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DOI: 10.18869/IJABBR.2017.412



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International Journal of Advanced Biological and Biomedical Research

Journal DOI: 10.18869/IJABBR

ISSN: 2322-4827

CODEN (USA): IJABIS

<http://ijabbr.com>



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IJABBR- 2017- eISSN: 2322-4827

International Journal of Advanced Biological and Biomedical Research

Journal homepage: www.ijabbr.com



Research Article

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Estimation of Lactate Dehydrogenase Activity in cerebrospinal fluid in different types of meningitis

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ARTICLE INFO

Article history:

Received: 14 Jan 2017

Revised: 26 Feb 2017

Accepted: 19 Mar 2017

ePublished: 30 Apr 2017

Key words:

Lactate dehydrogenase

(LDH)

Cerebrospinal fluid

(CSF)

Meningitis

ABSTRACT

Objective: Meningitis is life-threatening condition and examination of the Cerebrospinal fluid (CSF) may not give a precise diagnosis and prognosis of different types of meningitis. Bacterial meningitis is still a very common problem especially in many developing countries. The aims of study are to estimate the importance and significance of Lactate Dehydrogenase (LDH), protein and sugar in CSF of different types of meningitis. **Methods:** A total of 160 cases, aged between 1 month and 60 years, including patients with bacterial meningitis (n=50), 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 tuberculosis meningitis (TBM). Bacterial meningitis is more common than non bacterial meningitis. The enzymatic activity of LDH although significantly raised in PM compared to TBM but there was no cutoff level to differentiate them. The LDH level did rise quite significantly in pyogenic meningitis.

Introduction

Lactate dehydrogenase (LDH) is zinc containing enzymes of glucose metabolism. After discovery of LDH activity in cerebrospinal fluid (CSF) in 1956 by Bruns et al., Wroblewski et al. (1957) first described clinical significance of LDH in CSF. Thereafter, many workers found significant elevations of CSF-LDH level in meningitis and other cerebrovascular disorders. The reports indicated that an increase in CSF level of Lactate dehydrogenase might be of potential value in diagnosing bacterial meningitis when CSF findings of protein, sugar and cells are non-specific. Bacterial meningitis is still a considerable cause of mortality and morbidity especially

in children (Tunkel, A.R. and S.W. Michael, 2010, Roos, K.L. and K.L. Tyler, 2008 and Feigin, R.D. and E. Pearlman, 2004). Although many studies have acknowledged the CSF in either diagnosis or prognosis of bacterial meningitis patients (Kano H, Ohtani H 1997, Paradowski M, Lebos M, Kuydowicz J, et al 1995 and Sormunen P, Kallio MJT, Kilpi T, et al 1999) 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 (Gendrel D, Raymond J, oste J, et al.1999).

The aims of the study are to find out the role of LDH activity in CSF to differentiate among pyogenic, tuberculous and viral meningitis.

Material and Methods

Total 160 CSF samples were examined. Out of them 120 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 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

In control group the mean \pm S.D of CSF- LDH, Protein and sugar levels were 31.0 ± 9.47 , 29.90 ± 5.26 and 65.65 ± 5.48 respectively, which were within normal range.

Table 1: Distribution of CSF - LDH level with other parameters in control group

No. of cases (40)	Range	Mean	S.D.	SEM
LDH IU/L	10 - 44	31.0	9.47	1.50
Protein mg/100 ml	18 - 36	29.90	5.26	0.83
Sugar mg/100 ml	56 - 76	65.65	5.48	0.87

Table 2: Comparison among CSF - LDH, Protein and sugar level in cases of pyogenic meningitis with control

Group	LDH IU/L					Protein mg/100 ml					Sugar mg/100 ml				
	Range	Mean	SD	't' Value	P value	Range	Mean	SD	't' Value	P value	Range	Mean	SD	't' Value	P value
Control	10-44	31.0	9.47	20.67	0.0001	18-36	29.90	5.26	36.02	0.0001	56-76	65.65	5.48	75.46	0.0001
Pyogenic meningitis	181 - 333	247.65	37.58	25.05	0.0001	90 - 450	226.95	138.47	7.86	0.0001	10 - 36	23.87	8.98	12.76	0.0001

The CSF-LDH level in pyogenic meningitis is ranged from 181-333 IU/L with mean of 247.65 ± 37.58 , which is statistically highly significant than control ($P < 0.0001$). The protein level in pyogenic meningitis is ranged from 90-450 mg/100 ml with mean of 226.95 ± 138.47 , which is statistically highly significant than control ($P < 0.0001$). The sugar level in pyogenic meningitis is ranged from 10-36 mg/100 ml with mean of 23.87 ± 8.98 , which is statistically highly significant than control ($P < 0.0001$) (table 2).

Table 3: Study showing relationship among CSF-LDH level and other parameters in Tuberculous meningitis with control.

Group	LDH IU/L					Protein mg/100 ml					Sugar mg/100 ml				
	Range	Mean	SD	't' Value	P value	Range	Mean	SD	't' Value	P value	Range	Mean	SD	't' Value	P value
Control	10-44	31.0	9.47	20.67	0.0001	18-36	29.90	5.26	36.02	0.0001	56-76	65.65	5.48	75.46	0.0001
Tuberculous meningitis	95-250	154.24	36.66	14.99	0.0001	110-240	170.6	36.64	23.27	0.0001	20-50	39.48	9.22	21.46	0.0001

The CSF-LDH level in tuberculous meningitis is ranged from 95 – 250 IU/L with mean of 154.24 ± 36.66 , which is statistically highly significant than control ($P < 0.0001$). The protein level in tuberculous meningitis is ranged from 110-240 mg/100 ml with mean of 170.6 ± 36.64 , which is statistically highly significant than control ($P < 0.0001$). The sugar level in tuberculous meningitis is ranged from 20-50 mg/100 ml with mean of 39.48 ± 9.22 , which is statistically highly significant than control ($P < 0.0001$) (Table 3).

Table 4: Table showing the relationship of CSF-LDH and other parameters in cases of viral meningitis with controls

Group	LDH IU/L					Protein mg/100 ml					Sugar mg/100 ml			
	Range	Mean	SD	't' Value	P value	Range	Mean	SD	't' Value	P value	Range	Mean	SD	't' Value
Control	10-44	31.0	9.47	20.67	0.0001	18-36	29.90	5.26	36.02	0.0001	56-76	65.65	5.48	75.46
Viral meningitis	22-73	49.58	15.58	11.04	0.0001	45-80	63.75	10.25	21.54	0.0001	52-98	66.25	12.07	19.04

In table 4 shows that CSF-LDH level in viral meningitis is ranged from 22-73 IU/L with mean of 49.58 ± 15.58 , which is statistically highly significant than control ($P < 0.0001$). The protein level in viral meningitis is ranged from 45 – 80 mg/100 ml with mean of 63.75 ± 10.25 , which is statistically highly significant than control ($P < 0.0001$). The sugar level in viral meningitis is ranged from 52 – 98 mg/100 ml with mean of 66.25 ± 12.07 , which is statistically highly significant than control ($P < 0.0001$). The LDH level did rise quite significantly in pyogenic meningitis (Mean 247.65 IU/L Range 181-333 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 (table 2). 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, Mean 154.24 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 22-73 IU/L, Mean 49.58 IU/L, S.D. 15.58 IU/L and S.E.M. 4.49 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.

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 (Jadali, F. et al 2009, Sormunen P et al 1999, and Snyder R D 2003). This observation is quite in accordance with the observations made earlier by M. Sharma et al (2006); Moshe Nussinovitch (2009) 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 (Lending M et al 1964, Wroblewski, F et al 1958, and Aicardi J 1992). In viral meningitis CSF-LDH estimation may differentiate it from that of tuberculous and pyogenic meningitis and so of diagnostic importance. So CSF-LDH estimation is of importance as a diagnostic and prognostic tool as far as the dreaded disease of different types of meningitis are concerned.

Conclusion

It is conclude that biochemical profile of CSF variables have shown the effectiveness of rapid and definite tests for meningitis and treatment. However, this increase in protein level is due to the increased membrane permeability which may lead to increase CSF enzymes proportionately, which help to rule out in the differential diagnosis of meningitis

References

Bruns, F.H., Jacob W. and Wevermick,F.: Clinical Chemical acta, 1:63, 1956.

Wroblewski, F. , Decker, B. and Wroblewski, R. : Activity of Lactic dehydrogenase in spinal fluid Amer. Jr. Clin. Path. 28: 269, 1957.

Feigin, R.D. and E. Pearlman, 2004. Bacterial Meningitis beyond the Neonatal Period. In: Text Book of Pediatric Infectious Disease, Feigin, R.D., G.J. Demmler, J.D. Cherry and S.L. Kaplan, (Eds.). Saunders, Philadelphia, pp: 443-474.

Kanoh Y, Ohtani H. Levels of interleukin-6, CRP and alpha 2 macroglobulin in cerebrospinal fluid (CSF) and serum as indicator of blood-CSF barrier damage. Biochem Mol Biol Int 1997;43 (2):269-78.

Paradowski M, Lebos M, Kuydowicz J, et al. Acute phase proteins in serum and cerebrospinal fluid in the course of bacterial meningitis. Clin Biochem 1995; 28(4):459-66.

Sormunen P, Kallio MJT, Kilpi T, et al. C-reactive protein is useful in distinguishing gram stain-negative bacterial meningitis from viral meningitis in children. J Pediatr 1999;134 (6):725-9.

Gendrel D, Raymond J, oste J, et al. Comparisson of procalcitonin with C-reactive protein, interleukin 6 and interferon-alpha for differentiation of bacterial vs. Viral infections. Pediatr Infect Dis J 1999;18 (10):875-81.

Jadali, F., Sharifi, M., Jarollahi, A., & Nahidi, S. (2009). C - Reactive protein And Lactate Dehydrogenase in Serum and Cerebrospinal Fluid in Rapid and Early Diagnosis of Childhood Meningitis. Iranian Journal of Child Neurology., 1(4), 37-46.

Sormunen P, Kallio MJ, Kilpi T, Peltola H. (1999). C-reactive protein is useful in distinguishing Gram stain-negative bacterial meningitis from viral meningitis in children. J Pediatr. 134(6):725-9.

Snyder RD. Bacterial meningitis: diagnosis and treatment. Curr Neurol Neurosci Rep 2003; 3(6):461-9.

Sharma M. and Nand N. : Evaluation of Enzymes in Pyogenic and Tuberculous meningitis. JAPI, Vo. 54, Feb. 2006.

Moshe Nussinovitch et al : Cerebrospinal fluid lactate dehydrogenase isoenzyme in children with bacterial and aseptic meningitis. Accepted June 2009.

Lending M, Slobody LB, Mestern J. Cerebrospinal fluid glutamic oxalacetic transaminase and lactic dehydrogenase activities in children with neurologic disorders. J Pediatr 1964; 65: 415–21

Wroblewski, F, Decker B, Wroblewski R. The clinical implications of spinal fluid LDH activity. N Engl J Med 1958; 258:635–9

Aicardi J. Disease of the nervous system in childhood. Clin Dev Med 1992; 1115/118: 1132–5