

(From the University Hospital, Medical Out-patient Department and Allergy Clinic, Copenhagen. Director: Prof. Eggert Møller, M.D.)

DIAGNOSTIC USE
OF ALTERATIONS IN EOSINOPHILS AFTER
INJECTION OF HISTAMINE INTO
ALLERGIC PATIENTS¹

By

ERIK ANDERSSON

Although the mechanism of allergic reactions has been thoroughly studied, its problems have not yet been elucidated. During recent years histamine or histamine-like substances have been thought to be important factors in allergic reactions (1, 2, 3).

Serafini (4) found an increase in the histamine concentration of the blood after specific allergic skin reactions in sensitive patients. He also reported a marked increase in the histamine level of the blood after subcutaneous injection of histamine into allergic patients. Similar subcutaneous injections did not lead to any such increase in normal subjects. After injection of histamine, patients with bronchial asthma get an attack resembling asthma, manifesting itself as reduced vital capacity and audible wheezing. In normal subjects a corresponding histamine injection does not induce visible or measurable changes (5). The attacks that can be induced in allergic patients occur quite soon after the injection, also in patients who are entirely symptom free at the time of injection. The most severe cases of asthma show the most marked reactions (5, 6).

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In addition to eliciting mild or severe attacks of asthma, the injection of histamine into allergic patients also induced an increase in the number of circulating eosinophilic leucocytes, an increase which is not observed in normal subjects injected with histamine (7).

The present study was an endeavour to ascertain whether subcutaneous injection of histamine is applicable in diagnosing allergy on the basis of alterations in the number of circulatory eosinophil cells.

METHOD

A total of 50 asthmatics and 50 subjects without asthma or other allergic diseases, were injected subcutaneously with histamine, 0.5 mg. The eosinophil cells, in the blood were counted before and 15 minutes after the injection. Eosinophils were counted in capillary blood by v. Dungeren's method using Andersen's (8-9) modification. In all the asthmatics, the diagnosis was based on thorough studies, including allergy tests. The normal subjects were students and nurses or patients with mild gastric symptoms whose gastric secretion was to be studied after injection of histamine. None of the normal subjects had a history or objective signs of allergic diseases.

RESULTS

The results are given in Table 1 and 2. Table 1 shows that in 44 of the allergic patients the injection was followed by an increase in the circulating eosinophils, whereas in 6 there was a slight drop. All the 50 allergic patients had more or less severe focal reactions, ranging from a slight feeling of pressure in the chest to actual attacks of asthma. Among the normal subjects (Table 2) 34 showed a fall in the number of circulating eosinophils, 12 an increase, and 4 no change. None of the normal subjects had any complaints after the injection.

In counting eosinophil cells according to the present method, the standard deviation does not in any case exceed 15 %, but it is most marked at low eosinophil counts (9, 10).

TABLE 1

Number of eosinophil cells per ml blood before and after subcutaneous injection of 0.5 mg histamine into 50 asthmatic patients.

No.	Sex	Age	Eosinophil cells per ml.		Change in per cent
			Before histamine	15 minutes after histamine	
1	♀	32	3100	3420	+ 10
2	♀	27	520	610	+ 15
3	♂	38	962	1452	+ 34
4	♂	57	410	415	+ 1
5	♀	38	715	1050	+ 33
6	♀	35	506	563	+ 11
7	♂	49	150	338	+ 122
8	♂	31	988	1559	+ 57
9	♂	52	488	1000	+ 112
10	♀	56	412	788	+ 88
11	♀	58	710	1050	+ 47
12	♀	61	860	810	— 6
13	♀	48	370	480	+ 29
14	♂	63	510	720	+ 41
15	♂	61	600	580	— 2
16	♂	29	460	730	+ 58
17	♂	26	510	600	+ 17
18	♂	38	300	450	+ 50
19	♂	21	400	630	+ 57
20	♂	32	300	680	+ 106
21	♂	56	600	1150	+ 91
22	♂	54	520	730	+ 40
23	♂	48	1000	1310	+ 31
24	♂	19	510	630	+ 23
25	♂	62	870	860	— 1
26	♂	47	500	980	+ 98
27	♂	43	530	750	+ 40
28	♂	41	310	450	+ 45
29	♀	25	700	940	+ 36
30	♀	58	650	1160	+ 78
31	♀	24	920	1410	+ 54
32	♂	55	640	750	+ 14
33	♂	39	580	830	+ 43
34	♀	54	300	560	+ 86
35	♀	28	670	920	+ 37
36	♀	27	310	360	+ 16

TABLE 1 (cont.)

No.	Sex	Age	Eosinophil cells per ml.		Change in per cent
			Before histamine	15 minutes after histamine	
37	♀	32	420	600	+ 42
38	♂	31	570	380	— 33
39	♂	42	1050	1270	+ 21
40	♀	58	480	520	+ 8
41	♀	28	210	180	— 14
42	♂	49	320	630	+ 99
43	♂	38	400	550	+ 37
44	♀	25	170	250	+ 35
45	♀	38	720	1050	+ 45
46	♂	29	810	780	— 3
47	♂	47	440	870	+ 91
48	♀	53	310	530	+ 70
49	♀	39	160	280	+ 73
50	♀	57	460	600	+ 30

TABLE 2

Number of eosinophil cells per ml blood before and after subcutaneous injection of 0.5 mg histamine into 50 normal subjects.

No.	Sex	Age	Eosinophil cells per ml.		Change in per cent
			Before histamine	15 minutes after histamine	
1	♂	20	186	114	— 38
2	♂	24	248	162	— 35
3	♀	21	46	0	—100
4	♂	27	124	16	— 89
5	♀	51	425	150	— 64
6	♀	23	88	75	— 15
7	♀	19	125	148	+ 16
8	♂	38	494	463	— 6
9	♂	27	68	20	— 70
10	♂	31	102	78	— 24
11	♂	26	270	160	— 40
12	♂	32	140	70	— 50

TABLE 2 (cont.)

No.	Sex	Age	Eosinophil cells per ml.		Change in per cent
			Before histamine	15 minutes after histamine	
13	♀	67	50	60	+ 20
14	♂	38	150	30	— 80
15	♀	42	180	170	— 5
16	♀	27	70	140	+ 100
17	♂	31	110	20	— 81
18	♂	29	130	100	— 23
19	♀	37	80	20	— 75
20	♀	19	60	60	0
21	♂	30	40	50	+ 25
22	♀	68	40	20	+ 50
23	♂	55	70	10	— 85
24	♂	22	60	50	— 16
25	♀	70	220	150	— 31
26	♀	31	90	40	— 55
27	♂	29	30	60	+ 50
28	♀	31	40	30	— 25
29	♀	35	140	40	— 71
30	♀	43	50	50	0
31	♀	36	0	0	0
32	♀	45	80	40	— 50
33	♂	37	70	20	— 71
34	♀	26	60	50	— 16
35	♀	31	130	100	— 23
36	♂	45	70	20	— 71
37	♀	61	30	40	+ 33
38	♂	68	110	120	+ 9
39	♂	55	170	90	— 47
40	♀	37	80	100	+ 25
41	♂	39	75	15	— 85
42	♀	44	50	50	0
43	♀	28	10	0	— 100
44	♂	41	50	70	+ 40
45	♂	22	200	150	— 45
46	♂	53	90	30	— 66
47	♂	61	40	50	+ 35
48	♀	25	50	10	— 80
49	♀	63	40	80	+ 50
50	♂	19	180	200	+ 16

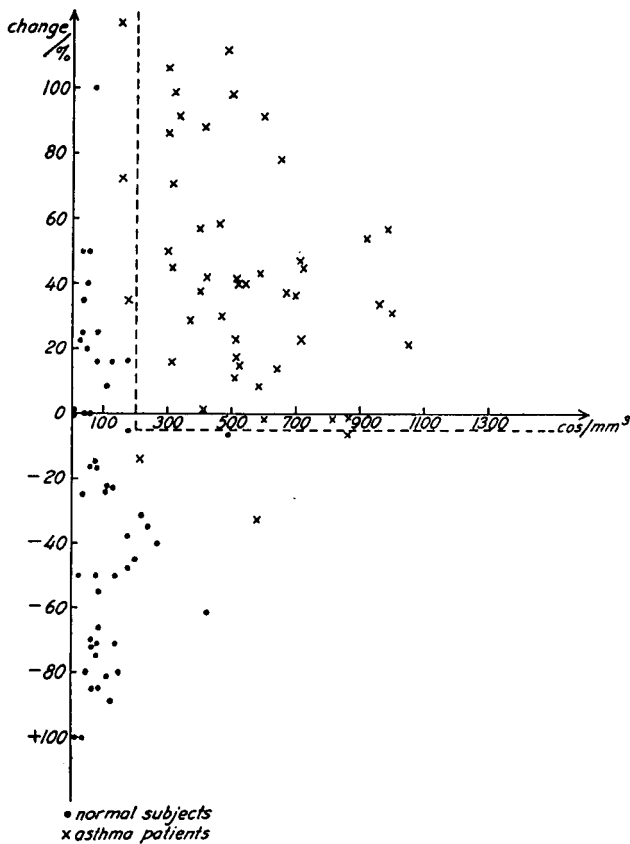


Fig. 1.

Fluctuations in eosinophils following administration of 0.5 ml 1 % histamine to normal and allergic subjects.

A glance at Fig. 1 shows that all the allergic asthma patients are grouped above the abscissa, whereas the normal subjects are grouped mainly below the abscissa close to the axis of the ordinate. A line drawn parallel with the axis of the ordinate through 200 on the abscissa and another line parallel with the abscissa through -5 form an angle which holds 90 % of the allergic values and none of the normal values. On this basis it may be said that, if the test fulfills the conditions (I)

patient's eosinophil count over 200 and (II) a change from —5 and upwards, we have a strong indication that the patient is suffering from allergic asthma.

The upper limit of normal eosinophil count is generally stated to be 400 cells per μ ml. By the present method this limit may be lowered down to 200 eosinophil cells per μ ml.

The standard deviation in counting the eosinophils affects the diagram but little, as it influences mainly the fluctuation of the non-allergic subjects about the axis of the abscissa. It is evident, moreover, that in the non-allergic subjects there is a tendency for the eosinophils to decrease after injection of histamine. This occurred in 78 % of the cases.

CONCLUSION

In 90 % of the asthmatics injection of histamine was followed by an increase in the circulating eosinophils and, at the same time, by an asthma-like attack. This indicates that in allergic asthma patients histamine induces a condition which resembles or is identical with an allergic reaction, whereas in normal subjects it has no effect or perhaps even causes a slight fluctuation in the negative direction. Injection of histamine as described above may, therefore, be used as a means of diagnosing allergy, provided the circulating eosinophils in the allergic asthma patients exceed 200 per μ ml.

SUMMARY

The effect of histamine injection on the eosinophil cells in 50 allergic asthma patients and in 50 non-allergic subjects was studied. In 90 % of the allergic patients, histamine caused an increase in the number of eosinophil cells, whereas in non-allergic subjects it generally gave rise to a slight drop. This method may be used in diagnosing allergy, if the circulating eosinophils exceed 200 per μ ml.

The present study only concerns allergic asthma; further studies are being made to investigate the histamine test in other types of allergy.

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