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Original Research Article

Significance of CSF-LDH in various types of meningitis

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Abstract

The cerebrospinal fluid concentration of Lactate dehydrogenase (LDH) was studied in patients with pyogenic and tubercular meningitis. Significant increase in LDH level (P<0.001) were observed in the test group when compared to the control group. LDH may useful in differentiating viral from other meningitis. It may act as corroborative evidence of meningitis.

Keywords: meningitis, cerebrospinal fluid, lactate,

1. Introduction

Meningitis refers to an inflammatory process of the leptomeninges and CSF within the subarachnoid space. Infectious meningitis is broadly classified into acute pyogenic (usually bacterial meningitis) aseptic (usually acute viral meningitis) and chronic usually (tuberculous, spirochetal or cryptococcal)[1].

Pyogenic meningitis is a major pediatric problem all over the world, especially in developing countries like India[2]. Antibiotics have reduced the mortality from almost 100% to 8-30%. Early and reliable diagnosis is the key to successful out come[2].

As presenting signs and symptoms may be inconclusive laboratory tests are essential in establishing a definite diagnosis. So, the rapid diagnosis of bacterial meningitis is an important function of most laboratories and usually based on CSF examination[3].

Many test for rapid diagnoses of bacterial meningitis have been introduced including the nitroblue tetrazolium test, litmus test, counter immnoelecrophoresis and gram stain. Even though the above tests, favors rapid diagnosis, they have their own drawbacks. Counter immunoelectrophoresis is utilized in the diagnosis of meningitis due to *haemophilus*, *pneumococci* and *meningococci* but the method requires specific high tittered antisera and overall false negative rate is about 10%.

The litmus lysate test for endotoxin is rapid and accurate in diagnosing gram negative meningitis but is of no value in cases of gram positive etiology further more if the gram negative bacterial count in the CSF is below 3000 to 400 microorganisms per cubic centimeter, a false negative litmus lysate test may result[4].

The information yielded by examination of Cerebrospinal fluid (CSF) is often of crucial importance in the diagnosis of neurological disease[5]. Various biochemical markers in CSF including lactate dehydrogenase (LDH) have been studied in diverse neurological conditions like leptomeningeal carcinomatosis, stroke and different types of meningitis[6]-[8].

The gram stain may be negative in as many as 30% of cultured proved bacterial meningitis prior antibiotic treatment may also alter bacteria, so as to

obscure their morphological and staining characteristic[4].

Enzymatic study (CSF-LDH) is a better sensitive parameter in diagnosis of various types of meningitis when all the above rapid diagnostic method fail[4].

1.1 Aims and Objectives

- The purpose of this study was to establish early diagnosis and therapeutic value of CSF-LDH in bacterial and non bacterial meningitis.
- To evaluate the importance of CSF-LDH estimation as compared to other investigation in diagnosis of bacterial meningitis in adults as well as in children.
- To find out whether it is specific, superior and faster than other parameters in differential diagnosis of meningitis.
- To find out its usefulness in differential diagnosis of meningitis.

2. Material and Methods

The present study carried out at Department of Pathology, Shree M.P. Shah Medical College and Guru Govind Singh Hospital, Jamnagar during the period from July 2004 to July 2006.

Total 140 CSF samples were examined. Out of them 100 patients of all age groups and either sex of clinically suspected cases of meningitis were taken as test group. The physical, Biochemical and microscopic examination of CSF were done in all cases of pyogenic, tuberculous and viral meningitis. 40 control subjects of all age and either sex were taken as control group.

In all cases, detailed history including age, sex, duration of symptoms, presenting symptoms, history of treatment prior to hospitalization.

Routine hematological investigation, X-ray, USG and CT scan finding were noted.CSF was obtain by lumber puncture and examined in detail including physical appearance, turbidity, presence of xanthochromia, cobweb, clot etc.

CSF microscopic examination including total cell count and differential count were done. Biochemistry analysis like (Sugar, Protein, Chloride, ADA and LDH) was also done.

3. Result

The present study consisted of 100 cases of suspected meningitis to differentiate them in to pyogenic of non pyogenic including tubersulous and view group by the help of CSF examination including physical color, appearance, xanthochromia etc. chemical (Sugar, Protein) microscopic examination with estimation of CSF LDH as mention in material and method.

The results were recorded, studied and tabulated as follow in 100 cases of meningitis and 40 cases of control group.

Table No: 01 Age distribution in various disease and control group.

age	Pyogemic meningitis		Tuberculous meningitis		Viral meningitis		Total	Control Group	
	No. of cases	%	No. of cases	%	No. of cases	%		No. of cases	%
0-12 Month	24	60	8	20	3	15	35	7	17.5
13-24 Month	03	7.5	10	25	2	10	15	6	15
25-36 Month	02	5	3	7.5	2	10	7	5	12.5
3-5 year	01	2.5	8	20	4	20	13	6	15
6-7 yeas	01	2.5	4	10	2	10	7	5	12.5
8-12 Year	02	5	2	5	4	20	8	3	7.5
13-20 \year	03	7.5	2	5	1	5	6	4	10
21-40 \year	02	5	2	5	2	10	6	2	5
>40 year	02	5	1	2.5	0	0	3	2	5
Total	40	100	40	100	20	100	100	40	100

Table no.01 shows that majority of cases (72.5%) occurred below 3 year of age in cases of pyogenic meningitis. The vast majority of cases (60%) were below one year. The cause of increase incidence during the first 3 year of life is possibly due to increase meningeal permeability.

In case of tuberculous meningitis, majority of cases below 5 year of age (72.5%) with the maximum incidence being in the age group of 1-2 years (25%) fallowed by 0-12 month (20%) and 3-5 years (20%).

Table 02: Sex distribution of disease cases

Type of meningitis	No. of cases	Male		Female	
		No. of cases	percentage	No. of cases	percentage
Pyogenic	40	24	24	16	16
Tuberculosis	40	22	22	18	18
Viral	20	12	12	8	8
Total	100	58	58	42	42

Table no. 2 is showing male predominance as compared to frequency of meningitis is female. In males pregnancy of pyogenic meningitis (24%) was more as compared to tuberculous (18%) and viral (12$) meningitis. Where as in females frequency of tuberculous meningitis was 22 %, 16% for pyogenic meningitis and 8 % for viral meningitis.

Table 03: CSF-LDH (Level) in various disease and control group

Type of meningitis	No. of cases	CSF-LDH Range	Mean
Pyogenic meningitis	40	35.5-750 U/L	171.25 U/L
Tuberculous meningitis	40	20.4-315 U/L	105.65 U/L
Viral meningitis	20	17-75 U/L	35.6 U/L
Control group	40	05-53 U/L	21.30 U/L

The table no.03 shows that CSF-LDH level increases maximally in pyogenic meningitis with range of 35.5-750 U/L and mean 171.25 U/L. there was mild increase of CSF-LDH in aseptic meningitis (17-75 U/L range and mean 35.6 U/L) and moderate increase in tuberculous meningitis (range 20.4-315 U/L and mean 105.65 U/L). CSF-LDH activity in the control group ranges from 05-53 U/L with the mean of 21.30 U/L and it is taken as a normal mean value in the present study.

Table 04: CSF –LDH Positivity & Negativity in various disease and control groups

Type of meningitis	CSF-LDH Positive		CSF-LDH Negative		Total No.
	No. of cases	Percentage	No. of cases	Percentage	
Pyogenic meningitis	35	87.5	5	12.50	40
Tuberculous meningitis	31	77.5	9	22.50	40
Viral meningitis	11	55	9	45	20
Control group	00	00	40	100	40

Table no 04 shows that LDH activity is increased in 87.5% of pyogenic meningitis, 77.5% of tuberculous meningitis cases and 22.5% of viral meningitis.

So, this shows that test is highly significant for diagnosis of bacterial meningitis to other meningitis group.

Table No. 05: Sensitivity, specificity and predictive value in pyogenic meningitis

	Disease present	Disease absent
Test positive	33	05
Test negative	07	35

Sensitivity = 33/40 = 82.5%

Specificity = 35/40 = 87.5%

Predictive value of positive test = 33/38 = 86.8%

Predictive value of Negative test = 35/42 = 83.3 %

Table no.05 shows that in case of pyogenic meningitis sensitivity was 82.5 % and specificity was 87.5%. The Predictive value of positive test was 86.3% and the Predictive value of Negative test was 83.3 % in present study.

In cases of pyogenic meningitis detection of 'p' value is <0.001 is highly significant.

4. Discussion

Meningitis is a significant cause of morbidity and mortality in children worldwide. Neurological outcome and survival depend largely on damage to central nervous system prior to effective treatment. Quick diagnosis in acute bacterial meningitis is due to large spectrum of signs and symptoms. However, it is usual practice to start antibiotics before the complete laboratory results are available. Such blind prescriptions are usually in non menigitis doses. Majority of children who reported to hospital, therefore, have already been treated with inadequate dose of antibiotics and present atypical features in CSF.

The activity of LDH varies from person to person and also from laboratory due to variation in the standardization of apparatus and reagents used.

Table no 06: Comparative analysis of age distribution in pyogenic meningitis.

Authors	Year	Age		
		0-1 year	1-3 year	>3 year
Achar and Thambiah[9]	1954	82.60	5.80	11.60
Paul[10]	1960	71.00	13.00	16.00
Vashi and Joshi[11]	1968	58.00	18.00	24.00
Gandhi[12]	1969	25.00	31.70	43.30
Kumar *et al*[13]	1980	54.50	19.70	25.80
Merchant and Patil[14]	1984	85.00	0.00	0.00
Present study	2007	60.00	12.50	27.50

Table no.06 shows that comparative analysis of only pediatric patient done as pediatric age group constituted about 82.5 % of total cases in the present study. Children up to 12 years of age were taken and calculations were done accordingly in present study.

Table no 07: Comparative analysis of age distribution in tuberculous meningitis.

Authors	Year	Age				
		0-1 year	1-2 year	3-5 year	6-7 year	>7 year
Udani *et al*[15]	1970	15.60	20.80	39.20	11.80	12.60
Benakappa *et al*[16]	1975	26.00	26.00	34.00	6.00	8.00
Present study	2000	20.00	25.00	20.00	10.00	5.00

As mention in table No.07 the age distribution in the present study correlated with that reported by Udani *et al* and Benakappa *et al*[16]. In the present study the highest incidence of disease i.e. 65% occurred in children under 5 years of age.

The incidence decrease after 5 years of age i.e. 10% between 6-7 years of age and 5% above 7 years of age Udani *et al*[15] and Benakappa *et al*[16] has reported similar decrease in incidence.

Table No. 08: Comparative analysis of CSF-LDH value in Bacterial meningitis and control group.

Authors	Year	CSF –LDH Bacterial meningitis	CSF-LDH Control group
P.V. Nelson[17]	1975	31-1498 U/L	3.17 U/L
Knight[4]	1981	88-2451 U/L	0.23-5 U/L(10.5U/L)
Present study	2006	35.5-750 U/L	5-53 U/L (21.3U/L)

In the present study the mean value was 21.3 U/Lin the control group which is more or less equated the past study group.

CSF-LDH activity is markedly increased in pyogenic meningitis group in the present study and it is correlated well with study of P.V. Nelson and study of Knight.

5. Conclusion

Bacterial meningitis is more common than non bacterial meningitis. Pyogenic meningitis is more prevalent under 1 year of age group while tuberculous meningitis is seen most frequently betweens 3 to 5 year of age. Estimation of CSF-LDH activity shows more sensitive (82.5%) and specificity (87.5%) to differentiate pyogenic meningitis from non bacterial meningitis. CSF-LDH level has inverse relationship with meningitis and direct relationship with leucocytosis.

So, overall conclusion of study is that estimation of CSF-LDH activity is not only supplementary aid but diagnostic and differentiating aid for meningitis.

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