Hyperpigmentation of the Flexures and Pancytopenia during Treatment with Folate Antagonists

Sir,

Hyperpigmentation of the skin has been described in patients with megaloblastic anemia from vitamin B12 deficiency and, less frequently, from folate deficiency. The mechanism of the hyperpigmentation in these patients is not clearly understood. The pigmentation pattern, distribution, and shade vary from patient to patient but usually the pigmentation is most pronounced in the hands and feet, especially over the knuckles and in the creases of the palms and plantar surfaces.

We describe a patient who developed folate deficiency secondary to treatment for ocular toxoplasmosis. She presented with thrombocytopenia, anemia, leucopenia and an unusual brown pigmentation of the flexures.

CASE REPORT

An 18-year-old white woman was admitted to our hospital because of a pancytopenia. Three weeks earlier she had been diagnosed as having toxoplasmosis chorioretinitis and therapy was initiated with pyrimethamine 25 mg twice a day, trimethoprim 160 mg + sulfamethoxazole 800 mg every 12 h and prednisone 20 mg daily. Two weeks after treatment was begun, a brownish pigmentation of the flexures was noticed and 3 days later, epistaxis, purpura and hematuria developed. At that time the hemoglobin was 9 g/100 ml, the white blood cell count 1,000 x 10^6/l and the platelet count 16,000 x 10^9/l. She was admitted to our hospital the same day. Examination revealed a pale young woman with non-palpable purpura on the extremities, secondary to thrombocytopenia, and a symmetrical brown pigmentation affecting the axillae (Fig. 1), sides of the neck and the antecubital fossae. The mucous membranes, nails and hair were normal. A bone marrow study showed a selective hypoplasia of the erythrocytic and megacaryocytic series, with megaloblastic changes. Serum B12 level was normal and serum folate level was decreased, 4 ng/ml (normal 5.5 to 15 ng/ml). A biopsy specimen of the axilla showed a thinned epidermis with hyperpigmentation of the basal layer and scattered melanophages in the papillary dermis. Fontana-Masson stain confirmed that the pigmentation within the dermal macrophages was melanin. Treatment was discontinued and the patient was treated with folic acid 9 mg daily. Ten days later the hemoglobin was 8.5 mg/100 ml, the white blood cell count 5,200 x 10^9/l and the platelet count 182,000 x 10^9/l. The pigmentation faded within the next 3 months.

DISCUSSION

Cutaneous hyperpigmentation secondary to folate deficiency is a much less recognized side-effect than is hematologic toxicity. There are few reports of pigmenatory changes secondary to folate deficiency.

Gough et al. (1) described 7 patients with nutritional deficiency of folic acid. They all developed megaloblastic anemia and hyperpigmentation of the skin, particularly of the sun-exposed areas. Baumslag & Metz (2) described 5 women with folic acid deficiency associated with pregnancy and lactation, who developed spotty pigmentation of the palms and soles. Downham et al. (3) reported one case of folate deficiency associated with grayish-brown pigmentation of the skin, not limited to sun-exposed areas. Hyperpigmentation cleared in all patients after treatment with folic acid. The pathogenesis of the pigmentary changes in folic acid deficiency is uncertain. An alteration in the metabolism of glutathione that would lead to inhibition of tyrosinase activity or elevated levels of biotin, a substance necessary for the hydroxylation of phenylalanine, have been suggested as possible causes of the hyperpigmentation. In our patient the cause of folic acid deficiency was the interference with its utilization by drugs. She was treated with trimethoprim, sulfamethoxazole and pyrimethamine. All these drugs are folate antagonists; when they are concurrently administered, as in our patient, synergism occurs, and it is attributed to the inhibition of tetrahydrofolate production at two sequential steps in its biosynthesis.

Although hematologic toxicity secondary to the use of folate antagonists is a frequently reported adverse effect, we have found only 2 reports of pigmentation and folic acid deficiency due to drug administration. TenPas & Abraham (4) described one patient who developed anemia, thrombocytopenia and a generalized diffuse hyperpigmentation 2 months after treatment with pyrimethamine and sulfadiazine had been started for ocular toxoplasmosis. The patient responded quickly to treatment with packed red cell transfusions, folic acid and prednisone. Greenspan et al. (5) described cutaneous hyperpigmentation resembling acanthosis nigricans in 2 patients with malignant brain tumors following chemotherapy with triazine, a folic acid antagonist. The pattern of hyperpigmentation in these patients was predominantly on the flexures, as in our patient. Of one of them had a decreased serum folate level that returned to normal as the hyperpigmentation resolved.

In our patient cutaneous hyperpigmentation was the first manifestation of her folate deficiency, before clinical signs of hematologic toxicity appeared. The development of cutaneous hyperpigmentation in a patient treated with folate antagonists should lead to the diagnosis of folic acid deficiency being considered.

REFERENCES


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Fig. 1. Brown mottled pigmentation on the axilla.
Increased Concentrations of Plasma Endothelin-1 and Fibronectin in Psoriasis

Sir,

In the present study, plasma endothelin-1 (ET-1) and fibronectin concentrations were measured in psoriatic patients \((n=24)\) and matched controls \((n=20)\), since a possible relationship was thought to exist between the plasma ET-1 and fibronectin concentrations and the aetiopathogenic mechanism in psoriasis, in which an increased vascular capillary angiogenesis is seen. Fibronectin is an \(\alpha_5\) surface-binding oposin protein that is mainly produced by endothelial cells. ET-1 is a very potent vasoconstrictor peptide, consisting of 21 amino acids, and is produced not only by endothelial cells but also by many other cell types. The patient group had higher plasma ET-1 and fibronectin concentrations than those of the controls. Alteration of receptors to fibronectin has been reported in psoriasis (1).

ET-1 is produced not only by vascular endothelial cells but also by a variety of other cell types, such as epithelial cells and keratinocytes (2). In the present study we aimed at investigating plasma concentrations of fibronectin and ET-1 in psoriatic patients and at comparing these parameters with those of the control group.

MATERIALS AND METHODS

Twenty-four psoriatic patients (12 males, 12 females), who applied to our hospital, were included in the study. Their age ranged from 5 to 50 years, with an average of 32 years. Mean duration of disease was 7.5 years (1–15 years). Of 24 patients, 6 had very severe clinical signs and the other 18 patients had moderately severe clinical signs. None of them had diabetes mellitus, hypertension, or renal or lung disease, all these being conditions related to increased plasma ET-1 concentrations. None of the patients received any medication except local corticosteroid use. Control plasma samples were obtained from age-matched healthy subjects (14 males, 6 females, mean age 36 years, age range from 20 to 53 years).

In order to determine the plasma concentrations of ET-1 and fibronectin, blood samples were drawn from the subjects in the morning in supine position. Five ml of blood were collected into tubes containing 100 \(\mu\)l EDTA/ml (EDTA 1 mg/ml) and 40 kallikrein inhibitor units/ml aprotinin (Trasylo18). Blood samples were then centrifuged at 4°C for 10 min at 2,000 g. Plasma samples were stored at \(-20^\circ\)C until assayed.

Plasma ET-1 was measured by a radioimmunoassay method in acidified plasma samples after extraction with Aprepp C2 columns (code RPN 1913, Amersham), which were preequilibrated with methanol and water. Endothelin was eluted with 5 ml of 0.1% trifluoroacetic acid in water and 80% acetonitrile in water plus 0.1% trifluoroacetic acid. The radioimmunoassay of plasma endothelin was performed using a commercially available kit (Endothelin 1-21 specific [125I] assay system, Amersham UK). Plasma fibronectin was determined by an immunoturbidometric method (Boehringer Mannheim, Cat. No. 401218, Germany).

Vals are presented as mean \(\pm\) standard deviation. For statistical evaluation, Student's \(t\)-test and regression analysis were performed. A \(p\) value <0.05 was considered statistically significant.

RESULTS

Mean plasma ET-1 concentrations were 4.3 \(\pm\) 1.3 (range: 2.3–7.1) pg/ml and 3.3 \(\pm\) 1.4 (range 1.4–5.6) pg/ml in the patient and control groups, respectively. There was a statistically significant difference between the groups \((p<0.05)\). Mean plasma fibronectin concentrations were 315.1 \(\pm\) 70.6 (range: 214.1–424.5) \(\mu\)g/ml in the psoriatic patients and 232.4 \(\pm\) 98.4 (range: 131.8–436.6) \(\mu\)g/ml in the controls. Plasma fibronectin concentrations were significantly higher in the psoriatic patients than in the control group \((p<0.01)\).

In correlation analysis, there was no statistically significant correlation between ET-1 and fibronectin values either in the patients or the controls \((p<0.05\) for both groups, Fig. 1). Age and sex had no influence on ET-1 and fibronectin either in the patients or the healthy subjects. Nor was there any correlation between the disease activity and plasma ET-1 and fibronectin values.

![Fig 1. Lack of correlation between ET-1 and fibronectin values.](https://example.com/fig1.png)