

DIAGNOSTIC AND PROGNOSTIC SIGNIFICANCE OF SERUM PHOSPHOHEXOSE ISOMERASE, ALDOLASE AND HEXOKINASE IN CARCINOMA CERVIX

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(Received on July 24, 1985)

Summary : Serum levels of phosphohexose isomerase (PHI), aldolase (ALD) and hexokinase (HK) activities have been determined in 76 patients of carcinoma cervix, in search of proper diagnostic and prognostic parameters. All the three glycolytic enzyme levels studied were found to be significantly elevated in all the groups of malignancy and showed a relation to the clinical stage and tumor. Serum PHI levels were of best diagnostic significance even at an early stage of the disease. The enzyme levels correlated well with the prognosis of the disease.

Key words : serum enzymes carcinoma cervix phosphohexose isomerase
aldolase hexokinase

INTRODUCTION

Enzymes in serum have been studied for many years as possible early indicators of neoplasia and as aids in following the progression and regression of disease (2). Elevated values of PHI has been reported in cervical carcinoma (3,5), The elevated value of aldolase and hexokinase has been studied (4). The present study is an effort to find out whether serum PHI, ALD and HK may also be used as biochemical parameters for diagnostic purpose and to evaluate their utility in following the course of therapy.

MATERIAL AND METHODS

Seventysix samples with carcinoma cervix and twentyfive healthy female normals were taken for this study. The carcinoma cases were divided into three groups.

Group — I	: Well differentiated	18
Group — II	: Moderately differentiated	38
Group — III	: Poorly differentiated	20

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Blood was collected in a clean dry autoclaved non-oxalated tube by venipuncture with a dry autoclaved syringe. The blood samples were kept at room temperature till supernatant was clear, which was centrifuged and serum was drawn out for analysis.

The serum PHI estimation was done according to Bodansky (1) by the method described in Sigma Technical Bulletin No. 650, The serum aldolase activity was determined by the method of Sibley and Lehninger (6) and Wolf *et al.* (8) described in Sigma Bulletin No. 752. The serum hexokinase estimation was done by the method of Sols and Krane (7).

RESULTS

Table I, shows the serum PHI activity, Table II the serum aldolase and Table III serum HK activity in controls and carcinoma cervix.

TABLE I : Serum PHI levels in carcinoma cervix before and after treatment.

	No. of cases	Before treatment Range Mean \pm S.D. (B. U)	No. of cases	After treatment Range Mean \pm S.D. (B. U)
Control	25	9 - 41 25.87 \pm 9.87	—	—
<i>Carcinoma Cervix :</i>				
Group - I	18	57 - 124 78.54 \pm 19.71***	15	13 - 40 26.92 \pm 8.43
Group - II	38	74 - 166 104.32 \pm 26.57***	28	38 - 145 99.84 \pm 24.53
Group - III	20	86 - 246 138.53 \pm 41.14***	15	97 - 279 145.42 \pm 48.57

***P < .001

TABLE II : Serum ALD levels in carcinoma cervix before and after treatment.

	No. of cases	Before treatment Range Mean±S. D. (Su/ml)	No. of cases	After treatment Range Mean±S. D. (Su/ml)
Control	25	2.2 - 9.2	—	—
<i>Carcinoma Cervix :</i>				
Group - I	18	4.9 - 15.8 7.96±2.38**	15	2.8 - 8.7 6.82±2.17
Group - II	38	5.9 - 17.4 12.69±2.91***	28	4.7 - 17.2 12.03±2.68
Group - III	20	6.3 - 21.9 15.14±3.22	15	9.4 - 19.5 14.43±3.05

P<.01, *P<.001

TABLE III : Serum HK levels in carcinoma cervix before and after treatment:

Group	No. of cases	Before treatment Range Mean±S. D. (Unit/mg P)	No. of cases	After treatment Range Mean±S. D. (Unit/mg P)
Control	25	5.2 - 13.2 9.43±2.24	—	—
<i>Carcinoma Cervix :</i>				
Group - I	18	7.6 - 20.9 14.54±5.07***	15	5.8 - 12.6 9.25±2.01
Group - II	38	8.9 - 25.7 17.58±5.63	28	8.5 - 24.3 17.19±5.72
Group - III	20	10.4 - 36.2 23.43±9.53***	15	9.8 - 33.6 20.23±9.16

***P<.001

DISCUSSION

Serum PHI : This enzyme was significantly elevated ($P < .001$) in all the 76 patients of carcinoma cervix studied before the treatment; comparatively lower values of this enzyme were observed in group-I and the highest in group-III. The elevated level came to normal after six months of treatment in all the cases of group-I. In group-II all the patients, except one showed elevated enzyme activity. In group-III the enzyme level remained high throughout the treatment and further elevation was observed.

Thus the study of serum PHI was found to be a useful biochemical parameter for the diagnosis of carcinoma cervix. It was also found to be useful in assessing the prognosis of disease as normal levels were seen in those cases who had clinical remission of the disease. Thus supporting the observations of other workers (3 5).

Serum ALD : This enzyme was diagnostic in 8 out of 18 cases in group-I, 30 out of 38 cases in group-II and 18 out of 20 cases in group-III. The elevated level came to normal after six months of treatment in group-I. In group-II the level remained elevated except in few cases. In group-III all the patients showed significantly high values.

Thus the serum aldolase level correlation showed limited to the clinical stage of carcinoma. The similar observations have been reported (4).

Serum HK : This enzyme was significantly elevated in 8 out of 18 patients in group-I, 27 out of 38 in group-II, and 17 out of 20 in group-III. The elevated level came to normal in all the cases after six months of treatment in group-I. In group-II the enzyme levels remained elevated throughout the study except in few cases and in group-III the enzyme activity was significantly elevated with the slight variations.

Thus this enzyme was found to be of limited use in diagnosis of carcinoma cervix in early stages of malignancy. But it was found to be of prognostic value. Elevated levels of tissue hexokinase have been reported in carcinoma cervix (4).

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(Received on January 2, 1978)

Summary : The combined effect of cyclophosphamide (CTX) and extracts of six plants belonging to *Crotalaria* and *Zenopsis* genera was assessed on experimental transplantable 2180 (both ascitic and solid forms) tumour. Successive petroleum ether and methanolic extracts from these plants were obtained. The combined administration of CTX and petroleum ether extract of *C. albidus* and the methanolic extract of *C. albidus*, *S. chrysanthemoides*, *S. densiflora* and *S. yacoumense* led to prolonging the life span of 2180 (ascitic) tumour bearing mice. The data indicate that the most effective extract in combination with CTX was the methanolic extract of *S. chrysanthemoides*. The extract alone had no effect on survival of tumour-bearing mice. The same extracts and the same combinations had no effect on 2180 solid tumour.

Key words : *Crotalaria*, *Zenopsis*, plant extracts, cyclophosphamide, 2180 tumour, antitumour activity, combination therapy

INTRODUCTION

Combinations of anti-cancer drugs belonging to different classes where the toxicity does not overlap are extensively used in clinics. In recent times, anti-cancer chemotherapy combined with non-anti-cancer drugs is looked upon as one of the approaches towards enhancement of the efficacy of chemotherapeutic agents in the treatment of malignant diseases (8). For example, polyene antibiotics and prodrugs were used in an attempt to increase cell membrane permeability for anti-cancer chemotherapeutic agents (10). Potentiation of anti-cancer agents by amphipathic B has been reported (7). Both aspirin and diploin could make plasma membrane permeable to various substances without impairing the function of the intracellular organelles (4). Cimicifuga

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