SOME BIOCHEMICAL MARKERS IN VARIOUS NEOPLASMS: A MULTIVARIATE ANALYSIS

BHAWANA NIGAM, S.P. JOSHI, SEEMA NAGAR, RAJESH CHAVAN AND D. PENDHARKAR*

Department of Biochemistry and Clinical Oncology*, Choithram Hospital and Research Centre, Indore 452 001, Madhya Pradesh.

ABSTRACT

The analysis of biochemical parameters in 162 patients with various neoplastic disorders along with 50 normal subjects showed significant rise in serum alkaline phosphatase and lactate dehydrogenase as compared to normal subjects. 21 patients with other monoclonal gammopathies which include infection and immunological diseases were also studied. Parameters such as serum calcium, uric acid, total protein, albumin and globulin were also analyzed in 42 (26%) cases of multiple myeloma, 27 (17%) cases of gastro-intestinal malignancies, 22 (14%) cases of urogenital malignancies, 11 (6%) cases of leukemia, 14 (8%) cases of carcinoma lung, 8 (4%) cases of head & neck cancers, 12 (6%) cases of carcinoma breast, 4 (2%) cases of bone tumors, 21 (12%) cases of other monoclonal gammopathies, including 7 (4%) cases of infection and 14 (8%) cases of immunological diseases. The results indicate use of enzymes alkaline phosphatase and lactate dehydrogenase in neoplastic disorders.

KEY WORDS: neoplastic disorders, multiple myeloma, alkaline phosphatase, lactate dehydrogenase.

INTRODUCTION

Neoplastic disorders are characterised by uncontrolled proliferation of a single clone of cells of different parts of body. Multiple myeloma is a malignant disease of plasma cells in bone marrow and occasionally in soft tissues. Patients with neoplastic disorders display changes in serum levels of some biochemical parameters. Review of literature revealed high values of serum lactate dehydrogenase in multiple myeloma (1), leukemia, carcinoma testis and Hodgkins disease (2,3,4). Low levels of serum albumin have been reported in multiple myeloma (5). It has also been observed that serum alkaline phosphatase level is elevated in bone tumors (6). Patients with multiple myeloma usually present with high levels of serum protein and globulin (7,8). Multiple myeloma has been reported to be associated with hypercalcemia (9).

It is evident from the review of literature that no single biochemical parameter can help in diagnosis of various neoplastic disorders. The present study was designed to investigate alterations in a number of biochemical parameters to find out whether some of them would be of possible use in the diagnosis of neoplastic disorders.

MATERIALS AND METHODS

The present study was carried out in random serum samples of 162 patients admitted at Choithram Hospital and Research Centre with various types of neoplastic disorders and 21 patients with other monoclonal gammopathies which include infection and immunological diseases. The patients were classified into 42 cases of multiple myeloma, 27 cases of gastrointestinal malignancies, 22 cases of urogenital malignancies, 11 cases of lymphoma, 17 cases of leukemia, 14 cases of carcinoma breast, 4 cases of bone tumors, 2 cases of neurological malignancies and one case each of malignant melanoma, choriocarcinoma and carcinoid. 21 patients with other monoclonal...
gammopathies included 7 cases of infection and 14 cases of immunological diseases. 50 healthy subjects were taken up as control group.

Blood (5 ml) was collected in sterile plain vial. Activity of alkaline phosphatase and of lactate dehydrogenase and levels of calcium, uric acid, total protein and albumin were estimated using the kits supplied by Boehringer Mannheim, GmBH, Bombay. Diagnosis in neoplastic disorders was based on biopsy reports. Multiple myeloma was diagnosed by cellulose acetate membrane electrophoresis along with clinical and radiological examination. In other monoclonal gammopathies an additional band was observed beyond beta and gamma region in cellulose acetate membrane electrophoresis. The test of significance was performed by student's 't' test.

RESULTS

The observations of biochemical parameters have shown that there is a significant rise in serum levels of alkaline phosphatase (p<0.05) and lactate dehydrogenase (p<0.05) in various types of neoplastic disorders as compared to control group, while in group of other monoclonal gammopathies values of alkaline phosphatase and lactate dehydrogenase were normal. In multiple myeloma, increased levels of serum uric acid and total protein were found to be statistically significant (p<0.001) as compared to control group (Table 1). Uric acid was also significantly increased in patients with infection. Significantly high values of serum globulin have been observed in multiple myeloma, gastro-intestinal malignancies, carcinoma lung and other monoclonal gammopathies i.e. infection and immunological disease. However, serum albumin levels were low in multiple myeloma, gastro-intestinal malignancies, leukemia, carcinoma lung and in other monoclonal gammopathies, which includes infection and immunological diseases as compared to normal subjects. Serum calcium levels were decreased in patients with multiple myeloma, gastro-intestinal malignancies, uro-genital malignancies, leukemia, carcinoma lung and other monoclonal gammopathies.

The correlation coefficient (r) between serum uric acid and alkaline phosphatase in multiple myeloma was 0.38 (Table 2) (Fig. 1). This relationship was found to be statistically significant by the test of probability (p<0.02). In multiple myeloma, the correlation coefficient between calcium and uric acid, calcium & alkaline phosphatase, calcium & lactate dehydrogenase were 0.39 (p<0.01), 0.33 (p<0.05) and 0.35 (p<0.05). A moderate rise in serum levels of calcium in multiple myeloma was reported (9). However, in the present study the serum levels of calcium were slightly lower as compared to normal subjects (Table 1). We can not offer any hypothesis for the same, may be it could be an accidental finding. In bone tumors, correlation coefficient between uric acid and alkaline phosphatase was -0.96 (p<0.05). This is on the basis of moderate increase in levels of alkaline phosphatase as compared to normal subjects and normal levels of uric acid in bone tumors as compared to normal subjects. Serum calcium and uric acid showed a poor correlation with remaining parameters.

DISCUSSION

A significant increase in serum alkaline phosphatase and lactate dehydrogenase was observed in patients of neoplastic disorders. Dimopoulos et al (1), Komberg et al (2) Taylor et al (3) and Schilling et al (4) had also reported rise in lactate dehydrogenase level while Levine (6) had reported increased level of serum alkaline phosphatase in neoplastic disorders. The destruction of tissues in various malignancies leads to the leakage of enzymes and appearance of the same in circulation, leading to increased plasma levels. Significantly elevated levels of total protein and globulin have been observed in multiple myeloma. Singh et al (7) and Putnam (8) had observed similar findings. It was due to neoplastic proliferation of a single clone of plasma cells, engaged in the production of a monoclonal protein i.e. immunoglobulin. Lower levels of albumin were observed in multiple myeloma. Chen et al (5) also reported lower levels of albumin in multiple myeloma.

Hyperuricemia has been observed in multiple myeloma. The mechanism for high levels of uric acid is most likely related to impaired renal excretion (10). High levels of calcium were observed in multiple myeloma (9). It could be because of bone destruction. Chen et al (5) found no significant increase in calcium level. In the present study, calcium levels were decreased in various neoplastic disorders. Correlation coefficient between uric acid and alkaline phosphatase in multiple myeloma has been observed to be significant (Fig. 1).