

SWEAT CHLORIDE CONCENTRATIONS IN RICKETS

Ergül Tunçbilek, M.D.* and Şinasi Özsoylu, M.D.**

The importance of the determination of sweat chloride in the diagnosis of fibrocystic disease of the pancreas has been established since 1953,¹ but such determinations became routine only after the introduction of pilocarpine iontophoresis for sweat collection. Furthermore, it is known that sweat chloride concentrations may be higher than normal in other conditions, such as hereditary diabetes insipidus,² allergic disorders,³ glycogen storage disease⁴ and chronic pulmonary emphysema.

In vitamin D deficiency rickets, which is still fairly common in this country, sweating is increased and chronic or treatment-resistant pulmonary infection is rather frequent, as it is in fibrocystic disease of the pancreas.

In this study, sweat chloride concentrations were determined for patients with rickets to learn whether they were increased or normal.

Material and Method

Sweat chloride concentrations were determined for 50 children between the ages of five months and two years with active rickets, which had been diagnosed by x-ray examination of the wrist, and 20 control patients in the same age range without rickets. In the study group, 19 patients had upper respiratory infections, 19 had bronchopneumonia, five had otitis media suppurativa and seven had malnutrition, in addition to rickets, when their sweat was collected for chloride determinations (Table 1). One quarter of these patients had also had a history of at least two episodes of lung infection during the last year. Control patients were from the outpatient population without serious infection and no history compatible with fibrocystic disease of the pancreas.

Results

The amount of sweat collected from the patients with rickets varied between 39 and 350 mg, with a mean of 83.875 ± 7.669 mg.

From Hacettepe University Faculty of Medicine, Department of Pediatrics, Ankara.

* Pediatrician, Hacettepe Children's Hospital.
** Hematologist and Associate Professor of Pediatrics.

TABLE 1
PATIENTS WITH RICKETS

	AGE	SEX	THE DISEASES FOUND IN ADDITION TO RICKETS	SWEAT AMOUNT (mg)	CHLORIDE IN THE SWEAT (mEq/L)
1	9/12	F	URI	349.70	7.
2	1	M	Otitis media	114.50	9.2
3	9/12	F	URI	40	49
4	9/12	M	none	80.45	17
5	1	F	Bronchopneumonia	45	48
6	9/12	M	Bronchopneumonia	101	24
7	1	F	none	121.30	25
8	7/12	F	Otitis media	39	41
9	8/12	F	URI	100.25	26
10	8/12	F	Bronchopneumonia	71.85	22
11	8/12	M	Pharyngitis	49	40
12	6/12	F	Bronchopneumonia	102.60	26
13	6/12	M	URI	42.90	34
14	9/12	M	Bronchopneumonia	75.30	27
15	11/12	F	URI	70.90	25
16	11/12	M	Bronchopneumonia	115.35	9.1
17	6/12	M	Bronchopneumonia	85.60	13
18	6/12	F	URI	92.95	36
19	8/12	F	URI	128.85	17
20	9/12	F	none	44.35	26
21	8/12	M	Bronchopneumonia	146.16	12
22	5/12	F	URI	45.90	30
23	14/12	M	Otitis media	42	43
24	1	M	URI	45.85	28
25	2	M	none	39.30	23
26	14/12	F	URI	59.10	28
27	10/12	M	URI	103	44
28	2	M	none	43.25	41
29	5/12	F	URI	40.80	45
30	9/12	F	Bronchopneumonia	87.75	20
31	5/12	F	Bronchopneumonia	125.90	22
32	9/12	M	URI	117.95	31
33	9/12	M	Bronchopneumonia	67.85	48
34	6/12	M	URI	76.85	30
35	1	F	none	39.45	41
36	11/12	M	URI	119.85	25
37	6/12	M	URI	93.85	29
38	8/12	M	Bronchopneumonia	124.20	44
39	6/12	M	Bronchopneumonia	86.15	22
40	6/12	F	Bronchopneumonia	119.30	9
41	9/12	F	Otitis media	96.80	11
42	10/12	M	Bronchopneumonia	111.05	18
43	11/12	M	Otitis media	69.20	37
44	8/12	F	URI	41.66	24
45	10/12	M	Bronchopneumonia	87.90	24
46	6/12	M	Bronchopneumonia	69.40	36
47	10/12	M	URI	105	22
48	10/12	F	Bronchopneumonia	63.45	25
49	1	F	Bronchopneumonia	44.10	24
50	6/12	M	none	42.85	21

In the control group the amount varied from 38 to 121 mg, with a mean of 58.277 ± 21.601 mg. The chloride concentration was found to be 7 to 49 mEq/L in the study group and 15 to 43 mEq/L in the control group. The mean values were $30.333 \text{ mEq/L} \pm 2.198$ and $30.944 \text{ mEq/L} \pm 2.544$, respectively.

Comments

It has been shown that if the quantity of sweat is minimal the chloride concentration may be falsely high. For this reason, we analyzed our sweat quantity results statistically for patients and for the control group. No significant differences could be found. Technically, when the sweat quantity was less than 38 mg, the whole test was repeated.

In addition to the conditions mentioned previously, it has been shown that sweat chloride concentrations may be increased in patients who have had prolonged profuse sweating. If patients with rickets do not have secondary infection, the common complaint is excessive sweating. The treatment of pulmonary infection in these children usually takes a much longer time than in children without rickets. Further, patients with rickets usually have protuberant abdomens due to muscular hypotonia, which may give the impression of malabsorption belly. Therefore, in patients with pulmonary infection who also have rickets, the possibility of fibrocystic disease of the pancreas may be entertained in the differential diagnosis. With this study, we have shown that sweat chloride determination could easily be used to differentiate the two diseases.

Summary

Sweat chloride concentrations were determined in 50 patients with rickets and in 20 control patients. No significant differences could be found between the two groups. The authors suggest that sweat chloride determination could easily be used to differentiate fibrocystic disease of the pancreas from rickets.

REFERENCES

1. Darling, R. C., di Sant'Agnese, P. A., Perera, G. A. and Andersen, D. H. : Electrolyte abnormalities of sweat in fibrocystic disease of pancreas, *Am. J. M. Sc.* 225 : 67, 1953.
2. Lobeck, C. C., Barta, R. A., and Mangos, J. A. : Study of sweat in pitressin-resistant diabetes insipidus, *J. Pediat.* 62 : 868, 1958.

3. Hsia, D.Y.Y., Driscoll, S. G., Greenberg, D., Lee, T. C. and Lanoff, G. : Abnormal sweat electrolytes in patients with allergies; a preliminary report, *A.M.A.J. Dis. Child.* 86 : 685, 1958.
4. Harris, R. C. and Cohen, H. I. : Sweat electrolytes in glycogen storage disease, type I, *Pediatrics* 31 : 1044, 1963.
5. Wood, J. A., Fishman, A. P., Reemtsma, K., Barker, H. G. and di Sant' Agnese, P. A. : A comparison of sweat chlorides and intestinal fat absorption in chronic obstructive pulmonary emphysema and fibrocystic disease of the pancreas, *New England J. M.* 260 : 951, 1959.
6. Tolgo, A., Dietz, A. A., Crane, J. B. and Reisner, D. : Sweat electrolytes in chronic pulmonary disease, *Ann. Intern. Med.* 58 : 961, 1963.
7. Cole, M. B., Hammel, J. V., Koenigsberg, M. et al: Sweat chloride testing in chronic lung disease, *J. Amer. Geriat. Soc.* 12 : 881, 1964.
8. Gup, A. M. and Briggs, G. W. : Elevated sweat sodium and chloride in adult without cystic fibrosis, *Arch. Intern. Med. (Chicago)* 112 : 699, 1963.
9. Gibson, L. E. and Cooke, R. E. : A test for concentration of electrolytes in sweat in cystic fibrosis of the pancreas utilizing pilocarpine by iontophoresis, *Pediatrics* 23 : 545, 1959.
10. Meites, S. and Faulkner, W. R. : *Manual of Practical Micro and General Procedures in Clinical Chemistry*, Springfield, Charles C. Thomas, 1962, p. 36.