

Serum Immunoglobulins in Patients with Prostate Cancer*

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Summary. Immunoelectrophoresis of serum proteins was performed on 16 patients with locally invasive (Stage III) and 20 patients with advanced (Stage IV) prostate cancer. Mean values of Immunoglobulin-G (IgG) was higher in Stage III than in Stage IV prostate cancer, although no remarkable changes were observed in the mean values of Immunoglobulin-A (IgA) and Immunoglobulin-M (IgM). - The percentage of the pa-

tients with decreased IgM was found to be higher in Stage IV (12 out of 20) than Stage III (3 out of 16) prostate cancer. Determination of serum immunoglobulins may be a useful, additional parameter in the evaluation of therapeutic responses in patients with prostate cancer.

Key words: Prostate cancer, immunoglobulins, immunoelectrophoresis

Serum Immunoglobulins in Patients with Prostate Cancer

During the last decade, the concept of immunologic competence has attracted much attention in order to understand the development and dissemination of malignant growth. "Immunologic surveillance" is regulated by two components of the lymphatic system; thymic system and germinal centers of lymph follicles. The thymic system and its dependent lymphocytes mediate delayed hypersensitivity while the germinal centers mediate humoral immunity by synthesizing immunoglobulins. The impairment of delayed hypersensitivity in patients with cancer has been shown by the intradermal injection of various antigens (1-5) and by topical application of chemicals such as DNCB (Dinitrochlorobenzene) (3-5). In spite of the impairment of delayed hypersensitivity, the ability of patients to form humoral antibodies appears to be well preserved (6-8).

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The value of immunoelectrophoresis (IEP) as a means of screening of immunologic competency in patients with various malignancies is well documented (9). The present study is concerned with the ability of patients with different stages of prostate cancer to form humoral antibodies as evaluated by immunoelectrophoresis.

Materials and Methods

Sixteen patients (ages ranging from 68 to 81 with an average age of 74) with locally invasive (Stage III) prostate cancer and 20 patients (ages ranging from 52 to 83 with an average age of 68) with advanced (Stage IV) prostate cancer were studied (Fig. 1).

After the initial histological diagnosis of cancer by biopsy, rectal palpation of the prostate gland, the levels of serum and bone marrow acid phosphatases, and the radiography of the skeletal system were utilized in staging of prostate cancer. Hormonal treatment utilized in these patients at the time of the study is summarized in Fig. 2.

Fig. 1. Immunoglobulins in prostate cancer

Stages	Age distribution				Total
III	-	5	9	2	16
IV	4	7	7	2	20
Ages	60	61-70	71-80	80	36

Fig. 2. Immunoglobulins in prostate cancer Stage III vs Stage IV Cancer

Present Treatment	Stages		Total
	III	IV	
none	1	1	2
oes. alone	-	1	1
orch. alone	2	1	3
orch. + oes.	13	16	29
orch. + oes. + cortisone	-	1	1
Total	16	20	36

Immunoglobulins were assayed by the single radial diffusion method (10) utilizing goat anti-human antisera to IgG, IgA and IgM and the immunoplates obtained from Hyland Lab., Los Angeles, Calif.

Values of immunoglobulins in normal male are reported to be as follows 11-12: Immunoglobulins G (IgG) 1158 ± 305 mgm%, Immunoglobulins A (IgA) 200 ± 60 mgm%, and Immunoglobulins M (IgM) 99 ± 27 mgm%.

Table 1. Serum immunoglobulins in state III prostate cancer (Mgm %)

of PTS.	IgG	IgA	IgM
1	1550	420	72
2	1400	500	76
3	1300	240	82
4	1600	345	75
5	1000	350	110
6	1160	270	118
7	2700	330	50
8	300	60	14
9	510	95	31
10	1850	760	108
11	1000	230	260
12	1300	270	52
13	2200	430	32
14	1300	400	125
15	1650	340	90
16	1100	270	67

Results

Comparison of the serum concentrations of IgG, IgA and IgM immunoglobulins between patients with Stage III and Stage IV prostate cancer revealed higher IgG levels in Stage III carcinoma (Table 1, 2). No significant changes were observed in mean values of IgA and IgM levels between the two group (Fig. 3). However, the evaluation of comparative distribution of immunoglobulins

Fig. 3. Mean values of serum immunoglobulins in prostate cancer

	IgG	IgA	IgM
Normal values	853-1463	140-260	72-126
Stage III 16pts	1525	317	85
Stage IV 20pts	1096	279	71

Table 2. Serum immunoglobulins in stage IV prostate cancer (Mgm %)

	IgG	IgA	IgM
1	1000	330	40
2	1200	260	36
3	158	38	20
4	2300	148	140
5	1100	620	44
6	490	170	22
7	1050	200	136
8	1150	250	36
9	1000	330	115
10	510	100	35
11	1260	211	44
12	2150	520	140
13	500	410	86
14	1000	580	49
15	850	110	70
16	1500	310	62
17	560	102	32
18	500	200	80
19	1700	410	150
20	1100	200	100

in Stage III versus Stage IV prostate cancer revealed significant changes in IgM levels depending on the dissemination of prostate cancer. Serum IgM levels were normal in 12 out of 16 patients with Stage III and in 5 out of 20 patients with Stage IV prostate cancer. Decreased IgM levels were noted in 3 out of 16 patients with Stage III, and in 12 out of 20 patients with Stage IV prostate cancer (Fig. 4).

bolized more slowly than either one. This might explain the higher serum concentrations of IgG in some of the patients with prostate cancer. IgM elevation occurs promptly after initial antigenic exposure, but falls rapidly. Increased serum levels of IgM is followed by a rise in IgG which represents more specialized molecular structure in antibody response (14).

The IgM fraction constitutes approximately

Fig. 4. Immunoglobulins in prostate cancer Stage III vs Stage IV Cancer

IEP	IgG		IgA		IgM	
Stages	III	IV	III	IV	III	IV
Normal	8/16	11/21	6/16	8/20	12/16	5/20
Increase	6/16	4/21	8/16	8/20	1/16	3/20
Decrease	2/16	6/21	2/16	4/20	3/16	12/20

Immunity	
Humoral	Cellular
Antibody Formation	Lymphocyte Infiltration
Antibody Deficiency States	Cellular Immunity Deficiency States
Hypoimmunoglobulinemia	Lymphopenia

Fig. 5.

Discussion

Immunologic deficiency in patients with various malignancies is presented either by lymphopenia indicating a deficiency in cellular immunity or by hypoimmunoglobulinemia suggesting a deficiency as observed in disseminated cancer (Fig. 5). The major portion of antibodies produced after repeated antigen exposure is located in IgG fractions of immunoglobulins (13). In peripheral blood, IgG appears later than IgA or IgM during an immunological response and it is cata-

5-10% of total serum antibodies by weight (15). The early appearance of IgM in peripheral blood could be due to a greater sensitivity in detection of IgM rather than an earlier synthesis (16). In this series, as expected, no significant changes in serum IgA concentrations were observed (15). More profound depression of IgM in patients with Stage IV cancer, as shown by this study, suggests a severe defect in humoral antibody response to an antigenic stimuli. Yet, other factors such as age of the patient, nutritional status and the sources of antigenic stimuli must be taken into consideration. Age difference was not considered as an important factor, since both groups were evenly matched. However, decreased antibody production has been observed in older individuals (12, 17). It is known that serum levels of immunoglobulins are dependent on the nutritional state of the individual and it is being depressed in starvation (18) Decreased degradation of IgG may be the reason of a higher serum IgG concentration in some of our patients, but, certainly, it does not explain the presence of higher serum levels of IgG in patients with Stage III, (locally invasive) prostate cancer (17, 20) since the catabolism of immunoglobulins is decreased in patients with cancer (19).

This study showed decreased IgM production in disseminated prostate cancer. Similar findings were also reported in Burkitt's lymphoma, hepatoma (22), Hodgkin's disease (23), and in other solid tumors (24). Increased IgM production could be a favorable prognostic sign as shown in patients with bronchogenic carcinoma (5).

The changes in serum immunoglobulins observed in this study suggests that the patients with Stage III prostate cancer are in a state of

increased antigenic stimulation and/or they may have a more competent system for immunological response. Findings are also suggestive that decreased serum levels of IgM reflect the progression of prostate cancer.

The determination of circulating immunoglobulins may be a useful additional parameter in the evaluation of response to various modes of treatment in patients with prostate cancer.

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