

Assessment of Lactic Dehydrogenase in Cerebrospinal Fluid to Differentiate between Structural and Non-Structural Central Nervous System Lesions in Patients with Diminished Level of Consciousness

Dr. Yogesh Kumar¹, Dr. Jyoti Prakash Yogi², Dr. S. Banerjee³

¹Residents, Department of Gen Medicine SMS Medical College/ RUHS, RAJ., India

²Residents, Department of Gen Medicine SMS Medical College/ RUHS, RAJ., India

³Sen. Prof. & Unit Head, Department of Gen Medicine SMS Medical College/ RUHS, RAJ., India

Abstract: *Although both metabolic and structural abnormalities have devastating effect on the CNS, their treatment approaches and prognoses vary considerably. This study was conducted among 53 patients with diminished level of consciousness and CSF was analyzed for quantitative LDH(IU/L) value. In our study mean CSF-LDH was 25.19 ± 12.92 in patients with non-structural lesion and 86.53 ± 32.09 in patients with structural lesion of brain and difference was statistically highly significant ($p < 0.001$). So CSF-LDH values can be used to differentiate between patients with structural pathology and those with metabolic disturbances.*

Keywords: lactic dehydrogenase (LDH); diminished level of consciousness; cerebrospinal fluid; non-structural lesion; structural lesion

1. Introduction

Acute impairment of consciousness is a common reason for emergency department admission. Causes of diminished level of consciousness^{1,2} include structural (like trauma, intracranial haemorrhage, tumor, hydrocephalus, epilepsy, meningitis, encephalitis, cerebral venous thrombosis etc.) and non-structural (like metabolic (including hyponatremia, hypocalcemia, hypomagnesemia, ketoacidosis, hypoglycaemia)), hepatic failure, uremia, hypercapnea, hypothyroid, hypertension, hypothermia, infections and drugs.

Damage within the central nervous system results in raised values of intracellular products within the cerebrospinal fluid considerably earlier than they can be detected in the bloodstream. Although many studies have demonstrated an increase in the concentration of creatine kinase, LDH, and glutamic oxaloacetic transaminase from 8 hours to several days after the onset of stroke, LDH was found to be the most sensitive CSF enzyme in indicating cerebrovascular events.^{3-6,8} A significantly increased CSF-LDH level has been demonstrated in patients with hemorrhagic infarcts, mild and moderate strokes, small lacunar infarcts, and even transient ischemic attacks.⁴ Normal CSF-LDH level are ≤ 70 units/L for newborns and ≤ 40 units/L for adults.^{6,9}

2. Problem Definition and Literature Survey

Although the Glasgow Coma Scale (GCS) score is used to analyse physical findings in patients with altered consciousness, but it cannot discriminate between structural and non-structural etiologies.^{1,2} Computed tomography (CT)

of the brain is a key diagnostic tool in these cases, though it may be inconclusive in some patients with coma or delirium and also it may not be readily available in many parts of the world.⁷

Wroblewski et al first described the clinical importance of elevated spinal fluid LDH in 1957. In 2008, Vazquez et al showed spinal fluid LDH level below 40 units/liter in adult critically ill patients with non-traumatic altered mental status is indicative of a metabolic derangement⁽⁹⁾.

To determine CSF-LDH values that may differentiate between patients with structural pathology and those with metabolic disturbances, we designed a study to quantitatively analyze the enzyme in patients with impaired consciousness.

3. Material and Methods

This prospective observational, cross-sectional study was conducted among 53 patients with diminished level of consciousness without history of trauma from July 2012 to June 2013 in Medicine wards at S.M.S. Hospital, Jaipur. The study included all patients >18 years of age who had GCS < 12 on admission (since all patients for the study were critically ill, the average GCS was much lower, with most being < 11).

Patients were excluded if a computed tomography scan showed contraindications to performing a lumbar puncture, if they had a coagulopathy, or if the CSF was xanthochromic or produced visible blood sediment after centrifuging. All patients had a CT-scan before a lumbar puncture was performed. The CSF was analyzed for quantitative LDH(IU/L) value. The study population was divided into

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two groups depending on whether their diagnosis indicated a structural or non-structural abnormality. Patients demography in both cohorts were assessed for differences and each group was analyzed individually. Unpaired Student's t test and Chi-Square test were used to determine statistical difference between variables. Pearson's coefficient was used to investigate the correlation between the two variables. Statistical significance was set at P value ≤ 0.05 .

4. Results and Discussions-

Table 1: Mean \pm Sd of CSF-LDH according to Lesion

	Lesion		p-value	Significance
	Non-structural	Structural		
Mean \pm Sd (CSF-LDH)	25.19 \pm 12.92	86.53 \pm 32.09	< .001	HS

Table 1 explains mean CSF-LDH, which was 25.19 ± 12.92 IU/L in patients with non-structural lesion and 86.53 ± 32.09 IU/L in patients with structural lesion. Mean of CSF-LDH in 53 patients of study was 46.61 ± 17.35 IU/L. Difference of mean CSF-LDH between structural and non-structural lesion was statistically highly significant ($p < 0.001$).

Table 2: Distribution according to CSF-LDH & Lesion

CSF-LDH	Lesion		Total
	Non-structural	Structural	
Abnormal (> 40 IU/L)	1 (1.89%)	28 (52.83%)	29 (54.72%)
Normal (< 40 IU/L)	20 (37.74%)	4 (7.55%)	24 (45.28%)
Total	21 (39.62%)	32 (60.38%)	53 (100.00%)

$\chi^2 = 31.770$ d.f.=1 $p < .001$ HS

Table 2 shows that out of 29 (54.72%) patients with abnormal CSF-LDH (> 40 IU/L), 1 (1.89%) had non-structural lesion and 28 (52.83%) had structural lesion. Out of 24 (45.28%) patients with normal CSF-LDH (< 40 IU/L), 20 (37.74%) had non-structural lesion and 4 (7.55%) had structural lesion. The association of CSF-LDH between structural and non-structural lesion was statistically highly significant ($p < 0.001$).

5. Conclusion

In our study mean CSF-LDH was 25.19 ± 12.92 in patients with non-structural lesion and 86.53 ± 32.09 in patients with structural lesion of brain. Difference of mean CSF-LDH between structural and non-structural lesion was statistically highly significant ($p < 0.001$). Thus in addition to the various tests including history and clinical examination to differentiate between structural and non-structural lesion of the brain, raised CSF-LDH can also be a useful tool to diagnose a structural lesion of the brain.

6. Future Scope

The association of CSF-LDH between structural and non-structural lesion was statistically highly significant ($p < 0.001$) as seen in our study. Thus it can be conveniently interpreted that significant increase in CSF-LDH was related to structural lesion of the CNS.

7. Limitations

Our study is limited by the fact that lumbar puncture and imaging studies were only done in patients that were able to tolerate these procedures clinically and unstable patients were excluded from the study. Other problem of this study was a wide range of values in the 95% confidence interval due to the low number of patients recruited during the research period. However, other studies have found results similar to ours (9,10,11). Larger, multi-center studies may be needed to more adequately assess the applicability of emergency department obtained CSF-LDH as a clinical tool.

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Author Profile



Dr. Yogesh Kumar received the graduation and post graduation degree in general medicine from SMS Medical college jaipur Rajasthan in 2011 and 2014 respectively. During 2011-2014 he stayed in SMS Medical College circumference.



Dr. J. P. Yogi received the graduation and post graduation degree in general medicine from SMS Medical college jaipur Rajasthan in 2011 and 2014 respectively. During 2011-2014 he stayed in SMS Medical College circumference.



Dr. S. Banerjee is working as a Sen. Prof. & Unit Head, Department of Gen Medicine SMS Medical College/ RUHS, RAJ., INDIA