SERUM PROTEIN ELECTROPHORETIC PATTERN IN CARCINOMA CERVIX

by

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Introduction

Amongst the multitudes of pathological conditions known to be associated with alteration in serum protein and its fraction, carcinoma cervix is one of them.

The slow and fruitful progress in the understanding of host reaction in cancerous lesion was made when the proposal for changes occurring in the metabolic pool of protein was made. The interest has been made more pertinent in clinical conditions when the new technique of protein fractionation by electrophoresis was introdused in 1937 by Teselius.

Serum protein pattern in carcinoma cervix still remains enigmatic and contributes one of the most important unsolved problems, this consideration stimulated the present study.

Material and Methods

The study consisted of 94 indoor patients of State Zenana Hospital attached to the S.M.S. Medical College, Jaipur.

Group I: Control

Fifty cases who were healthy individuals and gave no history of antecedent illness in the near past were taken as control.

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Group II

This group consisted of 44 cases of carcinoma cervix in various stages.

The sera of all the 94 individuals was taken and subjected to electrophoresis in a vertical model electrophoresis apparatus (Beckmann and Spinco) was used (Fig. 1). Total serum protein was

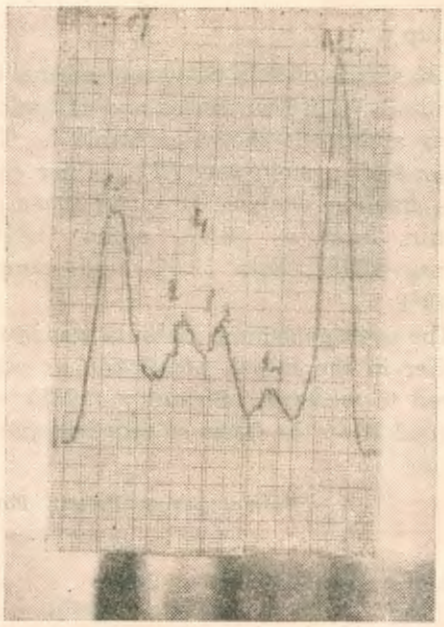
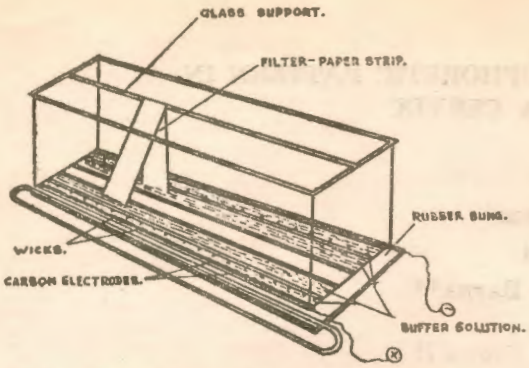


Fig. 1.

calculated by Van Slyke copper sulphate method "980". Detailed history of each



Electrophoretic Tank.
OBLIQUE VIEW

Fig. 2.

individual regarding complaints, socio-economic status, religion, caste, marital status, obstetric history, menstrual history and the physical examination was noted.

Observations and Discussion

Group I

The serum protein pattern of normal individuals in present series and of various other authors is shown in Table I. The mean total protein was 7.11 gm per cent. The fraction analysis revealed mean albumin level as 56.3% alpha$_1$ 4.01%, aplha$_2$ 8.34%, beta 12.6% and gamma 18.70%.

The average gamma globulin was found higher in the Indian population as compared to western. Strausky (1951) explained it on the basis of repeated infection in early childhood, whereas Whipple (1952) showed that the albumin is synthesized from aminoacid of animal origin, and globulin synthesis depends on the aminoacid of vegetable origin. Indians being predominantly vegetarians consume diet rich in vegetable protein.

Group II

All the cases in this series were Hindus. The peak incidence of carcinoma was in between 41 to 50 years.

Parity

The peak incidence was noticed in 5th and 6th para.

Diet

97.0 per cent of cases were found to be vegetarians.

Socio-Economic Status

76.0 per cent of the cases belonged to socio-economic class III and IV; and 84.0 per cent of the cases had moderate anaemia, and 88.0 per cent of cases came in late stages as is evident from Table II.

Table III shows the statistical evaluation of 44 cases of carcinoma cervix.

It was observed that the total protein did not show any variation from the controls. Decrease in albumin with advancement of stage of carcinoma and increase in total globulin with advancement of malignancy was noted.

TABLE I

Normal Serum Protein Pattern Observed by Various Authors

Authors and Years	Total Serum Protein (gm%)	Albumin	Globulin (%)			
			Alpha$_1$	Alpha$_2$	Beta	Gamma
Kumar *et al* (1957)	7.2	62.95	7.59		9.58	19.88
Sogani, R. K. (1959)	6.7	64.08	3.07	4.64	8.68	19.53
Mathur *et al* (1961)	7.1	58.06	3.30	7.50	11.40	19.40
Gupta P. *et al* (1976)	7.5	57.07	4.70	6.60	8.60	2.09
Present Series	7.1	56.31	4.01	8.34	12.60	18.70

TABLE II
Distribution According to the Different Stages

Stages of Carcinoma Cervix	No. of cases	Percentage
0	0	0.0
I	5	11.3
II	14	31.8
III	14	31.8
IV	11	25.0

The $alpha_2$ globulin increased in 40.9 per cent of cases and beta globulin in 56.8 per cent of cases.

In the present series $alpha_1$/Beta ratio increased with advancement of malignancy and A/G ratio decreased with advancement of malignancy as shown in Table IV and Table V.

As for back as 1939 Longsworth *et al* found lowered albumin, and raised alpha globulin and fibrinogen level in cancer plasma. Similar pattern was found by Leutscher (1941) and Seibert *et al* (1947).

The protein loss has been accounted for terms of sequesteration of host dispersible protein (Mider *et al* 1950). In the study of 222 cases they found, albumin was decreased, $alpha_1$ and $alpha_2$ globulin increased and gamma and beta globulin moderately increased. They suggested that decrease in albumin was the result

TABLE III
Statistical Evaluation of 44 Cases of Carcinoma Cervix

Total Proteins	Control cases	Stages of Carcinoma Cervix			
		I	II	III	IV
		TOTAL PROTEINS			
Mean	7.1	7.0	6.4	7.0	6.7
S.D. (±)	0.46	0.08	0.75	0.30	0.43
Range	6.1-7.8	7.0-7.2	5.9-7.4	6.4-8.0	6.2-7.0
		ALBUMIN (%)			
Mean	56.3	46.3	44.1	38.7	38.2
S.D. (±)	3.06	6.4	7.7	8.3	7.4
Range	46.1-64.6	40.0-58.4	27.5-58.4	20.2-45.8	30.0-58.6
		GLOBULIN (%)			
			$Alpha_1$		
Mean	4.0	2.2	3.5	4.1	4.7
S.D. (±)	1.2	1.3	1.6	3.09	2.55
Range	1.5-6.7	0.6-3.7	1.0-5.8	1.0-11.5	0.8-17.4
			$Alpha_2$		
Mean	8.3	6.6	7.7	6.8	6.7
S.D. (±)	2.2	3.8	3.7	3.7	3.3
Range	2.7-11.9	1.3-11.2	1.2-11.6	1.4-15.1	5.0-20.2
			Beta		
Mean	12.6	13.5	12.5	13.6	13.4
S.D. (±)	2.4	1.5	6.6	5.5	6.12
Range	7.8-18.2	11.6-16.4	2.1-23.8	3.1-23.5	5.0-21.3
			Gamma		
Mean	18.7	29.1	31.2	35.8	35.5
S.D. (±)	2.0	6.0	5.9	9.5	3.9
Range	11.4-21.4	24.0-38.5	25.8-42.3	13.4-66.9	30.6-41.4

TABLE IV

$Alpha_1$/Beta Ratio with Advancemen of Malignancy

Carcinoma Cervix Stage	$Alpha_1$/Beta Ratio
0	0.17
I	0.27
II	0.30
III	0.35
IV	0.34

TABLE V

Albumin and Globulin Ratio with Advancement of Malignancy

Carcinoma Cervix Stage	A/G Ratio
I	0.88
II	0.80
III	0.59
IV	0.57

of negative nitrogen balance which is specially reflected in albumin metabolism.

Winzler in 1953 said that hepatic dysfunction induced in some unknown manner by the presence of neoplasm may be the basis for the lowered serum albumin level (liver being the major site for albumin synthesis).

Snell and Gross (1956) examined 24 cases of malignancy and found that the difference between $alpha_1$, $alpha_2$ and beta globulin levels as compared to those of healthy control was not characteristically significant.

Korhler *et al* (1957) observed an increase in gamma globulin function in malignant disease.

In 1975 Karkaria and Gupta observed the serum protein in cancer cervix patients and revealed hypoproteinemia, hypoalbuminaemia, hypergamma globulinaemia. Increase in $alpha_1$ and $alpha_2$ globulin, lowering of A/G ratio and increase in $alpha_2$/Beta ratio with progress of cancer was observed.

Gupta *et al* (1976) observed serum total proteins were lower than in control cases. Albumin decreased with advancement of malignancy. No specific change was observed in $alpha_1$ and beta globulin. However, $alpha_2$ and gamma globulin were significantly raised with advancement of malignancy.

The marked increase in gamma globulin was in large part due to elevated plasma lipid level (Longsworth *et al* 1939 and Zeldis *et al* 1945). This also represents a tumour host reaction.

Summary and Conclusion

There was no significant change in total protein value with advancement of malignancy.

Gradual decrease in albumin from stage I to IV was noticed.

Gamma globulin had steady insrease from stage I to IV.

There was derrease in A/G ratio from stage I to IV.

Alpha/Beta ratio was found increasing from stage I to IV.

In view of the above it can be concluded that serum electrophoretic study being an easy, helpful and accurate investigation can be a useful tool in diagnosis and prognosis.

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