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FREE SERUM CALCIUM IN URTICARIA

By

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Ionized or free serum calcium (Ca_F^{2+}), diffusible complexed calcium and non-diffusible complexed calcium are the three fractions of calcium in plasma. Ca_F^{2+} has been considered to be the physiologically active fraction, influencing cell membrane permeability (4).

Some years ago, a flow-through electrode assembly for determining Ca_F^{2+} became available commercially. Since then, numerous articles have been published on calcium homeostasis in healthy subjects as well as in diseases affecting the parathyroid glands (2, 5, 6, 7, 8). The aim of this study was to examine the role of calcium in urticaria. Calcium has been recommended as therapy in urticaria and other allergic conditions. However, controlled studies on calcium metabolism in such conditions are lacking.

MATERIAL AND METHODS

The series consisted of 181 patients examined in 1972-1973 at the Department of Dermatology, University Central Hospital, Helsinki. Of the 181 patients 117 were women and 64 men. Their ages ranged from 18 to 77 years, with a mean of 38.1 years (Table 1). The cases of urticaria were divided into two groups according to the duration of the eruption. Those with symptoms of over two months' duration were regarded as chronic (99 cases) and the others as acute (50 cases). The comparison series consisted of 32 patients, 4 with psoriasis, 5 with connective tissue disease, 3 with sarcoidosis, and 3 with pyogenic infection of the skin, two cases each of atopic dermatitis, acne, pemphigoid, and calcinosis cutis, and one each of seborrhoeic dermatitis, erythrodermia, myeloma, non-definite pruritus, vitiligo, tinea, lichen ruber, alopecia areata and neurodermatitis.

TABLE 1

The Age and Sex Distribution of 210 Cases with Estimated Serum Ca_F^{2+} Level.

	No. of cases	Sex		18-39	40-59	≥ 60
		F	M			
Urticaria	149	95	54	58	76	15
chronic (> 2 months)	99	67	32	40	51	8
acute (≤ 2 months)	50	28	22	18	25	7
Other diseases	32	22	10	8	18	6
Controls	29	15	14	17	12	

In addition to the 181 patients, 29 apparently healthy volunteers from the staff of the dermatological clinic were included as controls.

Ca_F^{2+} was measured potentiometrically by using a Model 99-20 Serum Calcium Flow-thro system and a Model 701 Digital pH/mV meter (both from Orion Research Inc., Cambridge, Mass. 02139). For the analysis, venous blood from fasting individuals was collected in siliconized "Vacutainer" stoppered tubes without additives. All the tubes were filled to capacity to avoid direct contact between blood and atmospheric air. The blood samples were allowed to clot at room temperature for 2-3 hours, then centrifuged. The serum samples were withdrawn from the tubes into 1 ml plastic disposable syringes before the measurement was made. Standard solutions of 0.5, 1.0 and 2.0 mmol of Ca^{2+} per litre, each containing 0.15 mol of NaCl per litre (purchased from Orion Research) were used for the routine potentiometric analyses.

Serum albumin was measured with the bromocresol green method (1).

RESULTS

Serum albumin was normal in all but two cases. Both of them had constantly lowered albumin values. One of them had chronic, extensive psoriasis, and the other had scleromyxoedema.

The normal ranges of Ca^{2+} were 0.95-1.30 mmol/l. Fig. 1 shows the distribution of Ca_F^{2+} values in urticaria, in comparison cases, and in controls. The mean values in the various groups did not differ significantly. A hypocalcaemic value was found in one case (Case 1 in Fig. 1). The woman suffered from chronic urticaria, and further examinations revealed true hypoparathyroidism. Hypercalcaemic values were found in 6 cases. In 2 of them (Cases 2 and 3 in Fig. 1), hyperparathyroidism was confirmed later. One man with diabetes mel-

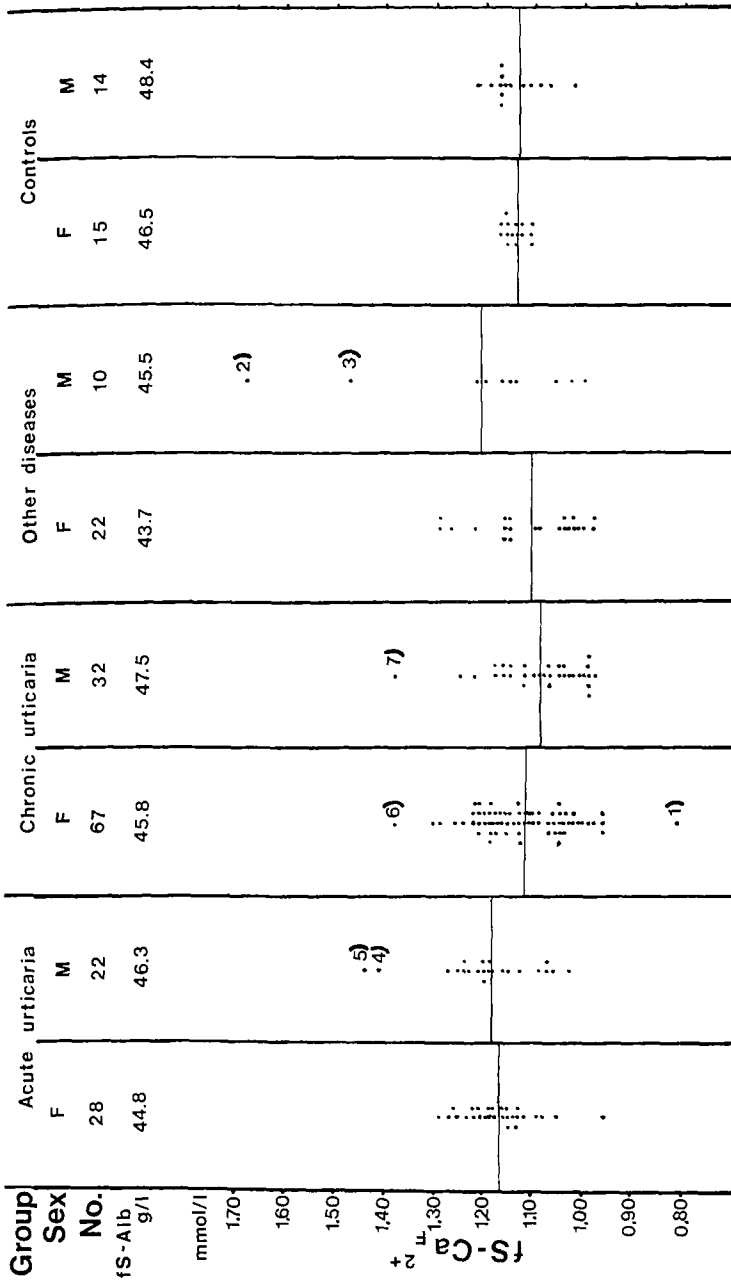


Fig. 1.

Serum albumin (fS-Alb) and free serum calcium (CaF^{2+}) values in urticaria, comparison series and controls. 1), 2), 3), 4), 5), 6), and 7) : see text.

TABLE 2

The Influence of Intravenous Calcium Gluconate (1 g) on the Free Serum Calcium (Ca_F^{2+})

Patient No.	Age years	Fasting	Ca_F^{2+} mmol/l	
			5 minutes	2 hours
1	35	1.13	1.26	1.20
2	22	1.22	1.38	1.22
3	25	1.27	1.50	1.33
4	33	1.16	1.33	1.30
5	41	1.21	1.30	1.24
6	32	1.18	1.30	1.22
7	52	1.10	1.17	1.14

litus was slightly acidotic when serum calcium was determined. In the three remaining cases (Cases 5, 6 and 7) no definite cause was found for the slight hypercalcaemia.

The influence of intravenous calcium injection on the amount of Ca_F^{2+} was examined by giving 1 g of a commercially available calcium gluconate to 7 female patients with urticaria (3 cases of acute urticaria and 4 of chronic urticaria). Ca_F^{2+} was determined just before, and 5 minutes and 2 hours after the injection, respectively. Only slight rises were encountered after 5 minutes, and the 2-h values were within normal limits in all but one sample (See Table 2).

CONCLUSIONS

In recent years, Ca_F^{2+} has been found to reflect the functional status of the patient's calcium metabolism better than the total amount of serum calcium (2, 3, 8).

In vitro studies have revealed that calcium is an essential co-factor in the antigen-evoked histamine release reaction in human cutaneous anaphylaxis (9). Absence of calcium ions abolished the second stage of histamine release from human leucocytes. However, there was no difference in histamine release between high and normal levels of calcium (9).

In the present study, Ca_F^{2+} values in the series of patients with urticaria did not differ from those of the comparison series or controls. Moreover, 1 g of calcium gluconate given intravenously caused only slight rise in the Ca_F^{2+} value. Thus, the amount of free serum calcium seems to be normal in urticaria, and there appears to be no reason to give calcium either intravenously or perorally in this disease.

SUMMARY

Serum Ca_F^{2+} was determined in 50 cases of acute urticaria, 99 cases of chronic urticaria, a comparison series consisting of 32 patients with various diseases and 29 apparently healthy controls. The mean values of Ca_F^{2+} in various groups did not differ significantly from each other. Seven cases showed abnormal values. Among these, further examinations revealed one case of hypoparathyroidism and 2 cases of true hyperparathyroidism. Intravenous injection of 1 g of calcium gluconate caused only slight rises in Ca_F^{2+} values. The raised values fell to normal in most cases within 2 hours. It is inferred that urticaria is not associated with detectable disturbances in calcium metabolism. Thus, treatment of urticaria with intravenous or peroral calcium does not seem to be indicated.

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