Comparative Study of Oxidative Stress in Carcinoma Breast Patients and Controls

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Research Article

Abstract: In the scenario of increasing evidence of cancers, the aim of the study was to evaluate the role of oxidative stress in breast cancer. For that purpose, 40 carcinoma breast cases and 40 age, sex matched controls were evaluated for serum MDA levels as an index of lipid peroxidation. The observations revealed that mean serum MDA in these cases was (12.1350± 0.104) nmol/ml while in controls it was (2.422± 0.709) nmol/ml. There was a rise in serum MDA levels in test group as compared to the control group which was statistically highly significant. The high levels of serum MDA indicate increased lipid peroxidation in carcinoma breast cases.

Key words: reactive oxygen species, lipid peroxidation, MDA

Introduction

Breast cancer is the commonest cause of death in middle aged women in the western world. The incidence is increasing in India also. The most common etiological factors are- increasing age, genetic abnormality (short arm of chromosome 17), diet rich in saturated fatty acids and low in vitamin C, hormonal causes, sedentary lifestyle, etc. Alongwith these, irradiation and oxidative stress i.e. excess of free radicals are also blamed.Free radical- A free radical can be defined as any species capable of independent existence that contains one or more unpaired electron. Free radicals are generally more reactive than non radicals. If two radicals react, both are eliminated. If a radical reacts with a non radical, another free radical is produced. E.g. radiation causes one of the oxygen hydrogen covalent bonds in water to split, creating 2 radicals. The hydroxyl radical is the most reactive species known to chemistry. It propagates chain reactions. The other reactive oxygen species are like superoxide, lipid peroxyl radical, singlet oxygen, hydrogen peroxide, hypochlorous acid, etc. the increased concentration of the reactive oxygen species in the blood can lead to DNA damage, lipid peroxidation, gene mutation, altered proteins, etc. Normally our body has a defense against the reactive oxygen species in the form of antioxidants. If these defenses are not completely efficient, the oxidative stress increases and it can lead to DNA damage, lipid peroxidation, etc. Of these, lipid peroxidation is important due to the large number of membrane fatty acids. When hydroxyl radical is generated close to the membrane and attacks fatty acid side chains of the membrane phospholipids I pulls off the hydrogen atom and combines to form water. The free carbon is most likely to combine with O_2, creating peroxyl radical. They attract adjacent fatty acid side chains and thus the chain continues. Accumulation of hydroperoxides leads to disturbed membrane functioning and also cytotoxic products; the most unpleasant are aldehydes like Malondialdehyde.

Methods

The study was carried out in the department of physiology, Government Medical College, Aurangabad. 40 females having carcinoma breast stage IV, aging between forty to fifty years were studied alongwith 40 age matched controls. Both groups were having a mixed diet and diabetes mellitus and hypertension were excluded from cases and controls. All the cases and controls were studied for assay of serum MDA using Satho TBARS methodology. (Serum containing lipid peroxide is treated with thiobarbituric acid in presence of 20% trichloroacetic acid. After keeping in boiling water bath for 15-20 minutes, the resulting chromogen is extracted with N- butyl alcohol and measured at 530 nm. MDA is used as standard.) Fasting blood was used and MDA was expressed as nmoles/ml.

Result

	Cases	Controls
Serum MDA levels	12.1350± 0.104 Nmols/ml	2.422±0.703 Nmols/ml

Discussion

In the etiology of breast cancer, radiation, high fat diet, chemical agents, drugs, chromosomal abnormalities have been incriminated along with oxidative stress. The damage due to oxidative stress can be to proteins, to

DNA, (causing mutations and oncogenesis) to lipids causing membrane damage. The lipid peroxidation is important due to availability of PUFA in membrane and as a destructive chain reaction producing cytotoxic products (like aldehydes) causing damage to cell membrane and other cell components. In this study, to assess free radical load in cases and in controls, we have measured serum MDA, a byproduct of lipid peroxidation. The mean MDA in cases was (12.1350± 0.104 nmols/ml) while in controls it was (2.422± 0.704 nmols/ml). there was a rise in serum MDA levels in test group as compared to controls. The rise may be due to, high levels of free radicals in the carcinoma cells, causing damage to DNA and mutation and cell injury[1]. There is also damage to lipids (lipid peroxidation) in cell membrane and other cell components. After damage to cell membrane, the byproducts are released into circulation and their levels in blood increase. One more observation is that, with reduction in tumor mass, serum MDA levels decrease. Huang *et al*[2] demonstrated significantly increased lipid peroxidation measured as MDA in the serum of breast cancer patients. Gonenc *et al*[3,4] showed significantly higher plasma MDA levels in cases as compared to controls. Polat[5] showed higher MDA levels in patients with malignant breast tumour as compared to control subjects. Similar studies by khanzode *et al*[6], Ray[7], Kumaraguruparan *et al*[8], showed an imbalance in redox status and increased MDA levels in patients. This is a preliminary study and a large group is necessary before the association between oxidative stress and cancers can be proved beyond doubt.

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