Pseudohyperkalaemia and infectious mononucleosis

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Summary

Pseudohyperkalaemia is described from a patient with infectious mononucleosis. The *in vitro* release of potassium was associated with clotting and all the blood cells may have been involved.

Introduction

In pseudohyperkalaemia, high potassium concentrations are measured in the plasma or serum of normokalaemic subjects because of *in vitro* leakage of potassium from blood cells. This condition has been reported in thrombocytosis (Ingram and Seki, 1962), leucocytosis (Bellevue *et al.*, 1975), myeloproliferative disorders (Myerson and Frumin, 1960) and in acute leukaemia (Chumbley, 1970). Recently, Stewart *et al.* (1979) have observed a family with inherited pseudohyperkalaemia. A patient is now described who had pseudohyperkalaemia and infectious mononucleosis.

Case report

A 14-year-old girl was admitted to hospital with a 2-week history of general malaise, anorexia, sore throat and a rash on her hands and legs. On examination she was found to have an exudative tonsillitis and cervical lymphadenopathy. There was no hepatosplenomegaly, and no rash was found. Investigations showed: sodium, 129 mmol/l; potassium, 7.3 mmol/l; chloride, 90 mmol/l; urea, 4.0 mmol/l; bilirubin, 7 μ mol/l; alkaline phosphatase, 34 KAu.; aspartate aminotransferase, 76 i.u.; α -glutamyl transpeptidase, 144 i.u.; hydroxybutyric dehydrogenase, 448 i.u.; Hb, 12.6 g/dl; platelets, 135×10^9 /l; WCC, 15.8×10^9 /l with a lymphocytosis of 55% of which 50% were atypical lymphocytes. The presence of a cold agglutinin was noted on the blood film. The characteristics of this antibody were those of anti-i: at 4°C, group O cells, 1/16; patient's cells, 1/16; cord cells, 1/128. At 21°C, group O cells, 1/4; patient's cells, 1/4; cord cells, 1/16. At 37°C, group O cells, nil; patient's cells, nil; cord cells, 1/4. The

direct Coombs' test was positive with broad spectrum and anti-complement sera. A positive Paul-Bunnell-Davidsohn test result confirmed the diagnosis of infectious mononucleosis; reaction with sheep cells in saline, 1/3584; after absorption with guinea-pig kidney, 1/3584; and after absorption with ox cells, <7. There was no evidence of a haemolytic anaemia: urinary urobilinogen was not raised, reticulocytes, 1.2%; and plasma haptoglobins, 1400 mg/l. The electrocardiogram was normal.

Methods

On admission, the patient's Hb and WCC were measured by the Coulter 'S' on a sequestrene sample; and biochemical tests by the Vickers M300 multi-channel analyser on clotted samples.

The patient's serum and plasma potassium results were compared with those of a normal volunteer. Three specimens of venous blood from each were placed into glass and heparinized tubes and left at room temperature. At 30 min, 4 and 8 hr after venepuncture, serum and plasma from the patient and volunteer were tested.

Results

There was no visible haemolysis in any sample from the patient or the volunteer. Serum and plasma potassium results are shown in Fig. 1.

Discussion

The release of potassium from blood cells after venepuncture may occur by rupture or increased permeability of the cell membrane. *In vitro* haemolysis of red cells is a well recognized cause of raised potassium levels. However, unless there is visible haemolysis in the sample, the increase in potassium is slight (Mather and Mackie, 1960). Increased permeability of red cells to potassium *in vitro* has been demonstrated in one family (Stewart *et al.*, 1979), but unlike the present case the raised potassium levels were obtained in plasma samples. In all other reported cases of pseudohyperkalaemia it has

FIG. 1. Potassium concentration (mmol/l) is plotted against no. of hr after collection. Patient's serum x—x; patient's plasma ●—●; normal serum x---x; normal plasma ●---●.

been suggested that the potassium has come from an excess of white cells or platelets.

The mechanism of the potassium leakage in this patient is uncertain. Important factors could be the atypical lymphocyte and the presence of a cold agglutinin. Infectious mononucleosis is characterized by the presence of large numbers of atypical lymphocytes. These cells may be more fragile than normal lymphocytes and their nuclear chromatin is described as 'smeared' (Wood and Frenkel, 1967). Wills and Fraser (1964) have shown that in 2 patients with pseudohyperkalaemia the increase in potassium levels was related to a rise in 'smear' cell counts. These authors concluded that some cases of pseudohyperkalaemia are due to leucocyte fragility.

Significant cold agglutinins are present in about

26% of patients with infectious mononucleosis (Worlledge and Dacie, 1969). Fortunately only a few patients have a haemolytic anaemia as the thermal range and titre of the antibody is often small. As in the present patient, the antibody is usually an anti-i. Interestingly, the i antigen site is found not only on red cells but also on leucocytes and platelets (Lawler, 1975). Thus, anti-i is able to bind on to the surfaces of all blood cells as the blood is cooled during transportation, and clotting with the activation of complement may result in potassium leakage. The role of the atypical lymphocyte and the i antigen site in this patient's pseudohyperkalaemia needs to be clarified.

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