

CLINICAL SIGNIFICANCE OF SERUM LACTATE DEHYDROGENASE, PHOSPHOHEXOSE ISOMERASE, ALDOLASE AND HEXOKINASE IN PROSTATIC CARCINOMA

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Summary : The enzyme activities of Lactate dehydrogenase (LDH), prostatic fluid LDH isoenzymes phosphohexose isomerase (PHI), Aldolase (ALD) and Hexokinase (HK) were determined in the sera of 77 samples of males. There were 12 cases of carcinoma prostate with metastases, 15 without metastases, 25 with benign prostatic hypertrophy and 25 nontumor. The enzyme activities of nontumor and benign group were statistically similar. The prostatic fluid LDH₅/LDH₁ ratio and PHI has been found to be the most sensitive parameter for detecting carcinoma prostate. Serial determinations of LDH, PHI, ALD and HK were found valuable for following the course of the disease during therapy.

Key words : serum enzymes
hexokinase

phosphohexose isomerase
lactate dehydrogenase

carcinoma prostate
aldolase

INTRODUCTION

Carcinoma prostate is the third commonest form of malignancy affecting males (7). All the available investigations like cytological examination of prostatic massage, needle and transurethral biopsy, and serum acid phosphatase determination do not always help in diagnosing early malignancy.

The serum glycolytic enzymes in metastatic carcinoma of prostate have been studied by many workers. Elevated activities of serum enzymes PHI and ALD have been reported (1,3,4,5).

The present study was undertaken with the intention of defining the intensity of

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glycolytic activity in nontumour, benign and malignant group and based on these parameters, ascertaining certain biochemical characterisation in carcinoma prostate.

MATERIAL AND METHODS

Seventy seven sera samples were used : 12 of carcinoma prostate with metastases; 15 without metastases; 25 benign prostatic hypertrophy and 25 nontumor, with no histological abnormalities.

The determination of serum LDH was carried out by the method of Wootton (14), while prostatic fluid LDH isoenzymes estimation was done by the method of Dietz and Lubrano (6). Serum PHI was determined by the method of Bodansky (2) as described in Sigma Technical Bulletin No. 650. Serum ALD activity was determined by the method of Sibley and Lehninger (10) and Wolff *et al.* (13) described in the Sigma Technical Bulletin No. 752. While serum HK was determined by the method of Sols and Krane (12).

RESULTS

Table illustrates the activities of serum LDH, PHI, ALD and HK in nontumor, benign, carcinoma prostate with metastases and without metastases. Fig. 1, 2, 3 and 4 represents enzyme of activity levels of LDH, PHI, ALD and HK respectively during follow up studies.

TABLE I : Serum LDH, PHI, ALD and HK activities in prostatic diseases.

Group	No. of cases	LDH IU/L	PHI BU	ALD SU/ml	HK Unit/mg P
		Range (Mean \pm S.D.)	Range (Mean \pm S.D.)	Range (Mean \pm S.D.)	Range (Mean \pm S.D.)
Control	25	81-175	11-45	2.5-9.6	5.4-13.4
		145.41 \pm 20.55	26.57 \pm 11.54	6.92 \pm 2.23	9.87 \pm 2.31
Carcinoma prostate with metastases	12	133-273	128-281	6.3-27.5	9.5-26.2
		208.59 \pm 35.36	167.25 \pm 32.63*	18.14 \pm 5.71*	17.88 \pm 5.72*
Carcinoma prostate without metastases	15	91-227	38-111	3.8-16.2	7.3-18.6
		171.23 \pm 27.75*	53.67 \pm 18.62*	11.65 \pm 2.31*	14.36 \pm 3.75*
Benign hypertrophy of the prostate	25	87-175	11-44	2.3-9.5	5.5-13.3
		149.83 \pm 19.26	26.78 \pm 9.64	6.74 \pm 2.07	9.61 \pm 2.13

*P < .001

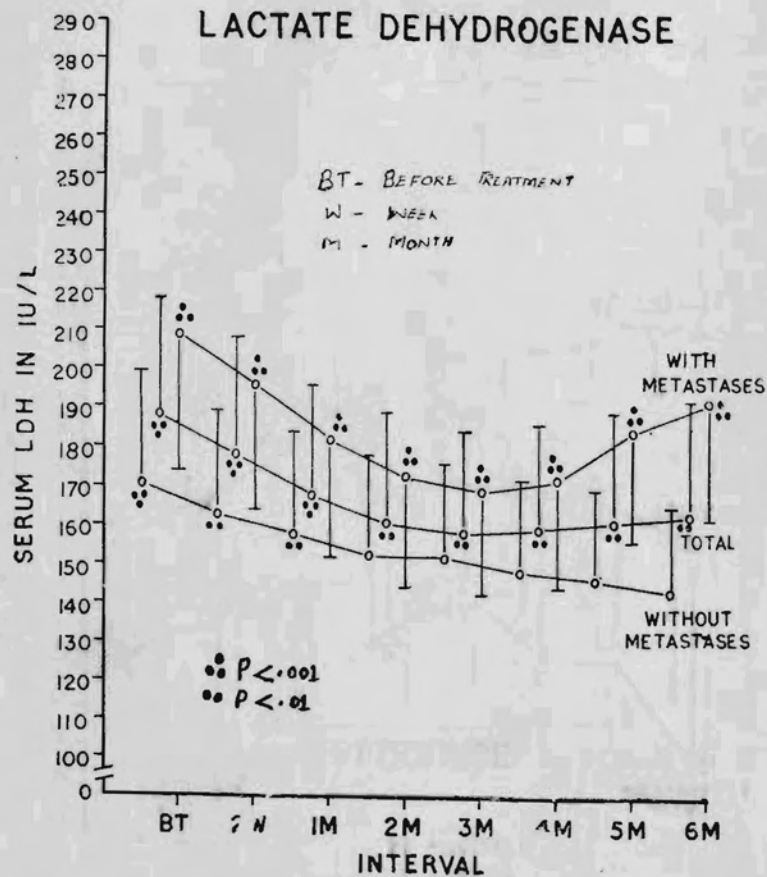


Fig. 1

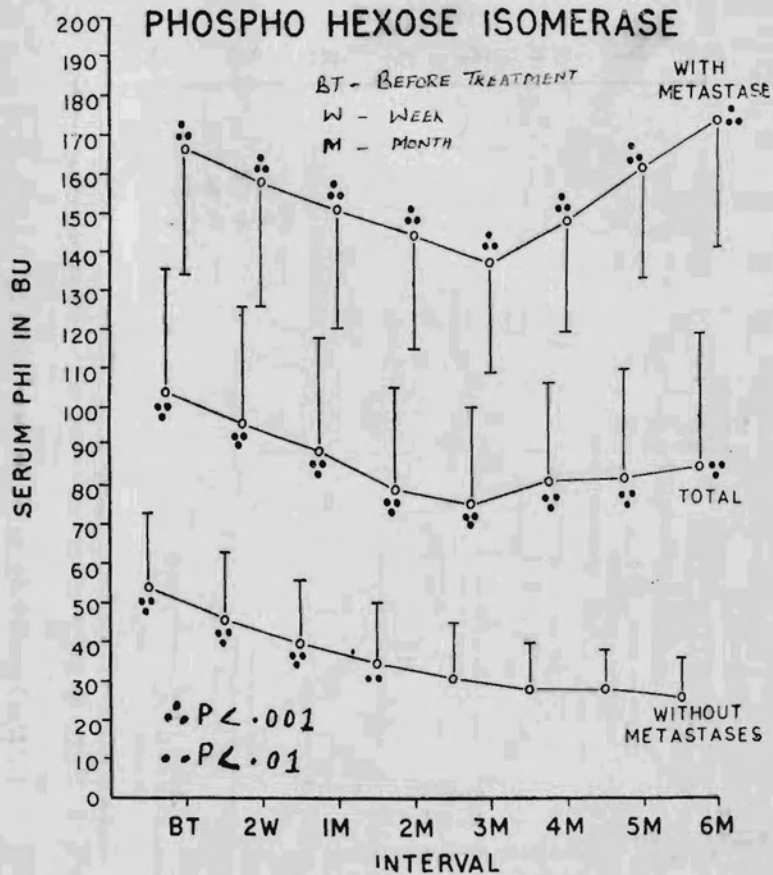


Fig. 2 :

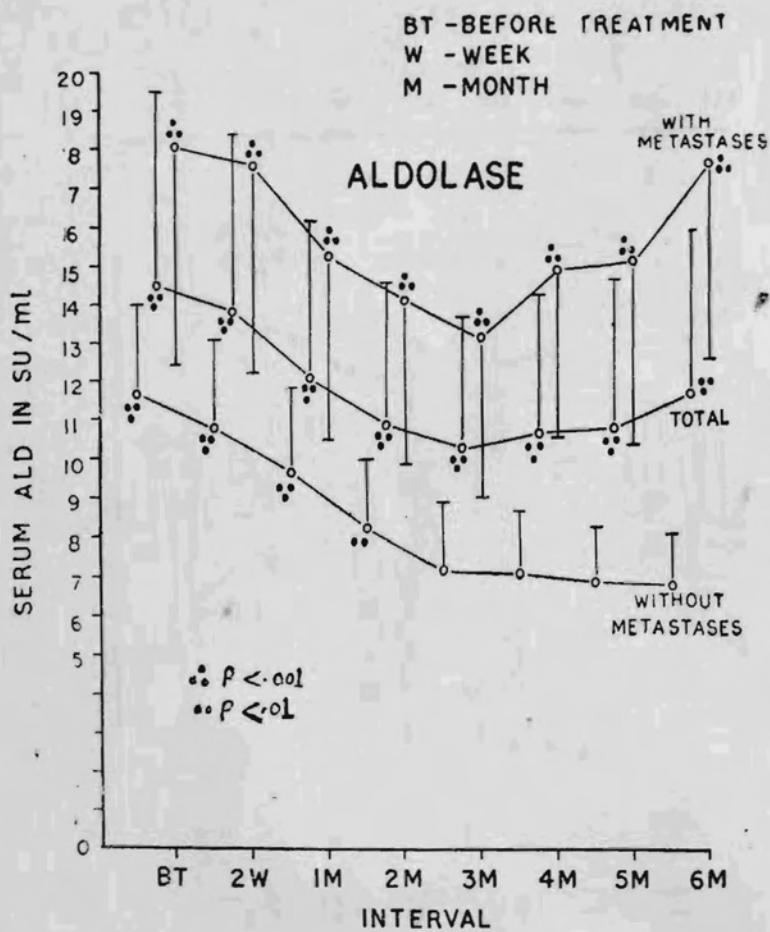


Fig. 3 :

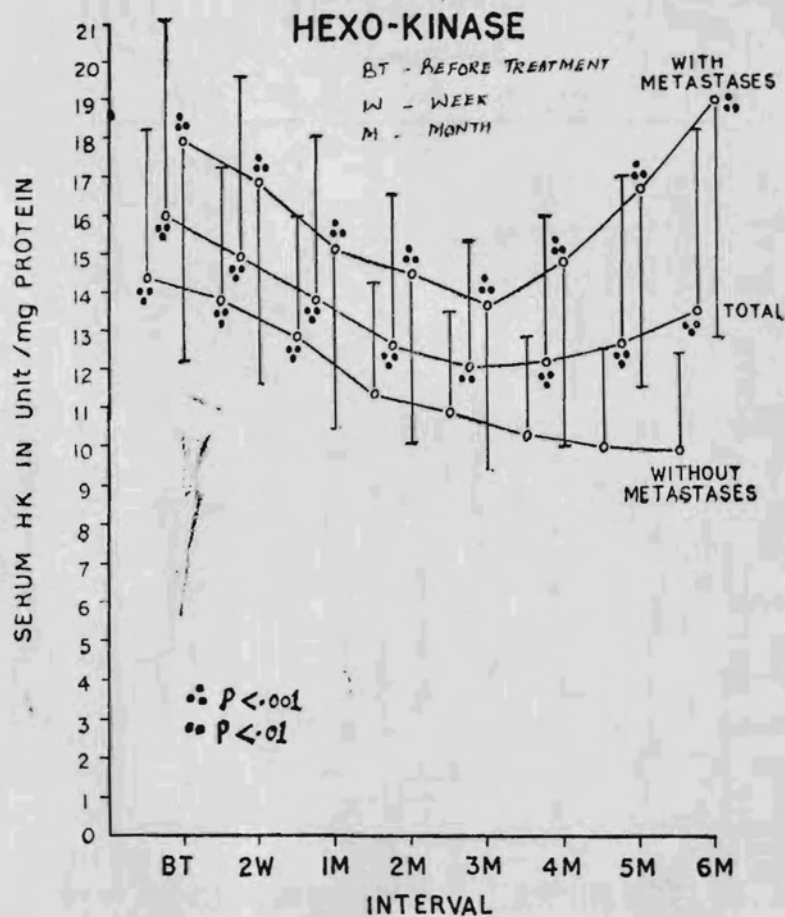


Fig. 4 :

DISCUSSION

Serum LDH : The level of serum LDH was diagnostic in 20 out of 27 cases. When these cases were divided into two groups; without metastases and with metastases, it was found that in cases without metastases serum LDH was diagnostic in 10 out of 15 cases. The enzymes level started declining after prostatectomy and hormonal treatment, and normal level was achieved in 46.6%, 84.6% and in all the cases after two weeks, first month and second month respectively and remained normal throughout the study. In cases with metastases the enzyme level was highly elevated and diagnostic in 10 out of 12 cases. The level remained elevated throughout the study (Fig. 1). In benign group the total serum LDH was found to be normal (Table I).

In this study prostatic fluid LDH isoenzymes were also estimated and it has been observed that LDH_5/LDH_1 ratio was diagnostic in all cases of carcinoma prostate. The cases without metastases had lower ratio as compared to the cases with metastases. Thus this estimation will also be helpful in assessing the extent of disease. Similar were the observations of others (8,11).

Serum PHI : This enzyme was diagnostic in 24 out of 27 cases. When these cases were studied into two groups, it was diagnostic in 12 out of 15 cases without metastases. After prostatectomy followed by hormonal therapy, the enzyme level started declining and normal level was seen in 33.3%, 38.4%, 69.2%, 90.9% and in all the cases at the interval of two weeks and first to fourth month respectively. In cases of metastases this enzyme was diagnostic in all the cases. The enzyme level remained diagnostic throughout the study in all the cases with slight change in the levels due to partial response to the treatment (Fig. 2).

Thus serum PHI is found to be a valuable parameter for the diagnosis and treatment of carcinoma prostate. Similar were the observations of others (4, 5, 9). These authors also found very high level of PHI in all the cases with metastases and moderate elevation in cases without metastases, whereas normal in cases of benign group (Table I).

Serum ALD : Serum Aldolase level was diagnostic in 18 out of 27 cases. In cases without metastases this enzyme was diagnostic in 9 out of 15 cases. The enzyme level started declining after the treatment and became normal in 46.6%, 61.5%, 84.6% and in all the cases at an interval of two weeks and first to third month respectively and remained normal throughout the study (Fig. 3). However, in cases with metastases, this enzyme was diagnostic in 9 out of 12 cases. The level varied slightly due to poor response to the treatment. Normal level of this enzyme has been found in benign group.

Thus, serum aldolase can also be used as an important parameter for the diagnosis and during followup. The level of this enzyme will also provide the extent of disease. Similar were the observations of others (1,3,5).

Serum HK : This enzyme was diagnostic in 16 out of 27 cases. In cases without metastases this enzyme was diagnostic in 7 out of 15 cases. The enzyme level started declining and normal level was seen in 60%, 76.9%, 92.3% and in all the cases at an interval of two weeks and first to third month respectively after the treatment. In cases with metastases this was diagnostic in 9 out of 12 cases. These cases showed poor prognosis and the level remained significantly high throughout the study (Fig. 4). This enzyme can also be used as a valuable index for the diagnosis and followup. The enzyme level correlated well with the extent of the disease, as very high levels were seen in cases with metastases. The results could not be correlated due to absence of similar data.

Thus, it is evident from this study that the determination of prostatic fluid LDH₅/LDH₁ ratio proves to be the valuable parameter for detecting carcinoma prostate in the beginning. Serum PHI has also been found to be the most sensitive biochemical parameter for the detection of not only metastatic carcinoma of prostate but also in the diagnosis of cancer of prostate without metastases. Serum LDH, PHI, ALD and HK may be of value in assessing the response to treatment and in prognosis.

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