Changes in the Concentration of Carbohydrate Components of Glycoproteins in the Serum of Oral Cancer Patients

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Introduction

Serum levels of protein bound carbohydrates are significantly elevated in neoplastic diseases[1] (quantitative changes in serum glycoproteins have been reported in human cancer[2]. It has shown that the site of malignancy contained almost twice as much as sialic acid than as the normal areas of the tissue[3]. A linear increase of serum glycoproteins with progression of malignant growth has been reported in head and neck cancers, carcinoma of uterine cervix and brest cancer[4,5,6].

The level of protein bound carbohydrates of glycoproteins in serum are composed of relatively small number of different monosaccharides which can be taken as a measure of glycoprotein. The quantification of serum glycoproteins in oral cancer patients may be useful adjuncts in assessing tumour extent and in monitoring response to treatment.

Material and Methods

Patients included in the study were inpatients in Regional Cancer Centre, Trivandrum. The study was conducted in 220 patients with carcinoma of oral cavity and 120 health control subjects. They were at different stages of oral cancer. The diagnosis was provided by histopathological examination. Cases diagnosed as cancer affecting anterior two thirds of tongue, alveolus, buccal mucosa, floor of mouth and retromolar area are clubbed together and taken as patients suffering from carcinoma of oral cavity. All patients had been clinically staged according to the TNM system of the UICC. Subjects having consumption of drugs, hormones including oral contraceptives, or any organic diseases were excluded from the present series. The patients selected for the study were in the age group of 25-65 years and were of both sex. Blood was collected from the peripheral veins and the seperated serum samples were stored at -70°c until assayed. Serum protein bound hexoses, fucose, hexosamine and sialic acid were estimated by different methods[7-10].

Results

Serum protein bound hexose and fucose contents in oral cancer patients and control were analysed and the results are given in table (I). It is seen that the level of protein bound hexose and fucose in oral cancer patients are significantly high.

Table—1

Serum protein bound hexose and fucose control in oral cancer patients and in control subjects

No. of patients		Hexose mg/dl	Fucose mg/dl
A. Normal control	120	125.6±4.9	6.6±0.26
B. Oral cancer patients	220	205.1±7.1[a]	16.3±0.42[a]

Valucs are Mean ± S.E.
Values obtained in patients are compared with that of normal controls. a = P < .001.

Serum concentrations of protein bound hexoses and fucose in oral cancer patients in various stages of disease is given in table (II). These two parameters are found to be increasing gradually as the clinical stage advances. The changes in the level of these parameters between the various stages of the disease (table II) is not statistically significant.

Table—II

Serum protein bound hexose and fucose content in oral cancer patients with different clinical stages.

Group	No. of patients	Hexose mg/dl	Fucose mg/dl
A. Normal control	120	125.6±4.9	6.6±0.26
B. Oral cancer			
Stage I	28	197.6±8.5	13.9±0.61[a]
Stage II	88	201.3±5.6[a]	16.1±0 57[a]
Stage III	74	208.1±6.1[a]	16.9±0.80[a]
Stage IV	30	216.2±9.7[a]	17.9±0,56[a]

Values are mean ± S.E.
Values obtained in stages I, II, III, and IV are compared with those obtained in normal controls.
a = P < .001.

Table—III

Concentration of protein bound hexosamine and sialic acid in oral cancer patients and in control subjects.

	No. of patients.	Hexosamine mg/dl	Sialic acid mg/dl.
A. Normal control	120	93.5±3.1	58 4±2.7
B. Oral cancer	220	202.7±5.6[a]	134.9±4.8[a]

All values are Mean ± S.E
Values obtained in patients are compared with those obtained in normal controls.
a = P < .001.

Table (III) dapicts the concentrations of serum protein bound hexosamine and sialic acid in oral cancer patients and controls. Both protein bound hexosamine and sialic acid are significantly high in oral cancer patients when compared to controls(P<.001). The changes in the concentrations of these parameters at various stages of oral cancer is given in table (IV). It can be seen that the levels of protein bound hexosamine and sialic acid at all stages of oral cancer are significantly elevated as compared to controls, but the difference between the successive stages is not significant.

Table—IV

Concentrations of protein bound hexosamine and sialic acid in oral cancer patients with different clinical stages.

Group	No. of patients	Hexosamine mg/dl	Sialic acid mg/dl
A. Normal control	120	93.5±3.1	58.4±2.7
B. Oral cancer			
Stage I	28	192.4±7.8[a]	118.4±4.4[a]
Stage II	88	195.1±6.5[a]	127.1±5 5[a]
Stage III	74	210.6±6.1[a]	147.3±4.1[a]
Stage IV	30	214.9±9.3[a]	143.2±6.4[a]

Values are mean ± S.E.
Values obtained in stages I, II, III, IV are compared with those obtained in control subjects
a = P < .001.

Discussion

Results from our study indicated that all the carbohydrate components of serum glycoproteins are significantly high in oral cancer patients as compared to controls (p<.001). The cellular transformation results in surface changes and an alteration in the pattern of complex polysaccharides and glycoproteins and these glycoproteins are secreted by the tumour into the extracellular fluid[11,12,13].

The increase observed in the present study may be explained on the basis of the fact that tumour cells synthesis more glycoproteins and shed them into the blood stream. In addition several authors have found an increased glycolisation of proteins in malignancy[14,15].

Moss *et al*[16] have shown that glycoprotein levels are associated with the clinical stage of the disease the extent of metastasis and tumour burden. Macbeth and Bekasi analysed hexose, hexosamine, siliac acid and fucose in serum and found that patients with clinicallv localized carcinoma of the brest have concentrations within the normal range but metastatic breast carcinoma showed substantial elivations. Our study in oral cancer patients is in agreement with the findings of

Macbeth and Bekasi. The graudual increase observed in the glycoproteins as the stage of the disease progresses may be due to increase in the tumour burden in metastasis. Cell mediated immunity is reported to be depressed in oral cancer patients[17]. The role played by glycoproteins in this depression cannot be ruled out. A possible mechanism for the immunosupression properties of the glycoproteins may be through masking of antigenic determinants on the tumour cells.

Summary

Protein-bound haxoses, fucose, hexosamine and sialic acid were estimated in the serum of 220 oral cancer patients and the values were compared with that of 120 normal controls. Carbohydrate components were found to be increased and the increase is significant with the progression of the clinical stages. The elevated level of serum glycoproteins may be associated with the increased synthesis and shedding of glycoproteins from the tumour cells into the blood.

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