Original Research Article

Aspartate Transaminase Activity of the Cerebrospinal Fluid in CNS Tumors

Sandeep Shrivastava[1], Kamlesh Singh Maurya[2]

[1]Assistant Professor Dept. of Surgery, Govt. Medical College, Datia, Madhya Pradesh, India
[2]Assistant Professor, Dept. of Surgery, Atal Bihari Vajpayee Government Medical College Vidisha, Madhya Pradesh, India

Received: 14-10-2020 / Revised: 07-12-2020 / Accepted: 24-12-2020

Abstract

Abstract: A closely related study was conducted regarding the activity of aspartate transaminase (AST) previously known as glutamic oxaloacetic transaminase in CSF. It was observed that AST activities was significantly raised in both supratentorial and infratentorial brain tumors. Similar studies between 1960 and 1970 showed almost the same results. Rise in activities were found in benign and malignant tumor. This paper reports CSF-AST activites in 20 cases of CNS tumors of different types.

Keywords: Aspartate, Transaminase, Cerebrospinal Fluid & CNS Tumors.

Introduction

There is a great deal of uncertainty concerning the value of enzyme measurements in neurological disorders. Several enzymes have been measured both in serum and, more particularly, cerebrospinal fluid (CSF), and many studies have attempted to relate changes from normality with diseases of the central nervous system. Certainly profound changes often are seen, but the value of many measurements as diagnostic and prognostic aids is questionable[1]. As with all studies on CSF, estimation of adequate reference intervals is a major problem since large numbers of so called normal samples are extremely difficult to acquire.

Short of biopsy, the identification of tumor cells in cerebrospinal Auid (CSF) is the most specific test for brain tumors[2]. However, this test is relatively insensitive unless leptomeningeal metastases are present or the brain tumor lies close to the CSF path ways. In addition, identification of the site of origin of the CSF tumor cells can be quite difficult on cytomorphologic criteria alone. For these reasons, CSF analysis has expanded into the fields of biochemical and immunologie identification of certain CSF tumor markers There has been considerable interest in the measurement of CSF levels of oncofetal proteins, neuronal or glial substances, enzymes, and hormones that either are produced by the tumor or are a product of tumor or nervous system degeneration[3]. Perhaps the most promising new technique involves the use of tissue- or organ-specific monoclonal antibodies directed against the tumor cell antigens. In addition, there has been recent interest in B and T-lymphocyte enumeration and identification of lymphocytic clonal proliferation in central nervous system (CNS) involvement by lymphoma and leukemia and in CSF tumor cell culture techniques[4&5].

**Correspondence*
Dr. Kamlesh Singh Maurya
Assistant Professor, Department of Surgery, Atal Bihari Vajpayee Government Medical College Vidisha, Madhya Pradesh, India.
E-mail: kamleshsinghmaurya@gmail.com

Material and Methods

This study was conducted at Arogya Satan Hospital, Jhansi M.P. from July 2015 to June 2016 in 20 patients out of which 16 were brain tumours and 04 were spinal tumours, out of 16 brain tumours 10 were infratentorial and 6 were supratentorial. The tumours included five tuberculomas, five meningiomas, two astrocytomas, two glioblastomas, one medulloblastoma, one craniopharyngiomas, one cavernous haemangioma and one benign cystic tumour. Rest two tumours were named after their gross features. Among the tumours studied 15 were benign and 05 were malignant. A simultaneous study of 21 neurologically normal subjects formed the basis of the normal values for comparison. The CSF was collected and the estimation of enzyme was done by colorimetric method as

described by mohun and cook and the values expressed as units per ml of CSF. The recorded data was analyzed stastically to ascertain their validity.

Results

Table 1: Statistical calculation

S. No.	Group	Number	Range (min-max.) (unit)	Mean	S.D. (±)	Confidence limits
1	Normal control	21	8-20	10.62	4.10	8.93-12.31
2	CNS tumours	20	8-43	25.6	11.65	20.16-31.04
3	Brain tumours	16	8-43	27.53	11.76	21.30-33.76
4	Spinal tumours	04	8.5-31	17.87	8.65	5.88-29.86
5	Supratentorial brain tumor	06	8.5-43	29.91	11.58	18.30-41.52
6	Infratentorial brain tumor	10	8.5-41	26.10	11.61	17.91-34.29
7	Benign CNS tumours	15	8.5-35	21.00	9.72	15.65-26.35
8	Malignant CNS tumours	05	30-43	39.4	4.84	33.82-44.98

Table 1 shows stastical calculations of the AST values in the various groups investigated including the controls. The mean AST content of the control group 10.6units/ml with a standard deviation of about 4.1 and confidence limit of 8.9 to 12.3 units.

Table 2: Comparison of groups with normal controls

S. No.	Group	Degree of Freedom (n1+n2-2)	T Value	Probability	Conclusion
1	Brain tumours	39	5.540	<0.001	Significant
2	Spinal tumours	27	1.643	>0.1	Insignificant
3	Supratentorial tumor	29	4.020	<0.001	Significant
4	Infratentorial tumor	33	4.117	<0.001	Significant
5	Benign tumours	33	3.934	<0.001	Significant
6	Malignant tumours	28	12.437	<0.001	Significant

Whereas comparisons of the group with the control is shown in table 2. The results are significant at 5% probability level in all the groups except for the spinal tumours, this establishes statistically significant the diagnostic value of CSF-AST in various types of brain tumours.

Table 3: Comparison of groups with one another

S. No.	Group Compared	Degree of Freedom (n1+n2-2)	T Value	Probability	Conclusion
1	Supratentorial Tumor & Infratentorial brain tumours	14	0.636	>0.1	Insignificant
2	Benign and Malignant CNS tumours	18	1.673	>0.1	Insignificant
3	Infratentorial brain tumours and malignant CNS tumours	13	3.12	<0.001	Significant
4	Brain and Spinal tumours.	18	1.847	>0.1	Insignificant
5	Supratentorial tumor and Spinal tumours	08	1.88	>0.1	Insignificant
6	Infratentorial brain tumours and Spinal tumours	12	1.43	>0.1	Insignificant
7	Benign CNS tumours & Spinal tumours	17	0.63	>0.1	Insignificant
8	Malignant CNS tumours & Spinal tumours	07	3.44	<0.00	Significant

Table 3 compares different groups with one another and shows the relative importance of estimating CSF-AST in these groups. The enzyme is significantly raised in malignant CNS tumours compared to benign tumours rest of the groups do not show any remarkable difference in the rise of their CSF-AST.

Discussion

Normal CSF-AST activity in patients with primary brain tumours were reported in by Fischer {1957}, David Jones {1969}[6,7]. However present study revealed raised values of CSF-AST in 60 percent of similar patients, those having normal quantity of enzyme were mostly tuberculomas and meningiomas higher values were obtained in two cases of the glioblastomas, one case of cavernous haemangiomas of spinal cord and one case of craniopharngiomas these results were found to be in partial agreement with those of Greens in 1958 and Dharker in 1976[8&9]. The CSF activity in both supra and infratentorial tumours is significantly raised as compared to the control group and the difference between the two groups of tumour is not significant this contradicts the claims that raised intracranial pressure could be responsible for increased AST activity in CSF. Further analysis of theses tumours by comparing the malignant and benign tumor revealed that the CSF-AST is significantly higher in malignant tumours then in benign ones. These findings suggest that estimation of AST values is important to differentiate benign and malignant CNS tumours[10]. The correlation between raised AST values and the malignant potential of the tumour is partly supported by the fact that the records of enzyme activites were not uniform in malignant tumours[11&12]. Considering the histological nature of the tumours, it appears that tuberculomas were associated with either normal or slightly raised CSF-AST activites.

Conclusion

The ASF activity of the CSF in 20 patients of CNS tumours has been investigated. The results show that enzyme is significantly raised in brain tumours and that the values are higher in malignant than in benign tumours. Estimation of this enzyme in CSF differentiates benign from malignant tumours but does not differentiate supratentorial from infratentorial tumours, while comparing the various groups with normal controls we found statistically significant the diagnostic value of CSF-AST in various types of brain tumours. The enzyme is significantly raised in malignant CNS tumours compared to benign tumours rest of the groups do not show any remarkable difference in the rise of their CSF-AST.

References

1. Dharker, S. R., Dharker, R. S. and Chaurasia, B. D. Lactate dehydrogenase and aspartate transaminase of the cerebrospinal fluid in patients with brain tumours, congenital hydrocephalus and brain abscess. 7. Neurol. New Psychiat., 1976;39 : 1081-1085.
2. Davies. Tones, CA B L.Actate dehydrogenase and glutamic oxalacetic transaminase of the cerebrospinal fluid in tumours of the central nervous system. Neurol, Neurosurg Psychiat. 1969;32: 324327.
3. Glass, P., Melamed, M., Chernik, N.L., et al.: Malignant cells in cerebrospinal fluid
1. (CSF): The meaning of a positive CSF cytology. Neurology, 1979;29:1369-1375..
4. Fleisher G. A Wakim. KG and Goldstein. N. P. Glutamia oxalacetie transaminase and lactie dehydrogenase in serum and cerebrospinal fluid of patients with neurologic disorders. Mayo Clinic Proc., 1957;32 : 188-197.
5. Green, J. B., Oldewurtel, H. A., Forester, F. M. and Sanches Longo, L. P.-Cerebrospinal fluid slutamisoxalacetic transaminase activity in neurologicdiseases. Neurology (Afinneap.). 1957;7 : 319.922..
6. Green, J. B., Oldewurtel, HA, O'Doherty, D. S. and Forester, F. M. --Cerebrospinal fluid transam. inase and lactic dehydrogenase Ictivities in neur. ologic diseases. Arch. Neurol. Psychiat (Chicago). 1958;80: 146-156..
7. Green, J. B., Oldewurtel, H. A. and Forester, F. M.-Glutamic oxalacetic transaminNE (GOT) and lactie dehydrogenase (LDH) activities. Study in the cerebrospinal fluid of brain tumour patients in normal human brain and in brain tumour homogenates. Neurology (Minneap.). 1959;9 :540-544.
8. Kataman, R., Fishman, R. A. and Goldensohn. E.S.Glutamic Oxalacetic transaminase activity in spinal fluid. Neurology (Minneap.), 1957; 7:853-855.
9. Mann, S. H., De Pasquale, N. and Paterson, R. Cerebrospinal fluid glutamic Oxalacetic acid transaminase in patients receiving electroconvulsive therapy and in neurologic diseases. Neurology (Minneap.), 1960;10:381-390.
10. Mellick, R. S. and Bassett, R. L. The cerebro. spinal fluid glutamie oxalacetic transaminas acti vity in neurological diseases. Lancet, 1904-906, 1964.
11. Mohun, A. F. and Cook, I. J. Y.-Simple methods for measuring serum levels of the glutamie oxalcetic and glutamic-pyruvic transaminases in routine laboratories. 7. Clin. Path., 1957;10: 394399.
12. Goldenberg, D. M., DeLand, F., Kim, E., et al.: Use of radiolabeled antibodies to Carcinoembryonic antigen for the detection and localization of diverse scanners by external photoscanning. N Engl J Med. 1978;298:1384-1388.

Conflict of Interest: Nil; Source of support: Nil