

Leprosy

III. A Comparison of IgA and IgM Immunoproteins of Patients with Pulmonary Tuberculosis and Leprosy^{1,2}

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In the previous paper we reported serum IgA and IgM immunoprotein changes in patients with leprosy (⁴). Briefly, IgA globulins were elevated in all types of leprosy. IgM globulins were elevated in practically all patients with lepromatous leprosy and in a much smaller number of patients with tuberculoid and indeterminate types of the disease. We investigated the serums of patients with pulmonary tuberculosis and compared the findings with our data from leprosy serums because there may be similar serum protein changes in these two disorders, since (1) the causative bacterial organisms are members of the same microbial family, (2) cutaneous hypersensitivity appears to be a reflection of partial disease protection in both disorders, and (3) both the lepromin and Mantoux reaction can convert from negative to positive after BCG inoculation (a possible manifestation of cross-immune reaction).

MATERIALS AND METHODS

The diagnosis of tuberculosis was established by clinical findings, laboratory studies (culture, etc.), and chest x-ray findings on 50 patients with untreated pulmonary tuberculosis seen at University Hospital, College of Medicine, Seoul National University, Seoul, Korea. The patients were classified as to (a) extent of pulmonary tuberculosis, based on the criteria of the National Tuberculosis Association (²) and (b) the sex and age of the patient (Table 1). The serums of these patients were col-

lected before therapy was started and were handled in the manner previously reported (⁵).

The serum electrophoresis and immunoelectrophoresis (IEP) (semiquantitative) determinations were made in the same manner as previously reported (^{4,5}), and with the same antisera (⁴). The serums of 25 normal subjects (not the same normals as used before (⁴)) were used as controls. All these normals had positive Mantoux tests. Pooled normal serum was used in IEP.

RESULTS

The results of the serum protein electrophoresis in the 50 patients and 25 normal subjects are seen in Table 2.

The semiquantitative results of the immunoelectrophoretic study with respect to the extent of tuberculosis, i.e., far advanced (Adv.), moderately advanced (Mod.) and minimal (Min.), are summarized in Table 3. The findings with respect to the ages of the patients are seen in Table 4.

DISCUSSION

Our serum protein electrophoresis (EP) findings of tuberculosis serums were similar to those reported by other investigators (^{4,5,6}) and to our previous EP results in leprosy serum (⁴); that is, with chronic infectious inflammatory disease the albumin fraction is lower than normal while the gamma globulin fraction is elevated.

The results of the immunoelectrophoresis analyses of tuberculosis serums were different from those of leprosy serums (⁴). The majority of the tuberculosis patients demonstrated more prominent IgA arcs in their serums than did normal subjects (Table 5, Figs. 1 and 2). Only a small percentage of patients showed prominent IgM arcs. The findings became more readily evident when

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TABLE 1. Classification of patients with pulmonary tuberculosis by sex and age.

Age in years	Sex		Extent of disease			Total
	M	F	Far adv. ^a	Mod. adv. ^b	Min. ^c	
<21	7	2	0	5	4	9
21-40	25	4	8	9	12	29
>40	11	1	6	3	3	12
Total	43	7	14	17	19	50

^a Far advanced^b Moderately advanced^c Minimal

TABLE 2. Serum protein electrophoresis.

Subjects	Protein concentration in % of total serum proteins $\bar{x} \pm$ S.D.				
	Albumin	Alpha ₁	Alpha ₂	Beta	Gamma
Normals (25)	59.1 \pm 3.9	5.1 \pm 1.6	10.6 \pm 1.8	8.0 \pm 1.3	17.2 \pm 2.4
Tuberculosis patients (50)	52.6 \pm 7.7	5.2 \pm 1.8	12.4 \pm 3.1	8.6 \pm 1.9	21.2 \pm 3.6

the serums of the patients were diluted 1:2 and 1:4 (Table 5, Fig. 1). When the patients were classified as to their extent of pulmonary tuberculosis (Table 3, Fig. 3), the responses of IgA and IgM globulins were similar to those noted in Figure 1; however, the concentration of IgA globulins in the patients with advanced or moderately advanced tuberculosis did not change with dilution of the patient's serum. The IgA titers appeared to be elevated. Only the advanced cases of pulmonary tuberculosis showed significant elevation of IgM globulin response.

The globulin responses of the patients with tuberculosis were similar to those of the patients with tuberculoid leprosy, but quite different from the responses of the lepromatous patients, who had a marked rise in IgM globulins with only a moderate rise in IgA globulins. We have previously demonstrated a difference in the IgA globulin response, based on ages of the patients with lepromatous leprosy (⁴). Our results in tuberculosis could not be conclusive since we had only nine patients under the age of 21 years (Table 4). The divergent

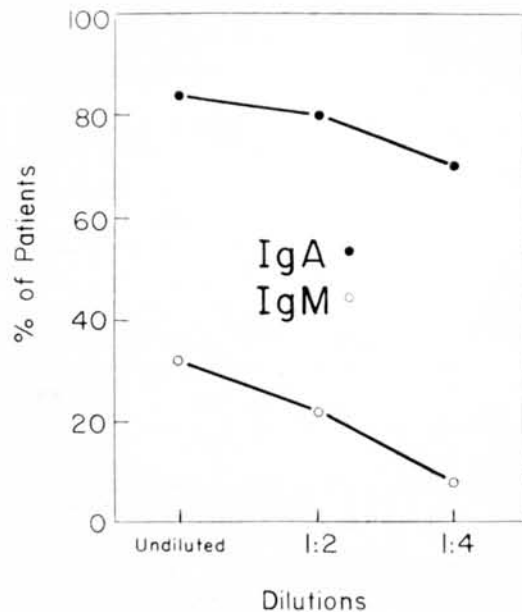


FIG. 1. Percentage of patients showing prominent IgA and IgM precipitating arcs after serial dilution of serums.

TABLE 3. Number of patients with various extents of pulmonary tuberculosis having prominent IgA and IgM precipitating arcs.

Extent of pulmon. tbc.	Patients' serums												Total patients in each category (extent of disease)
	Undiluted				Diluted 1:2				Diluted 1:4				
	IgA +		IgM +		IgA +		IgM ++		IgA ++		IgM ++		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Far adv.	13	93	7	50	13	93	4	29	13	93	2	14	14
Mod. adv.	13	81	4	25	12	75	2	13	12	75	0	0	16
Min.	16	80	5	25	15	78	2	10	11	55	1	5	20

Percentage was calculated from the numbers of patients with prominent arcs (+) or with arcs present in patients' serum and absent in normals (++) using the total number in each category (extent of disease).

TABLE 4. Number of patients in different age groups having prominent IgA and IgM precipitating arcs.

Age in years	Patients' serums												Total patients in each age group
	Undiluted				Diluted 1:2				Diluted 1:4				
	IgA +		IgM +		IgA +		IgM ++		IgA ++		IgM ++		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
<21	6	66	2	22	6	66	1	11	6	66	0	0	9
21-40	24	83	10	34	24	83	7	24	21	72	3	10	29
>40	12	100	4	33	10	83	0	0	9	75	0	0	12

Percentage was calculated from the numbers of patients with prominent arcs (+) or with arcs present in the patients' serum and absent in normals (++) using the total number in each category (age group.)

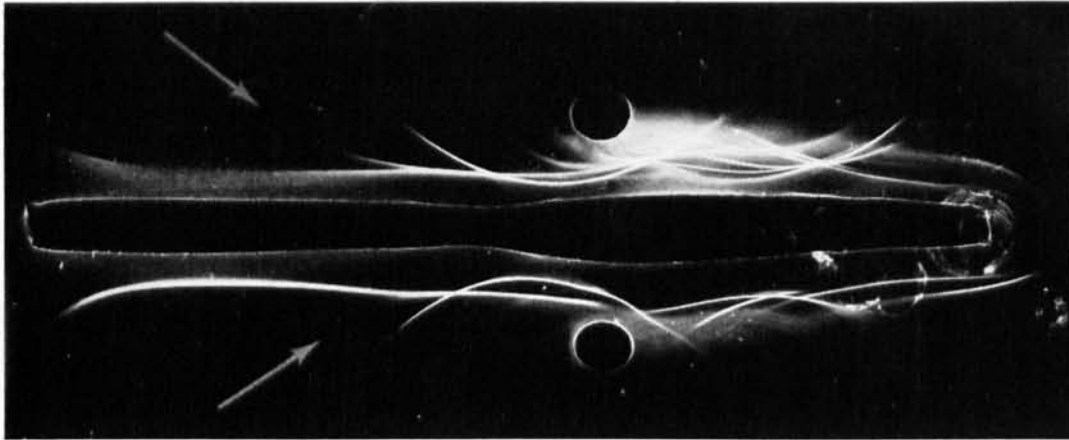


FIG. 2. Immunoelectrophoretic patterns. The upper pattern is of tuberculous serum, 1:2 dilution. The lower pattern is of normal serum, 1:2 dilution. The antiserum is antihuman horse serum. Note that IgA arc (arrows) is more prominent in the tuberculous serum than in the normal serum.

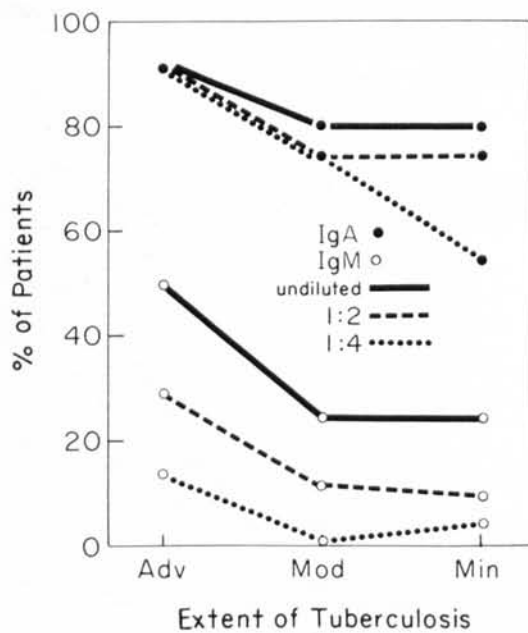


FIG. 3. Percentage of patients with varying extents of pulmonary tuberculosis showing prominent IgA and IgM precipitating arcs after serial dilution of their serums.

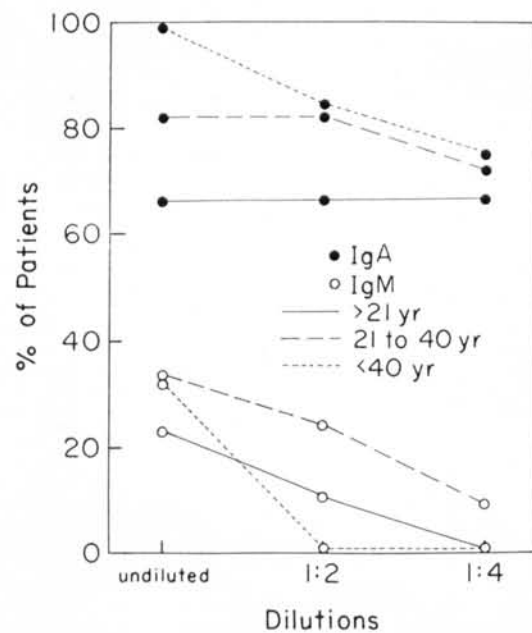


FIG. 4. Percentage of patients of various age groups showing prominent IgA and IgM precipitating arcs after serial dilution of their serums.

TABLE 5. Number and percentage of patients with prominent arcs.

	Patients' serums											
	Undiluted				Diluted 1:2				Diluted 1:4			
	IgA +		IgM +		IgA +		IgM ++		IgA ++		IgM ++	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Patients with prominent arcs	42	84	16	32	40	82	11	22	35	70	4	8

IgA globulin response seen in lepromatous leprosy patients of different age groups was not seen in the tuberculosis data (Fig. 4).

SUMMARY

A relatively larger number of patients with pulmonary tuberculosis show IgA globulin response than IgM globulin changes. These serum findings were similar to those described in tuberculoid leprosy serum, but different from those in lepromatous leprosy.

RESUMEN

Relativamente mayor número de pacientes con tuberculosis pulmonar mostró una respuesta de la IgA globulina que de la IgM globulina. Estos hallazgos en el serum fueron similares a aquellos descritos en el serum de la lepra tuberculoides, pero diferentes de aquellos en lepra lepromatosa.

RÉSUMÉ

Chez des malades atteints de tuberculose pulmonaire, une réponse des globulines IgA a été observée relativement plus fréquemment que des changements dans les globulines IgM. Les observations ainsi faites sur le sérum sont semblables à celles qui ont été décrites

pour le sérum de malades atteints de lèpre tuberculoides, mais elles sont différentes de celles obtenues dans la lèpre lépromateuse.

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