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STUDY OF SOME MINERALS IN SCALP HAIR AND BLOOD SERA OF PSORIATICS

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Abstract. Scalp hair and blood sera of two groups of psoriatic individuals were examined regarding some of their mineral contents by flame photometric and colorimetric procedures, and the findings compared with a normal control group. The results obtained revealed changes in the mineral content of scalp hair of psoriatics. A possible relationship may exist between hair and serum minerals.

Key words: Scalp hair; Psoriasis; Minerals

Electron microscopic studies of hair shafts in psoriasis have shown that there is abnormal keratinization (5). Moreover, biochemical studies on the epidermis and dermis in cases of psoriasis have revealed changes in their mineral content (1). Similarly, studies on scales from the psoriatic epidermis showed variations in their mineral content (3). It was therefore found of much interest to study some of the essential minerals and trace metals such as sodium, potassium, calcium, copper, iron and phosphorus present in scalp hair and blood sera of psoriatics and to compare the findings with normal controls to disclose possible significant changes.

MATERIALS AND METHODS

In the present work, three groups of cases were selected for the study. The first comprised 30 patients of both sexes varying in age from 3 to 60 years and suffering from psoriasis of the scalp only. The second group consisted of 10 patients of both sexes and suffering from psoriasis of the body not affecting the scalp. The third group comprised 30 normal controls of both sexes in the age range 3 to 60 years.

The cases selected for the study were chosen from one locality (Cairo) taking into consideration that they live under the same environmental and social conditions. Adult females chosen were those not taking oral contraceptives. Smokers were excluded from the study. Every case was subjected to thorough clinical and laboratory investigations to exclude any local or systemic disease. The investigations made were: blood picture, liver and kidney function tests, urine and stool analysis.

The clinical diagnosis of the patients was confirmed by histopathology. Hair samples from each case were obtained by cutting the hair just above the surface of the skin using a clean chromium-plated razor. The patients were instructed not to wash their scalps with soap and water for 4 days before hair samples were taken. The length of hair strands was standardized for all the cases to be 5 cm. The samples collected were rinsed in ether for 5

Table I. *Mineral contents of scalp hair in cases of psoriasis of the scalp (expressed in mg/kg hair)*

Disease	Sex	Age (y.)	No. of cases		Sodium	Potassium	Calcium	Copper	Iron	Phosphorus
Psoriasis of scalp	♀	3–60	15	Mean	1 611	145	4 017	73	111	256
				Range	575–3 220	36–337	2 857–5 000	20–217	50–200	136–539
Psoriasis of scalp	♂	3–60	15	Mean	1 419	267	3 734	168	89	264
				Range	782–2 875	105–546	2 643–4 783	43–400	33–216	118–666
Psoriasis of scalp	Total cases	3–60	30	Mean	1 506	201	3 970[a]	116[a]	102[a]	249[a]
				S.D.	±721	±114	±671	±91	±56	±111
Normal	Total M&F.	3–60	30	Mean	1 531	214	4 220	79	109	124
				S.D.	±868	±141	±574	±67	±63	±101

[a] Significant $P<0.05$; not significant $P>0.05$.

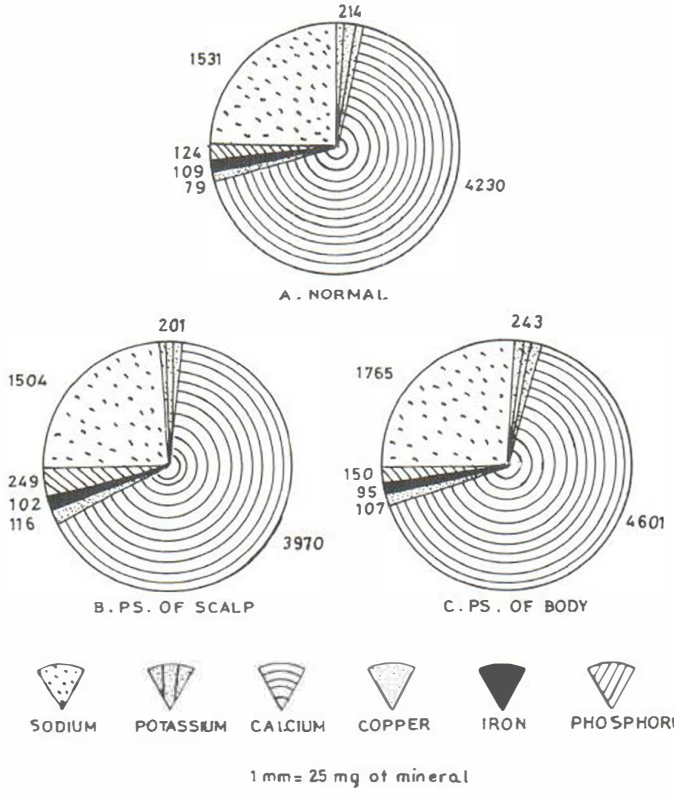

Fig. 1. The mineral contents of scalp hair in (A) normal individuals, (B) cases of psoriasis of the scalp, and (C) cases of psoriasis of the body not affecting the scalp.

minutes to dissolve fats and then allowed to dry. Each dried sample of hair was subjected separately to a series of thorough washings, using ordinary soap and water, followed by washing twice with distilled water and finally with bidistilled water twice. They were allowed to dry at ordinary room temperature. One-half gram of each sample was digested separately using a mixture of concentrated sulphuric acid and hydrogen peroxide, and the resultant colourless drop was diluted with bidistilled water to obtain a 1% solution on which the estimations were made.

As regards the serum, blood was withdrawn with a wide-bore needle from the normal controls and from patients with psoriasis of the scalp only. The blood samples were left to clot in centrifuge tubes, which were then centrifuged at 3200 r.p.m. and the supernatant serum samples were decanted into dry, clean test tubes.

Table II. *Mineral contents of scalp hair in cases of psoriasis not affecting the scalp (expressed in mg/kg hair)*

Disease	Sex	Age (y.)	No. of cases		Sodium	Potassium	Calcium	Copper	Iron	Phosphorus
Psoriasis not affecting the scalp	♀	3–60	5	Mean	2 043	227	4 762	111	103	145
				Range	851–3 220	176–312	4 434–5 000	33–238	50–166	88–250
Psoriasis not affecting the scalp	♂	3–60	5	Mean	1 070	280	4 285	95	75	164
				Range	990–1 150	155–406	4 000–4 571	75–116	50–100	45–283
Psoriasis not affecting the scalp	Total M&F	3–60	10	Mean	1 765[a]	243[a]	4 601[a]	107[a]	95[a]	150[a]
				S.D.	±840	±88	±338	±66	±42	±85
Normal	M&F	3–60	30	Mean	1 531	214	4 220	79	109	124
				S.D.	±868	±141	±574	±67	±63	±101

[a] Significant $P<0.05$; not significant $P>0.05$.

Table III. *Mineral contents of serum in cases of psoriasis of the scalp*

Case	Sex	Age (y.)	No. of cases		Sodium (mg/100 ml)	Potassium (mg/100 ml)	Calcium (mg/100 ml)	Copper (mg/100 ml)	Iron (mg/100 ml)	Phosphorus (mg/100 ml)
Ps. of scalp	M&F	3–60	15	Mean ±S.D.	352±106[a]	19.9±7.5[a]	9.8±4.9[a]	119±25[a]	3.8±1.1	3.8±101
				Range	225–598	9–30	8.3–11.8	43–340	85–150	2.2–5.6
Normal	M&F	3–60	15	Mean ±S.D.	327±25	18.6±4.5	10.6±5.07	131±38	136±22	3.5±1.1
				Range	290–358	12–27	8.8–12.3	75–190	105–170	1.9–6.1

[a] Significant $P<0.05$; not significant $P>0.05$.

Sodium and potassium were estimated in each sample separately using the flame photometric procedure (7). Calcium was determined by the Erichrome se. method (2), copper by the di-ethyl di-thiocarbamate method (8), iron by the 2-2 dipyridyl method (6), and phosphorus was estimated by the Gomori method (4, 7).

RESULTS

The contents of the minerals studied in hair of scalp affected with psoriasis, as compared with normal controls, are shown in Table I and Fig. 1*a*, *b*.

The contents of the minerals studied in scalp hair of patients with psoriasis of the body not affecting the scalp, as compared with normal controls, are illustrated in Table II and Fig. 1*a*, *c*.

The contents of minerals studied in blood sera of psoriatics, as compared with normal controls, are shown in Table III.

DISCUSSION

Analysis of the above-mentioned findings showed clearly that in the case of psoriasis of the scalp, there is a constant and significant increase in the amounts of copper and phosphorus in hair. On the other hand there is a constant and significant decrease in the amounts of calcium and iron, while the decrease in the sodium and potassium contents was not affecting the scalp showed a significant increase in sodium, potassium, calcium, copper and phosphorus, together with a significant decrease in the iron content of scalp hair. It is evident that in all psoriatics there is an increase in the amounts of copper and phosphorus and a decrease in the amount of iron in scalp hair.

The results of mineral content determinations in sera of psoriatics showed that there is a possible relationship between hair and serum mineral content. There is an increase in the amounts of copper, phosphorus, sodium and potassium in both scalp hair and serum of psoriatics. There is a decrease in the iron content in both.

These findings may suggest that scalp hair as a part of the integument may suffer from psoriasis. Moreover the psoriatic process should not be considered only as a cutaneous disorder affecting both skin and nails but as a cutaneo-ungulopilary metabolic disease.

REFERENCES

1. Abdel Aziz, M. M.: A study of zinc and other minerals in dermatosis associated with abnormal keratinization, M.D. Thesis, Faculty of Medicine, Cairo University, Cairo, 1972.
2. Brush, J. S.: Determination of calcium. Anal Chem *33*: 798, 1961.
3. El-Saiee, L.: Some minerals in normal Egyptian scalp hair and in certain diseases associated with hair affection. M.D. Thesis, Faculty of Medicine, Al Azhar University, Cairo, 1974.
4. Gomori, G. J.: A modification of the colorimetric phosphorus determination for use with the photoelectric colorimeter. J Lab Clin Med *27*: 955, 1942.
5. Orfanos, C., Mahrle, G. & Christenhusz, R.: Verhornstörungen am Haar bei Psoriasis. Arch Klin Exp Derm *236*: 107, 1970.
6. Ramsay, W. N. M.: Advances in Clinical Chemistry (ed. H. Sobotta & C. P. Stewart) Vol. I, p. 1. Academic Press, New York, 1958.
7. Varley, H.: Practical Clinical Biochemistry, 4th ed., pp. 448, 475, 491. William Heinemann Medical Books, London, 1969.
8. Ventura, S. & King, E. J.: Determination of copper. Biochem J *48*: 61, 1951.

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