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RESEARCH ARTICLE

SERUM LACTATE DEHYDROGENASE AS PROGNOSTIC MARKER IN BREAST CARCINOMA

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ABSTRACT

Objectives: To observe levels of LDH levels for prognosis of breast cancer in breast carcinoma patients and in controls.
Methods: Fifty breast carcinoma patients were studied with regard to its clinical, histopathological and therapeutic modalities to that of the prognosis of the disease indicated by serum lactate dehydrogenase, liberated by aerobic respiration of cancer cells and were followed up for a period of eighteen months.
Results: This study also shows that lactate dehydrogenase levels decrease following treatment showing that the tumor is the cause of lactate dehydrogenase production in carcinoma breast patients, the pre treatment lactate dehydrogenase levels were seen to decrease with significance of the study showing p value to be <0.001 and the level of lactate dehydrogenase was found to be raised across the stages of carcinoma breast. In the present study lactate dehydrogenase is shown to indicate survival in breast carcinoma patients (p value <0.003).
Conclusion: Lactate dehydrogenase proves to be a prognostic marker in carcinoma breast that is simple, cheap and easily available.

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INTRODUCTION

While cancer accounts for high morbidity and high mortality rate throughout the world, cancer of breast is common in women in developed countries. More than 40% of all breast cancer cases are found in developing countries. The prognosis for breast cancer generally depends upon its stage. Prognostic markers currently accepted for clinical use in carcinoma breast, such as nodal status, tumor size, histological grade, hormone receptor status and others do not adequately identify patients with higher rate of relapse. There is therefore the need of simple biochemical investigations which can be easily assayed, are less expensive and can detect metastasis. Lactate Dehydrogenase or lactic acid dehydrogenase is an enzyme found in nearly all living cells. A dehydrogenase is an enzyme that transfers a hydride from one molecule to another. Lactate dehydrogenase is an oxidoreductase that catalyses the reversible NAD – dependent interconversion of pyruvate to lactate during glycolysis as per the reaction given below :

$CH_3\ CO\ COO^- + NADH_2 = CH_3CHOH\ COO^- + NAD.$

Cancer cells mainly generate ATP through glycolysis even in the presence of normal oxygen pressure. Most cancer cells produce large amount of ATP regardless of the availability of oxygen and hence metabolism referred to as "aerobic glycolysis". Such a variant respiratory pattern might help in the selection of cells capable of rapid growth under anaerobic conditions which are known to prevail in many neoplasms without adequate blood supply (hypoxia) . In other words, tumor cells can survive extremely well whether oxygen is present or not, thereby allowing for a sort of " one upmanship " or a competitive advantage over the normal cell when supplies are limited (Maxwell *et al*., 1997). As discussed above the study was taken up to study the role of lactate dehydrogenase as a prognostic indicator in carcinoma breast.

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MATERIALS AND METHODS

The study was conducted on patients with breast cancer admitted in the department of General Surgery, Rajendra Institute of Medical Sciences, Ranchi during the period from 2013-2015. Clinical data was obtained from clinical examination of patients admitted in the Department of Surgery. The patients who reported positive for carcinoma breast their blood samples were collected for serum lactate dehydrogenase. Then three weeks after any therapeutic intervention that the patient underwent serum lactate dehydrogenase was documented. Exclusion criteria was myocardial infarction, haemolytic anemia, muscular dystrophy,

liver disease, kidney disease, pancreatitis, drugs, patients already received treatment or were undertreatment for malignancy.

RESULTS

1.Comparison of mean LDH in cases and controls

	Mean LDH 1 (IU/L)	STD. Deviation
Cases	622.16	120.38
Controls	347.88	67.64

P value <0.001
Serum LDH levels were significantly elevated in patients of breast cancer when compared with the control group.

2.Relation of LDH before and after treatment

	Mean LDH	Std deviation
Pretreatment	612.52	110.89
Posttreatment	403.15	129.34

P value <0.001
Serum LDH levels significantly decrease after treatment.

3. Relation between survival and pretreatment LDH levels

Survival	No. of patients	Mean LDH 1(IU/L)	Standard deviation
Disease free	45	605.89	108.45
Residual disease	5	768.60	135.49

P value <0.003
Serum LDH levels were elevated in patients who had a poor prognosis of the disease.

DISCUSSION

In the present study the levels of Lactate Dehydrogenase was found to be significantly elevated in cases of carcinoma breast than in controls. The concentration of Lactate Dehydrogenase was found to be 348 IU/L in controls and 622 IU/L in cases of carcinoma breast with p value <0.001 which is similar to studies done by Swetha (2013), Chandrakanth *et al*. (2011) Seth (2003). These results show that invading tumor cells causes severe tissue damage resulting in release of intracellular enzymes like lactate dehydrogenase into the blood stream by the injured or dying cells. The elevated levels of lactate dehydrogenase could be brought about as an enzyme essential for anaerobic glycolyis. The level of lactate dehydrogenase was found to be raised across the stages of carcinoma breast. In the present study the level in Stage I was found to be 596 IU/L and Stage IV was found to be 698 IU/L. Two deaths were recorded both of which had levels of lactate dehydrogenase above 700 IU/L. Three recurrence was seen in the one and half year follow up period all of whom had levels above 550 IU/L. Visnja Bogadnovic (2008) showed similar results in their study. Results showed that the only patient at clinical stage III B without distant metastases at the time of investigation had an increased lactate dehydrogenase activity. Clinical follow-up of that patient showed relapse of primary disease with massive bone metastases and lethal outcome one year after ending of the chemotherapy. In my study pre treatment lactate dehydrogenase levels were seen to decrease from 612 IU/L to 403 IU/L after treatment with significance of the study showing p value to be <0.001 similar to results shown by Swetha (2013), Chandrakanth *et al*. (2011), Sandhya Mishra (2004). In this study the follow up of patients for eighteen months was done which showed high lactate dehydrogenase levels in patients who died or had recurrence within the period of observation. The significance of the data in our study is p value equal to 0.003. In works done by K.D. Swenerton *et al* five year follow up of breast carcinoma patients was done by serum lactate dehydrogenase levels which showed high percentile of survival time in patients with low levels of lactate dehydrogenase with significant p value of the study which was < 0.01.

Conclusion

The study found that the levels of lactate dehydrogenase correlated well with the other prognostic factors and a high level of lactate dehydrogenase indicated poor prognosis in a patient of breast cancer. The decrease in the level of lactate dehydrogenase following treatment suggested that it is marker worthwhile using for monitoring the disease or follow up.

As emphasized earlier in the introduction there was a need for a simple, cheap and easily available prognostic marker. Lactate dehydrogenase proves to be one such marker. The other uses in the disease are-

1. Detection of risk
2. Staging and prognosis.
3. Predict the response to therapy,
4. Monitor treatment.

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