

## Studies on Clinical, Haematological Aspects and Pathological Changes of Gastric Mucosa in Geophagia

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### INTRODUCTION:

Various forms of geophagia have been reported from different parts of the world such as: south and west of the United States, particularly among pregnant Afro-American women (10), a few cases from Turkey (2) and 5 similar cases from Egypt (9). A clinical syndrome consisting of dwarfism, hypogonadism, hepatosplenomegaly and iron deficiency anaemia in association with earth or clay ingestion is now well-known in medical and pediatric wards in Iran and is referred to as earth-eating syndrome. 11 cases of geophagia have been reported from Shiraz (Iran) (8). None of the above mentioned cases had a study of gastric biopsy and histological examination of the gastric mucosa.

During the 4 years 21 patients with a history of geophagia have come to our attention. We have made study on clinical and haematological aspects of the patients and especially on histological changes of gastric mucosa.

This communication intends to report a summary of clinical and haematological aspects of the syndrome and especially to stress the histological changes of the gastric mucosa and their improvement (in 5 patients) after iron therapy.

All patients were under 26 years of age, 16 of them between 15 and 20 years; 17 of them were males and 4 females, duration of geophagia was from 4 to 20 years (in 3 patients undetermined). Physical and full blood examination was carried out in all patients, the latter consisted of haemoglobin, haematocrit, reticulocyte count, leucocyte count, platelet count and differential leucocyte count with especial attention to the red cell morphology (accorded with MCHC); finally bone marrow examination including Perl's staining for iron was also carried out. Other laboratory studies such as: blood urea and sugar, serum total protein and protein electrophoresis, serum bilirubin, transaminases, urine analysis, serum iron and TIBC and stool examination, 3 times, (for ova, parasites and blood) were also carried out in the patients, Chest and skeletal X-ray taken in all of them. Gastric suction biopsy with histological examination were done in all patients.

## RESULTS

All patients had iron deficiency anaemia with related symptoms such as: weakness, lassitude, palpitation and pallor. A summary of patients' history and physical signs including age, sex, duration of geophagia, clinical features, haemoglobin values and the results of bone marrow iron Staining is shown on Table-1.

15 patients had retardation of growth, genitalia and secondary sexual characteristics and 6 had normal general appearance and genitalia; 12 of them had moderate, 6 slight enlargement of the liver and 3 had no hepatomegaly; 8 had marked, 10 moderate degree of splenomegaly and 3 had normal spleen. 19 of them had soft or moderate systolic murmur (haemic murmur) of the apex or base of the heart with slight to moderate cardiac enlargement. Other signs such as: dry and grey hair, spoon nails (in 14

Patient	Sex	Age yrs	Duration of geophagia	Clinical Features			Hb gr%	Bone marrow Iron	
				general appearance yrs	liver	spleen			genitalia
1	F	20	10	10	++	++	retarded	6	absent
2	M	19	undetermined	12	++	++	" " "	5.7	" "
3	M	15	5	8	+	++	" " "	7.5	" "
4	F	25	20	normal	++	++	normal	6	" "
5	M	22	20	12	+	++	retarded	5.5	" "
6	M	15	10	10	++	+++	" " "	5.5	" "
7	M	20	15	12	++	+++	" " "	7.5	" "
8	M	19	8	10	++	+++	" " "	5.5	" "
9	M	15	4	normal	++	++	normal	5.7	" "
10	M	18	10	8	++	+++	retarded	5.5	" "
11	M	25	15	normal	++	+++	normal	3.2	" "
12	F	20	undetermined	12	+	+++	retarded	5	" "
13	M	17	" " " "	10	+	++	" " "	3	" "
14	M	20	5	normal	++	+++	normal	5.7	" "
15	M	20	15	" " "	normal	normal	" " "	5	" "
16	M	26	undetermined	14	++	+++	retarded	3.2	" "
17	M	19	" " " "	normal	+	++	normal	5.5	" "
18	M	24	5	12	normal	normal	retarded	5.5	" "
19	M	16	8	8	" " "	" " "	" " "	5	" "
20	M	17	6	12	+	++	" " "	5.7	" "
21	F	18	8	12	++	++	" " "	5.5	" "

Table - 1: Clinical and haematological features of the patients.

cases) were also found in the majority of patients. 3 patients had dysphagia and 3 bilateral asymptomatic enlargement of parotid glands.

Haematological aspects in the patients were as follows:

a) Blood picture: the haemoglobin varied from 3 to 7.5 gr %, in 16 cases between 5 and 6 gr %; the red cell morphology showed microcytic and hypochromic anaemia with slight anisocytosis and poikilocytosis; MCHC values varied from 25 to 28 %, although in few cases values lower than 25 % were also seen. The reticulocyte count was from 1 to 3 %. In 18 cases, leucocytes were reduced, mainly due to neutropenia. Platelets were also diminished in the 16 patient.

b) Bone marrow was usually hyperplastic with erythroid hyperlasia; erythropoiesis was usually micronormoblastic; most of the intermediate and late normoblasts showed rather defective nuclear pattern, their cytoplasm being decreased and sometimes had a ragged border. Myeloid and megakaryocytic series were normal. Stainable iron was absent in all cases.

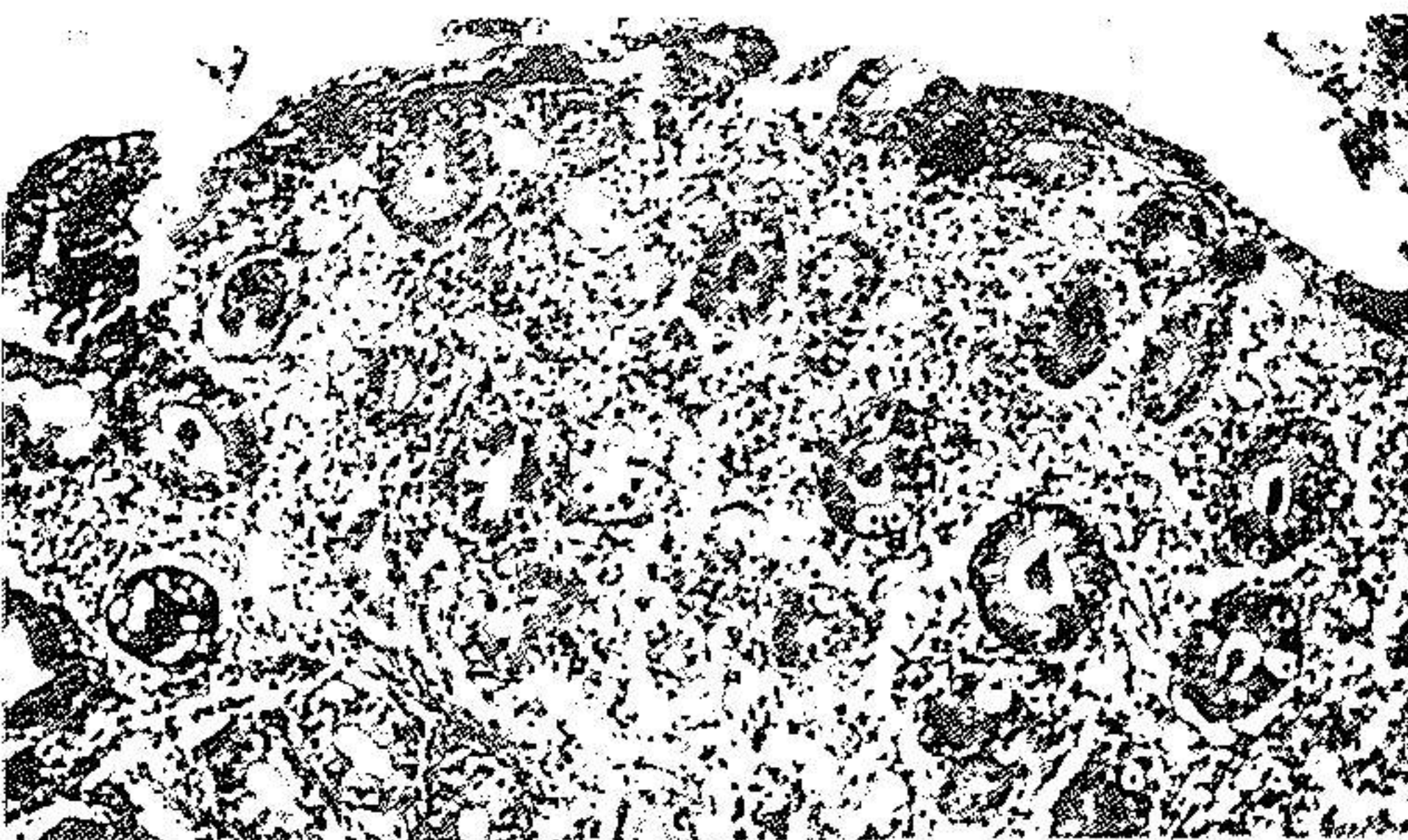
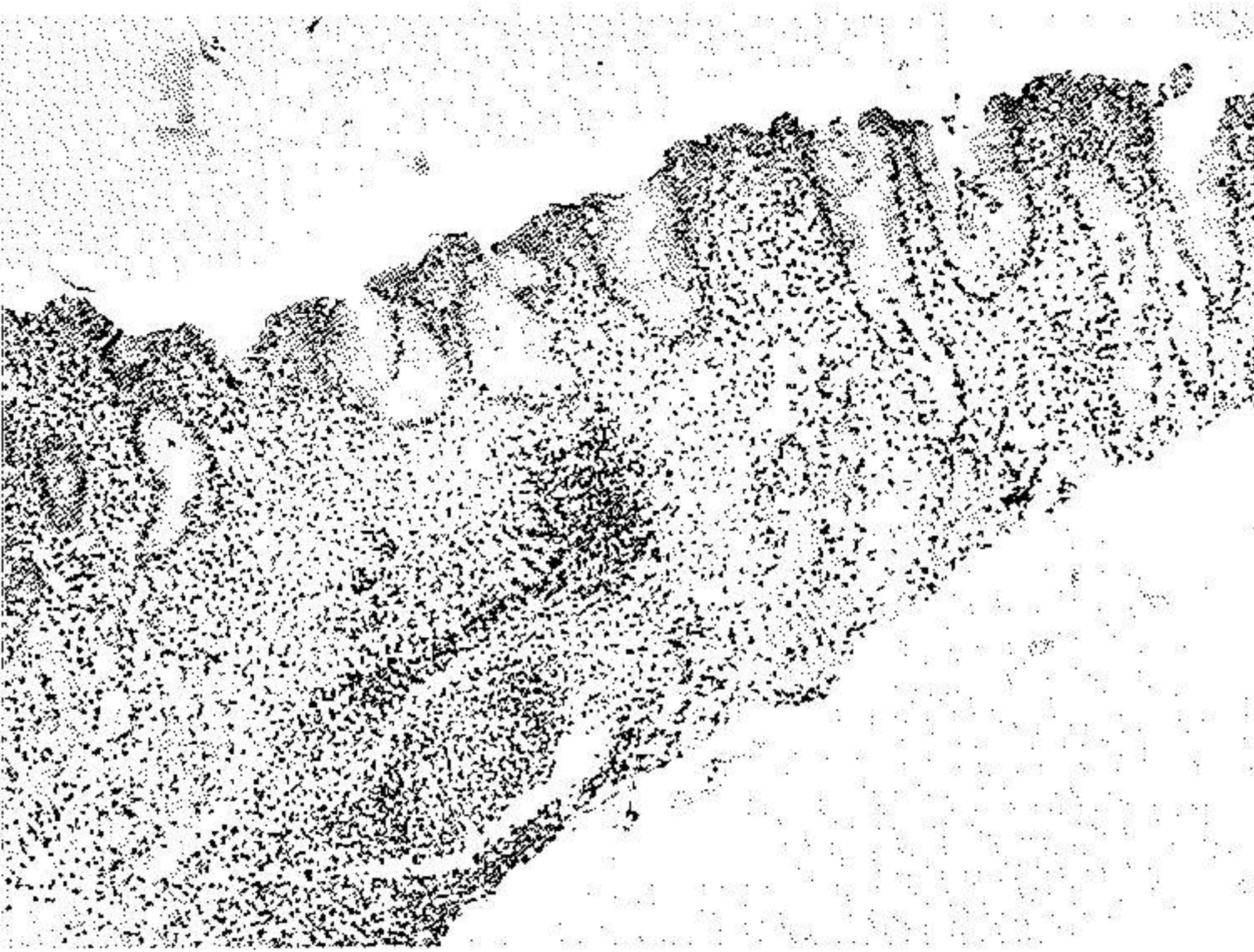
Blood urea and sugar, serum total protein and protein electrophoresis, serum bilirubin, serum transaminases and urine analysis were all within normal limits. Serum iron was from 26 to 56 gr % and TIBC from 332 to 481 gr %. Stool examination for ova and parasites was negative in 8 patients but 9 had ascaris, 2 enterobius and 2 trichocephalus ova; all of them had negative occult blood.

Skeletal survey showed normal mineralization of bone in 11 and generalized mild osteoporosis in 10 cases.

Gastric biopsy: Mucosal lesions were present in all cases (Table-2), histological finding showing some resemblance to those seen in megaloblastic (pernicious) anaemia. In 12 cases advanced lesions were noted, the characteristic findings being those of atrophic gastritis, i.e. thinning of the mucous membrane, scarcity of gastric glands abundance of elongated epithelial and of caliciform cells associated with diffuse lymphoplasmocellular infiltration of the stroma (Fig. 1,2,3); in some of them, a slight increase of fibroblasts was observed, increased thickness of the muscularis mucosa was noted in only 2 cases. In the remaining 9 biopsies the histological aspect was that of superficial gastritis. The surface epithelium contained numerous cuboidal or flattened cells. Increased desquamation and scattered microerosions were present and relatively dense lymphoplasmocellular infiltration was noted in the stroma. In 5 patients biopsy specimens taken 6 months after correction of the anaemia showed remarkable improvement of the gastric mucosa (Fig. 4).

Patient	Gastric Biopsy before treatment		Gastric Biopsy after treatment
1	atrophic	gastritis	—
2	superficial	" " "	—
3	atrophic	" " "	—
4	superficial	" " "	—
5	" " " "	" " "	—
6	" " " "	" " "	—
7	" " " "	" " "	—
8	atrophic	" " "	improved
9	" " " "	" " "	—
10	" " " "	" " "	—
11	superficial	" " "	—
12	" " " "	" " "	—
13	" " " "	" " "	—
14	atrophic	" " "	—
15	" " " "	" " "	—
16	" " " "	" " "	—
17	" " " "	" " "	improved
18	superficial	" " "	improved
19	atrophic	" " "	improved
20	" " " "	" " "	improved
21	" " " "	" " "	improved

Table - 2: results of gastric biopsies.





## DISCUSSION

The cause of earth or clay eating seems to be undetermined, it could be attributed to various factors such as: psychological, cultural, nutritional and environmental influences (10). Since 18 of our patients were born in villages, in the family of farmers, gardeners and shepherds the clay and earth were easily available for them. It was difficult to estimate the daily amount of clay or earth eaten by the patients but some of them ingested large amounts. All patients had iron deficiency anaemia, with no detectable blood loss. We have observed different side effects of iron deficiency anaemia associated with geophagia including dwarfism, hepatosplenomegaly, hypogonadism and spoon nails (the latter in 14 cases); all of which are well detailed in various articles (2, 7, 8, 9, 10). Some other additional signs such as bilateral asymptomatic enlargement of parotid glands and dysphagia were also found in 3 patients.

Considerable controversy exists whether the iron deficiency anaemia associated with geophagia is the cause or the result of it. According to Minnich et al (7) iron absorption may be prevented by clay and earth eating, the results obtained with radioactive iron, indicate a pronounced reduction in iron absorption during periods of clay or earth ingestion. Serum iron in all patients was low. Leucopenia and/or thrombocytopenia seems being due to hypersplenism and/or longstanding iron deficiency anaemia. Because the patients came from lower social classes, nutritional deficiencies might have been a contributing factor to their anaemia.

According to Croft et al (4), gastric cell loss is increased 4-5 fold in patients with atrophic gastritis. A reflection of an increased cell turn over rate is shown by high DNA loss in gastric washing, in patients with atrophic gastritis; the loss of free iron in the stool was significantly related to gastric DNA rate. Thus, the result obtained suggests, that high gastric-cell loss may be a factor causing iron deficiency anaemia in patients with atrophic gastritis.

Chronic inflammatory disease of the acid-secreting gastric mucosa in man may be associated with the development of two types of circulating antibodies directed against two distinct antigenic components of the gastric parietal cells (6). The first are antibodies to the microsomal antigens of the gastric parietal cells (PCA) that can be shown by immunofluorescent techniques and the second are antibodies, blocking and binding, to intrinsic factor (IF). If antibodies are only found in the sera of patients (60%) with pernicious anaemia. PCA antibodies are found in the serum, gastric juice and mononuclear inflammatory cells of the gastric mucosa (6). In gastritis associated with pernicious anaemia the incidence of PCA is over 85% and with iron deficiency, in females, is about 60%. PCA is rarely found in healthy subjects (6). By discussing present opinion about atrophic gastritis as an autoimmune disease, in regard to our patients, we have not studied immunological aspects of atrophic gastritis associated with geophagia, but this is a plan for our future studies.



Gastric biopsy is clearly the most reliable means of establishing diagnosis of atrophic gastritis (6). In our studies we have paid a great attention to pathological changes of gastric mucosa. Several other authors have investigated cases of hypochromic anaemia by gastric biopsy and in approximately 90 per cent of these cases the anaemia was the result of bleeding (1).

Studies evaluating gastric mucosa with biopsy have shown that gastric lesions in idiopathic hypochromic anaemia rarely improves (11), but it is of particular interest to note that the mucosal lesions seem, at least in some patients, to be reversible after discontinuation of geophagia and appropriate treatment of anaemia. Control biopsies performed 6 months after correction of the anaemia, in 5 cases, showed remarkable repair with increase of gastric glands and reversion of the surface epithelium to a more or less normal condition. This is contrary to findings in megaloblastic (pernicious) anaemia, where persistence of mucosal lesions, even after normalization of the blood condition, has been reported (3,5).

Because of lack of cooperation of the patients in taking iron tablets, especially for longtime, we used intramuscular iron, iron sorbitol (Jectofer) for their treatment.

Correction of the anaemia led to disappearance of the cardiac murmur and return of the heart to its normal size, marked decrease in the size of liver and spleen and reversion of genitalia and secondary sexual characteristics to normal or near normal, in patients.

### SUMMARY

- 1) Geophagia characterized by, severe, anaemia, dwarfism, hypogonadism and hepatosplenomegaly is sometimes seen in young patients (and children) in Iran.
- 2) Haematological aspects of the syndrome are those of, severe, iron deficiency anaemia.

- 3) Gastric biopsies and histological findings revealed superficial or atrophic gastritis showing some resemblance to those seen in pernicious anaemia.
- 4) Haematological features, anaemia and many of the clinical signs of the syndrome were improved after appropriate iron therapy.
- 5) Histological changes of gastric mucosa improved, in 5 patients, 6 months after correction of the anaemia.

### RESUME

- 1) Les caractéristiques de syndrome de geophagia sont: anémie intense, nanisme, hypogonadisme et hépto-splénomégalies chez les jeunes geophages et les enfants.
- 2) Le signe hématologique majeur de ce syndrome était une anémie ferriprive.
- 3) La biopsie de la muqueuse gastrique faite chez ces sujets nous a montré une gastrite superficielle ou une gastrite atrophique avec des lésions histologiques comparable à celles qu'on trouve dans l'anémie pernicieuse.
- 4) Les signes cliniques ont diminué; tandis que l'aspect hématologique est disparu après l'administration de fer.
- 5) Chez 5 sujets, dans notre série, le contrôle histologique de la muqueuse gastrique a montré une régénération très nette, 6 mois après le traitement de l'anémie.

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