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Diabetes insipidus and marked elevation of foetal haemoglobin in a case of acute leukaemia

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Summary
A case of acute myelomonocytic leukaemia is described in which diabetes insipidus was the presenting symptom.

Case report
A 46-year-old man first presented in Iran, in October 1972, with a history of polyuria, anorexia and fever for 2 weeks. He had lost 18 kg weight in the preceding year. On examination he was found to be anaemic (Hb 6·5 g), with hepatomegaly of 3–4 cm and a 'palpable' spleen. The urinary specific gravity was 1·002. Bone marrow at that time showed 'many abnormal cells'. A diagnosis was made of diabetes insipidus secondary to a malignant process and he was treated with 5 i.u. vasopressin tannate noce with considerable improvement in the polyuria. This was subsequently changed to nasal pitressin t.d.s. in view of increasing pain at injection sites. He was transfused with three units of whole blood and transferred to Hammersmith Hospital for further investigation.

When first seen on 21 November 1972 he was found to have a Hb of 7·8 g, WCC 3000 (30% neutrophils, 20% blasts, 33% lymphocytes, monocytes 9% and eosinophils 8%) and platelets 192,000. Bone marrow showed acute myelomonocytic leukaemia. Alkaline denaturation showed 47% resistant Hb; Hb A2 estimation was 1·2% and electrophoresis showed an Hb A/F pattern. The patient was therefore admitted for further investigation.

During the first week in hospital the nasal pitressin was stopped, and his mean urinary output was 6 l/day, average SG 1000 and average osmolality 1·05, and 260 for urine and plasma respectively. Detailed investigation of his hypothalamic-pituitary-adrenal function was carried out. A poor response to intravenous thyroid-releasing hormone was obtained, the TSH values at 0, 20 and 60 min following injection being 1·6, 2·5 and 2·8 μU/ml respectively. There was a normal basal level of luteinizing hormone and follistic stimulating hormone and following intravenous thyroid-releasing hormone was obtained, the TSH values at 0, 20 and 60 min following injection being 1·6, 2·5 and 2·8 μU/ml respectively. There was being 3·8, 22·0 and 28·0 respectively. However, serum FSH levels measured in mU/ml were 4·4, 5·9 and 7·6 respectively showing a poor and slow response of follicular-stimulating hormone. This is in keeping with the 'hypothalamic pattern of response' (Hall

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et al., 1972) and is compatible to that response found with thyrotrphin-releasing hormone where the hypothalamic cells responsible for the production of TSH have low values of this hormone owing to pre-existing hypothalamic disease. Following an insulin tolerance test there was a normal response of both cortisol and growth hormone. Protein bound iodine was normal at 4-6 μg/100 ml, the normal range in the laboratory being 4-8. Serum T3 was normal at 4-9, the normal range being 4-7-8-1 and T4 was normal 8-5 μg/100 ml, the normal range being 5-4-11-8 μg/100 ml. A clomiphene test was normal, the values for luteinizing hormone on the tenth and eleventh days being 7-6 and 7-8 ml/ml respectively and for testosterone being 286-0 and 295-0 ng/100 ml respectively. Urinary output of 17 oxosteroids and 17 oxogenic steroids was normal, being 7-3 mg and 28-9 mg per 24 hr respectively. Eight and 15 hr water deprivation tests were carried out and both confirmed the presence of diabetes insipidus. The values on the 8 hr tests were U3 90, P3 300; U3: P3 0-3. U3 represents the urine passed in the sixth and seventh hours of the 8 hr deprivation test and P3 is the plasma sample in the mid-point of that period. In the normal person the urine osmolality should be 600 mosmol/kg or more and the plasma osmolality should not be greater than 300. The U3/P3 ratio should be greater than 2 in the normal and less than 1-9 in confirmed diabetes insipidus. Following exogenous ADH the patient was able to concentrate his urine normally on an 8 hr water deprivation test. Radiography of the skull and pituitary fossa was normal as were the chest X-ray and intravenous pyelogram. Brain scan was normal. Lumbar puncture showed an increase in monocyteid cells and normal CSF pressure; no leukaemic cells could be identified on a cytocentrifuge preparation.

Treatment was started with chlorpropamide 250 mg b.d. and the patient subsequently had an average urinary output of 2 l/day, SG 1-010 and osmolality of 310.

In the normal individual, Hb F should account for no more than 1% of the total haemoglobin after the sixth month of life. In this patient the value of presentation was 47%, and haemoglobin electrophoresis showed an Hb A and F. The Hb A2 was reduced, 1-2%. A slight increase in Hb F has been described previously in acute leukaemia (White, 1972), but to our knowledge the level found in this case has not been previously described. Following transfusion with a total of 7 units of blood, the Hb F level fell to 8-8%. There are three possible explanations for the marked increase in Hb F. (1) That the patient had a form of thalassaemia; (2) that he was heterozygous for the High Fetal gene; and (3) that it was a consequence of his leukaemia. The first was excluded by the finding that the relative rates of α and β chain synthesis measured in his circulating reticulocytes was 1-03 (normal range 0-95-1-1). The second possibility was excluded by finding that the Hb F was heterozygously distributed throughout the red cells. We conclude therefore that the Hb F was being synthesized by the same abnormal leukaemic clone of stem cells. Chemical analysis of the chain is being undertaken.

Acute myelomonocytic leukaemia was diagnosed on the bone marrow findings which also showed a blast cell content of 70%. Since the patient was found to have a high level of cytidine kinase in the bone marrow cells (Tattersall, 1973) he theoretically should have responded to cytosine arabinoside by infusion. However, his blast cell count was 2900/μl before a 24 infusion of cytosine arabinoside and had fallen by only 70% (to 850/μl) 48 hr after the infusion was finished. Because of this failure treatment was started with the TRAP regimen (T = thioguanine 100 mg/m²/day on days 1-5, p.o. R = rubidomycin 40 mg/m² on day 1, i.v. A = cytosine arabinoside 100 mg/m²/day on days 1-5, i.v. and P = prednisolone 30 mg/m²/day on days 1-5, p.o.) (Spiers, 1972). In view of the probable leukaemic involvement of his hypothalamus, external radiotherapy was given to the hypothalamic area. Hyperuricaemia was satisfactorily controlled with allopurinol. This therapy produced a fall in the circulating blast cell count, but with the concomitant neutropenia the patient developed two episodes of pyrexia. The first of these responded well to antibiotic therapy (Tattersall et al., 1972), no cause for the pyrexia being found. The second episode was associated with a perianal abscess and E. coli septicaemia, and responded well to surgical drainage and antibiotics. Subsequently the patient developed pulmonary oedema possibly on the basis of leukaemic infiltration of his myocardium. Therapy was unsuccessful and the patient died on January 10, 1973. Permission for necropsy was refused on religious grounds.

Discussion

Unfortunately, without necropsy the presumptive aetiology of the diabetes insipidus in this case could not be substantiated. However, in cases previously described in the literature (Castaigne and Hubault, 1953; Eilersen, 1960; Fabiani and Lucentini, 1955; Flynn and Bowers, 1947; Joseph and Levin, 1956; Laakso, 1964; Malter, Gross and Teree, 1969; Miller and Campbell, 1971; Roszenzweig and Kendall, 1966; Camarri and Fantoria, 1972) both leukaemic deposits (Cammari and Fantoria, 1972) and haemorrhage (Roszenzweig and Kendall, 1966) have been found in the region of the hypothalamus. Haemorrhagic lesions have usually been associated with low platelet counts at presentation (Laakso, 1964; Roszenzweig and Kendall, 1966) which would
suggest that in this patient who was not thrombocytopenic, the hypothalamic lesion was a deposit. In previously reported cases, diabetes insipidus has been described as a presenting symptom (Joseph and Levin, 1956) and also has occurred during the course of the disease (Laakso, 1964). Most cases have been adults who have had acute leukaemia and there are a few reports of children having diabetes insipidus as a complication of acute lymphoblastic (Malter et al., 1969) or acute myeloblastic leukaemia (Joseph and Levin, 1956).

No cases found in the literature had a markedly raised Hb F and it seems likely from our studies that this was a consequence of his leukaemia.

References
Fabiani, F. & Lucentini, L. (1955) Case of acute hemocytoblastic leukaemia beginning and ending with the complicating disease of diabetes insipidus. Progressive Medicine, 11, 269.


Megaloblastic anaemia associated with the oral contraceptive pill

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Summary
A 27-year-old housewife suffered from severe headaches for a period of 2 years which developed after she started taking an oral contraceptive pill. During this time she gradually developed folic acid deficiency anaemia. This resulted from the inhibition by 'the pill' of the intestinal conjugase system required to deconjugate polyglutamatic folate. The patient's headache did not recur after stopping the pill and her anaemia improved with folic acid supplement. The relation between folic acid metabolism and 'the pill' is discussed.

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Megaloblastic anaemia associated with oral contraception
A large number of metabolic side effects induced by the contraceptive pill have been described (Drill, 1965). Shojania, Hornady and Barnes (1968), Snyder and Necheles (1969) and Streiff (1970) have described lowered levels of serum folate in women on oral contraceptives, but overt megaloblastic anaemia appears to be uncommon. The following report describes this entirely remediable condition which presented in an insidious form.

Case report
Mrs M.K., aged 27 years, was seen in the casualty department. She had taken 16 tablets of codeine
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Postgrad Med J 1974 50: 468-470
doi: 10.1136/pgmj.50.585.468

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