Association Of Cerebrospinal Fluid Lactic Acid Level In Various Types of Meningitis

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Summary

C. S. F. lactic acid level increases in pyogenic and tubercular meningitis (TBM), level being higher in pyogenic than TBM. There was no significant change in aseptic meningitis as compared to normal. The rise in lactic acid had a *directly proportional* relationship with cerebrospinal fluid (C. S. F.) protein and cell count while inversely proportional to C. S. F. sugar in pyogenic and TBM. Successful treatment led to the return of lactic acid level to normal within 2 to 3 weeks in pyogenic meningitis while after 6 weeks in TBM. Serial C. S. F. lactic acid estimation offer an useful indicator to evaluate the efficacy of therapy in pyogenic and TBM.

Introduction

Cerebrospinal fluid (C. S. F.) lactic acid level increases considerably in different types of meningitis which comes back to normal after successful treatment. There is not much change in aseptic meningitis as compared to control group.

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Material and Method

Patients studied were grouped in various categories on the basis of history, clinical examination & lumbar puncture analysis.

Category I

Patients with or without history of fever, headache, & vomiting were included. On examination there was no finding suggestive of meningitis. C. S. F. examination revealed normal pressure, clear, protein and sugar were within normal levels of 20 to 40 mgm%, & 40 to 80 mgm% respectively. C. S. F. cells were less than 5/cumm³, mostly lymphocytes. C. S. F. was sterile. (Control cases of Idiopathic epilepsy).

Category II

Patients with history of fever, vomiting and headache for over 2 weeks were included. On examination there was finding suggestive of meningitis. C. S. F. examination showed raised pressure, clear fluid & on keeping there occurred cob-web formation. C.S.F. protein was more than 50mgm%, while C. S. F. sugar was less than 60% of the concomitant blood sugar. C. S. F. cells-total count more than 25 cells cumm, mostly lymphocytes. One of the following tests was positive,

(1) Sputum for A. F. B.	(2) C. S. F. smear culture for A. F. B.
(3) Mantoux, B. C. G. test	(4) Radiological evidence of tuberculosis.
- (Included tubercular meningitis cases)

Category III

Patients with history of fever, othoea, were included or. On examination there were features of meningitis. C. S. F. examination revealed turbid color, increased pressure, C. S. F. protein more than 40mgm%, and sugar reduced to even zero. C. S. F. cells (total) more than 100/cumm, mostly polymorphs. (Furulent meningitis cases).

Category IV

Included in this category were patients with history of viral infection. On examination there were features of meningitis. C. S. F. examination revealed clear fluid of normal pressure, C. S. F. sugar and protein were within normal limits, C. S. F. cells total moderately raised, mostly lymphocytes, C. S. F. culture was negative. (Viral meningitis cases).

Method

In all groups C. S. F. lactic acid was estimated in each caseh on the days of admission. In case of purulent meningitis lactic acid was estimated at the end of 3rd day, 1st week and 2nd week., while in case of TBM lactic was estimated at the end of 1st week, 4th week and 6th week.

Lactic acid was estimated by method developed by Baker and Summerson (1940).

Observation

Total number of cases studied in different categories were 32, out of which 20 were males & 12 females. Their ages ranged from 18 to 60 years.

Table- I

Showing C. S. F. lactic acid level in category- I (N=8)

	No. of Cases	C. S. F. Lactic acid (mgm/dl)
1	1	14
	2	20
	3	6
	4	17
	5	9
	6	8
	7	22
	8	7

C. S. F. lactic acid level in category- I was 12.9 ± 5.9 mgm% (Range 6 to 22mgm%).

Table- II

Showing C. S. F. lactic acid level in cases

No.	Lactic acid			
	Before treatment	1st week	4th week	6th week
	On Treatment			
1	40	28	20	11
2	80	44	30	14
3	44	40	34	16
4	66	30	24	12
5	56	34	30	12
6	72	36	34	10
7	70	50	56	14
8	64	32	24	16
Mean	61.5	36.7	30.2	13.2
S. D.	12.9	7.0	7.5	2.06

C. S. F. lactic acid level before starting treatment was 61.5 ± 12.9 mgm% and at the end of 1st, 4th, & 6th week were 36.7 ± 7 mgm% , 30.2 ± 7.5 mgm% & 13.2 ± 2.06 mgm% respectively.

Table- III
Showing C. S. F. lactic acid level in category- III (N-8)

No.	C. S. F. lactic acid (mgm%)			
	Before Treatment	3rd day	2nd week	END OF 3rd week
1	108	26	12	10
2	70	26	14	12
3	94	25	16	14
4	80	26	12	12
5	112	24	16	14
6	92	28	14	10
7	90	26	14	10
8	88	24	14	10
Mean	91.7	25.6	14	11.5
S. D.	12.2	1.2	2	1.3

C. S. F. lactic acid level before starting the treatment was 91.7 ± 12.2 mgm%. On the 3rd day, at the of 2nd & 3rd week the level was 25.6 ± 1.2 mgm%, 14.0 ± 2.0 mgm% & 11.5 ± 1.3 mgm% respectively.

Table- IV
Showing C. S. F. lactic acid level in category IV (N- 8).

No.	Lactic acid level (mgm%)	No.	Lactic acid level (mgm%)
1	22	5	18
2	12	6	16
3	14	7	14
4	10	8	12
Mean -- 14.7			
S. D. -- 3.5			

C. S. F. lactic acid level in viral meningitis was 14.7 ± 3.5 mgm%.

Table- V

Showing C. S. F. protein, sugar & lactic acid & cells (Range--R. Mean --M) in different categories.

GROUP	PROTEIN mgm%	SUGAR mgm%	LACTIC acid mgm%	CELLS/ Cumm	PREDOMINANT cells
Category i	R--14.32 M--24.2	44-48 64	6-22 12.9	2-7 3.2	Lymph.
Category II	R--50-400 M--205	20-30 25	40-80 61.5	80-500 222.5	Lymph
Category III	R--150-600 M--364	0-24 8.7	70-112 91.7	500-4,000 1625	Poly
Category IV	M--20-60 R--30	40-44 42	12-22 14.7	10-70 23.7	Mixed

Discussion

In the present study there were 20 males & 12 females. C. S. F. lactic acid level in control group was 12.9 ± 5.9 mgm%. This value is in accordance with the finding of Paulson et al (1977), & Singhal et al (1981).

In category- II (TBM) C. S. F. lactic acid level was 61.5 ± 12.9 mgm%. This result is in relation with the finding of Aslam (1979). With the institution of antitubercular therapy the C. S. F. lactic acid level at the end of 1st, 4th & 6th week were 37.7 ± 7.0 mgm%, 30.2 ± 7.5 mgm%, & 13.2 ± 2.0 mgm% respectively. It took 6 weeks for the lactic acid level to reach the normal value. This result is in agreement with the findings of Brook et al (1979) & Lanwers (1978).

In category- III (Purulent Meningitis) the lactic acid level was 91.7 ± 12.2 mgm%. This result was in accordance with the findings of Jenson et al (1979), Parlaskis et al (1980) & Singhal et al (1981). With the institution of antibiotic therapy the C. S. F. lactic acid level at the end of 3 days, 2nd & 3rd week were 26.6 ± 1.2 mgm%, 14 ± 2 mgm% & 11.5 ± 1.3 mgm% respectively.

In category- IV (Aseptic meningitis) the lactic acid level was 14.7 ± 3.5 mgm%. This result is in accordance with the findings of Blend et al (1974), Gandhi et al (1977) & Singhal et al (1981). In both purulent & TBM, lactic acid level increased with the increase of C. S. F. protein, while lactic acid level increases with the decrease of C. S. F. sugar. This finding is in accordance with the findings of Gandhi et al (1977). As regards cell reaction to lactic acid is concerned, it is seen that with the increase in the number of cells in purulent & TBM there was increase in the C. S. F. lactic acid. This result is in consistent with the findings of Gandhi et al (1977).

The increase in C. S. F. lactic acid according to De Sanctis et al (1933) is that W. B. C. produces lactic acid as a result of glucose metabolism within the C. S. F. Menkes (1969) proposed that actively metabolising neutrophils contributed little to C. S. F. lactic acid. It was further supported by finding increased concentration of lactic acid in the C. S. F. of patients with TBM (Montani & Perret 1964, Sudre & Reiss 1969 & present study). In such cases the cellular response is mononuclear.

Kopetsky and Fishberg (1933) postulated that in purulent meningitis there is decreased supply to the brain due to raised intracranial pressure leading to increased lactic acid. This hypothesis is supported by Paulson et al (1967), Posner et al (1967) & Plum et al (1967) showed that changes in C. S. F. lactic acid is because of alteration in cerebral metabolism. A low clearance rate of lactic acid from C. S. F. result in increased level of the same. It has been seen by Alexander et al (1962) in animals.

References

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