Original Article

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Role of Lactate Dehydrogenase Activity and C-Reactive Protein in Cerebrospinal Fluid for Different Types of Meningitis

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Abstract

Background: Meningitis most common neurological disorder with high mortality rate. Cerebrospinal fluid (CSF) examination by routine tests does not always provide rapid definite information as far as causative agent of different types of meningitis. Bacterial meningitis a common problem especially in many developing countries; *Aim:* To evaluate the diagnostic and prognostic significance of Lactate Dehydrogenase (LDH) enzymes and C-reactive protein (CRP) by comparing it with the levels of serum in CSF of different types of meningitis. *Material and Methods:* A total of 150 cases, aged between 2 month and 60 years, including patients with bacterial meningitis (n=40), pyogenic meningitis (n=46), viral meningitis (n=24) and a control group (n=40), were analyzed on the basis of data from the initial clinical examinations. *Results*: Significant increase in LDH level ($P<0.001$) were observed in the test group when compared to the control group. The LDH activity was significantly elevated in the CSF and serum ($p < 0.001$) in cases of pyogenic (PM) as well as tuberculous meningitis (TBM). CRP was positive in almost all cases and was in the range of 0.7 to 9.7 mg/dl and values were corresponding in the serum. Bacterial meningitis is more common than non-bacterial meningitis. *Conclusion:* The enzymatic activity of LDH although significantly raised in PM compared to TBM but there was no cutoff level to differentiate them. CRP can be used as a supportive evidence of meningitis.

Keywords: Lactate Dehydrogenase; CRP; Cerebrospinal Fluid; Meningitis.

Introduction

Bacterial meningitis is a common problem during childhood, and considerable cause of mortality and morbidity especially in children [1-3].

Although many studies have acknowledged the CSF in either diagnosis or prognosis of bacterial meningitis patients [4-6], recent studies however emphasize the fact that absence or low levels of CSF (especially after 12 hours' manifestation of clinical symptoms) strongly rule out bacterial meningitis [7].

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Lactic dehydrogenase (LDH) is present in most tissues and body fluids examined, including cerebrospinal fluid (CSF) and potentially useful biomarker of bacterial meningitis.

C-reactive protein (CRP), an acute phase serum protein formed by the body in response to various non-specific stimuli such as infection, tissue necrosis or neoplasm.

However, routine diagnostic use of cerebrospinal fluid (CSF) CRP in differentiating bacterial and non-bacterial meningitis has been evaluated in very few studies [8]. The present work has been undertaken with aims to assess whether there is any significant difference in LDH activity in CSF in different types of meningitis, so that it can differentiate between pyogenic, tuberculous and viral meningitis.

Material and Methods

The present study carried out at Department of Biochemistry, Indira Gandhi Institute of Medical Sciences, Patna, during the period from Feb 2014 to Nov 2016. Total 150 CSF samples were examined. Out of them 110 patients of all age groups and either sex of clinically suspected cases of meningitis were taken as test group. 40 control subjects of all age and either sex having no neurological, hepatic, muscular, and cardiac disorders were taken as control group. Cerebrospinal fluids were collected by the lumbar puncture with all aseptic and antiseptic precautions were taken in a clean, dry and sterile vial. CSF sample was tested for CRP by simple antigen antibody precipitation test, i.e., latex slide agglutination method with the help of commercially available kit supplied by Span Diagnostic. CSF was centrifuged at 3000 rpm for 10 minutes and estimation of LDH, was done with clear supernatant parts of CSF. LDH was estimated by UV kinetic method (using Kit) by semi-auto analyzer.

Results

The LDH level did rise quite significantly in pyogenic meningitis (Mean 230.4 IU/L Range 189-330 IU/L and p<0.0001). In control group the range of CSF-LDH was 10-44 I.U./L with a mean of 31.0±9.47 I.U./L. It was almost concluded that the estimation of CSF-LDH is of diagnostic as well as prognostic value particularly if interpreted together with clinical examination and routine cytochemical examinations. In cases of tuberculous meningitis also the CSF-LDH level was significantly high but less than that of pyogenic meningitis (Range 95-250 IU/L, p<0.0001). In tuberculous meningitis also CSF-LDH estimation is of diagnostic and prognostic importance. In viral meningitis the CSF-LDH levels was slightly higher than that of normal and significantly lower than that of tuberculous meningitis and pyogenic meningitis (Range 24-70 IU/L, mean 46.4 IU/L, S.D. 13.5 IU/L shown in table 1. In viral meningitis CSF-LDH estimation may differentiate it from that of tuberculous and pyogenic meningitis and so of diagnostic importance.

Table 1 shows that CSF-LDH, mean levels in pyogenic meningitis, tuberculous meningitis and viral meningitis were 230.4±35.8, 132.3±32.3 and 46.4±13.5 IU/L respectively, which is highly significant (P<0.0001) as compared to controls. CSF-protein, mean levels in pyogenic meningitis, tuberculous meningitis and viral meningitis were 216.5±118.3, 150.2±31.6, and 53.9±9.5 mg/100 ml respectively, which is highly significant (P<0.0001) as compared to controls. CSF-sugar, mean levels in pyogenic meningitis, tuberculous meningitis and viral meningitis were 20.6±7.6, 32.3 ±8.1, and 56.1 ± 10.8 mg/100 ml respectively, which is highly significant (P<0.0001) as compared to controls. CSF CRP was increased in 44 cases (95.65%) of pyogenic meningitis. The mean CSF CRP in cases was 2.15±1.83 mg/dl was statistically significant when compared with control (p <0.001). The mean CSF CRP in controls was 0.052±0.12 mg/dl. Serum CRP was increased in 43 cases (93.47%) of pyogenic meningitis. The mean serum CRP in cases was 1.23±1.98 mg/dl as compared to control (p <0.0001). The mean serum CRP in controls was 0.04±.19 mg/dl.

Table 1: Table showing the mean, S.D,'t' and P values of CSF LDH, protein, sugar levels in different types of meningitis

Types of meningitis	LDH IU/L				Protein mg/100 ml				Sugar mg/100 ml			
	Mean	± S.D.	't' values	P values	Mean	± S.D.	't' values	P values	Mean	± S.D.	't' values	P values
Pyogenic meningitis	230.4	35.8	29.2	0.0001	216.5	118.3	5.76	0.0001	20.6	7.6	11.2	0.0001
Tuberculous meningitis	132.1	32.3	19.0	0.0001	150.2	31.6	3.27	0.0001	32.3	8.1	18.3	0.0001
Viral meningitis	46.4	13.5	10.01	0.0001	53.9	9.5	18.6	0.0001	56.1	10.8	17.90	0.0001

Table 2: CRP value in cases and control

	CSF- CRP	Serum –CRP
Control	0.052±0.12 mg/dl	0.04±0.19 mg/dl
Meningitis	2.15±1.8 mg/dl	1.23±1.98 mg/dl

Discussion

The meningitis is one of the important causes of considerable morbidity and mortality in children's. In order to differentiate aseptic meningitis to the bacterial meningitis, numbers of studies have shown the effectiveness of rapid and definite tests using CSF variables and markers of peripheral blood for various common and uncommon laboratory measurements [9-10]. This observation is quite in accordance with the observations made earlier by M. Sharma et al [11]; Moshe Nussinovitch [12] who also observed raised LDH level in the CSF of patients of pyogenic meningitis. Some researchers have suggested a disturbance in the blood-brain barrier which enables plasma LDH to reach the CSF, or production of LDH by neoplastic tissue or by white blood cells and exogenous bacterial sources [13-15]. In viral meningitis CSF-LDH estimation may differentiate it from that of tuberculous and pyogenic meningitis and so of diagnostic importance. CSF CRP. Shimetani et al [16] also showed a substantial increase in CSF and serum CRP levels in cases of meningitis. Kumar et al [17] observed a very significant increase ($p<0.0001$) in CSF in cases of pyogenic, so CSF-LDH and CRP estimation is of importance as a diagnostic and prognostic tool as far as the dreaded disease of different types of meningitis are concerned. CSF and serum CRP was elevated in 96% of cases when compared to control. Vaishnavi et al [18] and Takhiwale et al [19] observed a similar trend with the levels of CSF CRP.

Conclusion

Bacterial meningitis is more common and frequently reported than non-bacterial meningitis. Evaluation of CSF-LDH and CRP may help to differentiates pyogenic meningitis from non-bacterial meningitis.

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