophosphatemic on admission. For an unclear reason, the patient of Funabiki et al (1) was not given an adequate amount of phosphate until the 7th hospital day, though clearly low serum phosphate levels were documented soon after admission.

Commonly, in the presence of renal failure or oliguria as was present in their patient, the phosphate depletion is compensated for by renal retention of endogenous phosphate and overt hypophosphatemia is rare. In the patient with renal failure or oliguria, the phosphate repletion is regarded not only as unnecessary but as a dangerous procedure which requires extreme caution. In their patient, hypophosphatemia progressed and persisted even when the presence of rhabdomyolysis added a great endogenous phosphate load. It appears that, in addition to the redistribution of phosphate induced by refeeding, the early introduction of CHDF which removed phosphate efficiently contributed to negate the phosphate retention. To maximize phosphate removal, a filtrate replacement fluid such as Sublood B contains no phosphate and the clearance of phosphate by hemofiltration is thought to be slightly higher than that by hemodialysis (4).

Neuromuscular manifestation of hypophosphatemia and/or phosphate depletion in alcoholics is quite variable, including rhabdomyolysis, encephalopathy, generalized weakness and peripheral neuropathy (5). In addition to the case of severe ataxia and tetraparesis cited by Funabiki et al (1), a case mimicking Wernicke’s encephalopathy has been reported in association with hypophosphatemia in an alcoholic man. According to this case report (6), the neurological deterioration despite the treatment with fluids containing potassium, magnesium and vitamins given for a presumptive diagnosis of early delirium tremens and Wernicke’s encephalopathy disappeared in a few hours after the administration of potassium phosphate. The pretreatment serum phosphate level was 0.6 mg/dl, and a causal relation between the hypophosphatemia and neurological disorders was claimed to be highly probable. As mentioned by Funabiki et al (1), there may be many similar cases which have not been reported because the manifestation of acute severe hypophosphatemia in alcoholics may readily be interpreted as consistent with alcoholic encephalopathy such as Wernicke’s encephalopathy or delirium tremens.

Chronic alcoholism is also a common cause of magnesium depletion through inadequate dietary intake, diarrhea and urinary losses induced by ethanol, and hypomagnesemia develops during alcohol withdrawal (7). ATP synthesis may increase as the cellular exposure to ethanol declines, and refeeding stimulates a phosphorylation reaction; this resynthesis of ATP can promote cellular uptake of magnesium accounting for hypomagnesemia. Although most of the neuromuscular symptoms observed in patients with hypomagnesemia appears to be the result of secondary hypocalcemia, severe hypomagnesemia per se may exhibit frank central nervous system disturbance (2). Thus, in treating chronically alcoholic and malnourished patients, the routine protocol should include close monitoring and correction of the serum levels of phosphate and magnesium as well as potassium. The danger of unbalanced supplementation of nutrients may be common to malnourished patients of any cause. Previously we reported in this Journal (8) a case of anorexia nervosa in whom rhabdomyolysis and acute renal failure developed associated with hypophosphatemia which was worsened by refeeding.

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References


