

Blood Glutathione Level in Breast Cancer Patients Before and After Surgery

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Summary

GSH and some other biochemical parameters (LDH, ALP, GGT & ferritin) were determined in the blood of 28 confirmed cases of breast cancer before and ten days after surgery (radical mastectomy) and 25 normal healthy, non-pregnant females. All the parameters, except GGT, were significantly raised in breast cancer and their level dropped after radical mastectomy but was still higher than normal, suggesting that more time was needed for them to normalise. GSH was found to be elevated in 68% of patients as compared to higher side of the normal. This value had further increased to 83% if GSH/Hb was calculated. Further, whole blood GSH returned to normal range in 72% cases within 10 days of operation while other parameters still remained high.

Introduction

While cancer is the major killer in the world, cancer of breast is the leading cause of death in women (Park, 1994). These deaths can be prevented if cancer can be detected early. Early detection of cancer depends to a large extent on several physical techniques, pathological tests and biological markers. These include alpha fetoprotein, carcinoembryonic antigen, human chorionic gonadotrophin, prostatic acid phosphatase (Burtis & Ashwood, 1994) and less specific lactate dehydrogenase (LDH), alkaline phosphatase (ALP) and gamma glutamyl transferase (GGT). However, the analytical method of many of these is very difficult and expensive. There is, therefore, need of a parameter which can be assayed easily and is less expensive.

Sulfhydryl groups play an important role in cell division (Harington, 1967). Earlier, one of the author Sharma had found significantly depressed serum sulfhydryl levels in a variety of cancer patients (including breast cancer) and its return to normal after 15th day of surgery (Vaid et al. 1974).

The interest in sulfhydryl groups in cancer has been revived recently with the publication of report of Beutler and Gelbart (1985) who found markedly lowered plasma glutathione in a variety of malignant disorders including breast cancer. On the contrary, GSH was found to be increased in red cells of breast cancer patients (El-Sharabasy et al, 1993).

Since glutathione estimation is very easy and not much work has been done on the behaviour of GSH in cancer, we have undertaken this study. The study was restricted to cancer of one type only – breast cancer. GSH was estimated before and after surgery and a few other biochemical parameters (ferritin, LDH, ALP, GGT) were also measured simultaneously for comparison.

Materials and Methods

The present study was conducted on 28 clinically established and histopathologically confirmed breast cancer female patients. These patients were admitted in female surgical wards of S.M.S. Hospital Jaipur. The results were compared with 25 age-matched

normal non-pregnant healthy female subjects.

Lasting blood samples were collected from healthy control and cancer patients just before surgery (pre-level) and 10 days after surgery, i.e., complete mastectomy (post-level). Hemoglobin, reduced glutathione (Beutler, 1971) and Ferritin (Worwood, 1986) were determined immediately in whole blood. Alkaline phosphatase, lactate dehydrogenase and gamma glutamyl transferase activities were measured in serum on an autoanalyser (Merck, Selectra) using kits supplied by Merck.

Results and Discussion

This study was conducted on 28 confirmed cases of carcinoma breast and 25 normal healthy non-pregnant females. The cancer cases consisted of 18 infiltrative duct carcinoma, 7 lobular carcinoma and 3 medullary carcinoma. Blood values were determined in them just before operation and 10 days after surgical operation (mastectomy). All these values are presented in table-1. It can be seen from Table I, that except GGT, the level of all the parameters before operation was significantly higher in breast cancer patients than in normal control women. These values dropped after operation but were still above normal, suggesting that more time was needed for normalisation.

A comparison of individual values of pre-operative level of these parameters in cancer cases with the highest value of that parameter in normal women revealed that LDH value in 56% of patients, ferritin value in 64% of patients, GSH value in 68% of patients, and GSH/Hb value in 83% of patients was above the normal range, hence these values may be taken as percent of certainty by which cancer of breast can be diagnosed on the basis of that criteria. None of the patients had GGT and ALP outside the normal range, hence their determinations are not of much diagnostic importance.

We have also listed in Table-I, percent rise in breast cancer cases of pre-operative level as compared to control. This may indicate the sensitivity of that parameter in detecting breast cancer. On this criteria following sequence is observed in decreasing order of sensitivity: Ferritin > LDH > GSH/Hb > GSH > ALP > GGT.

The elevated GSH value returned to normal range in as many as 72% cases ten days after surgical removal of malignant lesion. None of the other parameters returned to normal within this period. Although the role of GSH in tumors is not clearly understood, its level was reported to be elevated in malignant lesions of breast as compared to normal human breast tissue and benign lesion (El-Sharabasy et al 1993; Murray et al 1987; Iscan et al. 1998).

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Table I: Some biochemical parameters in breast cancer cases before and after surgery

Group	Ferritin (ng/ml)	ALP (U/L)	LDH (U/L)	GGT (U/L)	GSH (mg%)	GSH/Hb (mg/g)
Normal Control (25)	105.5 ± 31.8	81.3 ± 27.8	210.8 ± 54.5	21.7 ± 7.0	28.2 ± 4.9	2.5 ± 0.3
Breast Cancer (28)						
Pre-I level	256.7 ± 92.4	105.5 ± 23.9	413.0 ± 119.6	23.9 ± 8.3	39.0 ± 8.5	3.8 ± 0.7
Post-I level	223.0 ± 91.7	99.7 ± 25.3	369.5 ± 126.0	21.9 ± 7.9	33.0 ± 6.7	3.6 ± 0.6
Percent change in pre-level from normal	+ 144.5	+ 29.7	+ 95.9	+ 10.1	+ 38.6	+ 56.0

All values are mean ± S.D.