Indian Journal of Clinical Biochemistry, 2001, 16(1), 113-115

EVALUATION OF SERUM GLYCOPROTEINS IN ORAL CARCINOMA

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ABSTRACT

The present study was conducted on thirty untreated oral cancer patients proved by clinical and histopathological evidence and thirty healthy control subjects. The levels of glycoprotein-associated carbohydrates such as hexose, hexosamine, fucose and sialic acid were found to be elevated significantly as compared to control subjects. There was a progressive rise in these markers as the stages of oral cancer advanced.

KEY WORDS : Oral cancer, Hexose, Hexosamine, Fucose, Sialic Acid.

INTRODUCTION

Glycoproteins are proteins that have oligosaccharide chains covalently attached to their polypeptide backbone .These oligosaccharide chains encode considerable biologic information which depends upon the constituent sugars, their sequences and their conformation (1). About 200 monosaccharides are found in nature, however only eight are commonly found in the oligosaccharide chains of glycoproteins, which include galactose, glucose, mannose, N-acetylneuraminic acid, fucose and xylose (1). Glycoproteins play an important role in the cellular phenomena that undergo alterations during cancerous transformations (2). Although many tumor markers are studied in oral cancer none of them has been shown to be specific (3). Significant increase in one or more of the glycoproteins content of the serum has shown to be associated with neoplastic diseases (2,4,5).

Elevated levels of glycoproteins in oral cancer was observed by Bradley et. al. (6). In India also increased levels of protein bound hexose (7), protein bound fucose and sialic acid (8) were reported in oral cancer. But none of the Indian investigators have found changes in levels of all these four glycoproteins together such as protein bound hexose, hexosamine, fucose and sialic acid and their relationship to tumor burden in oral cancer. Considering the high prevalence of oral malignancy, the present study was carried out to find the correlation between serum protein bound hexose, hexosamine, fucose, sialic acid in oral cancer, in comparison with normal individuals and correlated with clinical staging.

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MATERIALS AND METHODS

Thirty oral cancer patients admitted to the Shirdi Sai Baba Cancer Hospital and Research Centre, Kasturba Medical College and patients of O.P.D clinic of the oral medicine, College of Dental Surgery, Manipal, proved by the clinical and histopathological evidence were selected for the study. According to TNM stage of cancer, out of 30 oral cancer patients studied 5,7,10 and 8 were of stages I,II,III and IV respectively.Thirty non-hospitalized healthy male and female controls were selected for comparison. None of the subjects studied was suffering from cardiovascular, renal, hepatic or other malignant diseases. Blood was collected and allowed to clot and serum was separated.

Protein precipitation

Protein precipitation of serum samples was done for the estimation of protein bound hexose,hexosamine and fucose. 0.05 ml of serum was taken for estimation of protein bound hexose and fucose and 0.1 ml for

protein bound hexosamine. 5 ml of isopropanol was added to each tube, kept at room temperature for 30 minutes, then centrifuged, and the supernatant decanted. The precipitate was washed with methanol, again centrifuged and decanted. This methanol washed precipitate was used for determination of protein bound hexose, hexosamine and fucose.

Protein bound hexose by phenol sulfuric acid method (9), protein bound hexosamine by the method of Elson and Morgan as modified by Winzler (10, 11), protein bound fucose by Dische and Shettles method and protein bound sialic acid by diphenylamine method (10) were estimated. Results were statistically analyzed by student's 't' test. When the 'p' value was equal to or less than 0.05, the comparison between the two groups was considered statistically significant.

RESULTS

Serum protein bound carbohydrates such as hexose, hexosamine, fucose and sialic acid levels in the serum of healthy controls and in the patients with oral cancer are shown in the table 1. There was an obvious increase in the level of serum protein bound hexose, hexosamine, fucose, sialic acid in oral cancer group with a mean value of 150.1 mg/dl, 131.4 mg/dl, 13.7 mg/dl and 114.0 mg/dl respectively, when compared to control values of 95.26 mg/dl, 101.03 mg/dl, 10.80 mg/dl and 82.13 mg/dl respectively.

The mean value of serum glycoproteins increased progressively as the stage of oral cancer progressed from stage I to stage IV (table 1). When compared with the mean value of control with oral cancer group as a whole and with each group separately, the rise in serum protein bound hexose, hexosamine and sialic acid were statistically significant for all the groups except for the comparison with stage I.

DISCUSSION

Significantly increased glycoprotein glycan moieties such as hexose, hexosamine, fucose and sialic acid were observed in this study. Elevated levels of protein bound hexose and hexosamine (2, 5, 12), fucose (2, 5, 13) and sialic acid (2, 12, 14, 15) has been found in various non malignant and other malignant conditions.

Cell membrane constituents are considered to play a prominent role in neoplastic diseases (16). These glycoproteins are not the tumor specific markers. However in the present study, the serum glycoproteins were increased in oral cancer group when compared with controls and this is statistically significant ($P<0.001$). The increased level of glycoproteins reflect in whole or in part, the processes associated with tissue proliferation rather than with tissue destruction (10). However, as the patients in this study did not have any systemic ailments and other malignancies, the increase in serum glycoproteins appears to be a true phenomenon due to oral carcinoma. Since the glycoproteins are markers for other types of tumor activity, they may have potential application in early diagnosis of oral cancer. However,

Table 1. Levels of glycoproteins in control and oral cancer patients.

Clinical Condition	Hexose	Hexosamine	Fucose	Sialic acid
Control	95.2±4.3	101.0±2.7	10.8±0.3	82.1±1.8
Oral cancer	*150.1±4.3	*131.4±4.3	*13.7±0.5	*114.0±2.5
Stage I	114.8±3.0	110.0±4.0	11.4±0.2	99.6±2.5
Stage II	*124.5±5.0	*122.1±4.1	*12.8±0.4	*106.0±2.5
Stage III	*162.2±7.3	*140.0±6.1	*14.0±0.8	*118.8±2.1
Stage IV	*179.5±12	*142.1±10	*15.7±1.2	*124.0±5.5

The values are expressed as mg/dl. Mean±SEM, * $p<0.001$ significantly different from control

further detailed studies are necessary to find out whether the serum glycoproteins would be of help in clinical diagnosis.

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