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Original article:

Study of assessment of level of serum cholinesterase in patients with liver diseases

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Abstract:

Introduction: The activities of serum transaminase may be raised due to increased release from non-liver tissue sources in various pathologies. Increased serum alkaline phosphatase activity may result from physiological or pathological enzyme production and release from non-liver tissue sources.

Materials and methodology: This was a Descriptive study that was conducted in PRAVARA RURAL HOSPITAL and Medical College, Department of Medicine, for a period of 2 years, starting from 30th September 2017 to 30th September 2019. Study population was included patients having liver diseases of age group 18-70 years of either sex admitted in the medicine department of Pravara Rural Hospital between time period of September 2017 to September 2019

Results: In our present study, we found , when comparing & correlated s. cholinesterase with albumin & bilirubin statistically correlation index was found highly significant. (P values = 0.0042 with albumin, P= 0.0032 with bilirubin) When comparing & correlated s. cholinesterase with SGPT & SGOT statistically correlation index was found highly significant. (P values = 0.00021 with SGPT, P= 0.0034 with SGOT)

Conclusion: In conclusion, findings of the present study have demonstrated that the level of cholinesterase is closely correlated with the damage severity of liver cells and may respond to the liver disease.

Introduction:

The activities of serum transaminase may be raised due to increased release from non-liver tissue sources in various pathologies. Increased serum alkaline phosphatase activity may result from physiological or pathological enzyme production and release from non-liver tissue sources. Serum bilirubin may be raised because of increased erythrocyte breakdown rather than because of failure of hepatic clearance.[1]Albumin concentration may be reduced for reasons other than failure of liver synthesis [2]. As a result, none of these tests can individually confirm liver dysfunction. Therefore there is a need for a test which should be specific as well as sensitive for liver diseases. Cholinesterase is a family of enzyme that catalyze the hydrolysis of the neurotransmitter acetyl choline into choline and acetic acid.

The [1] types of cholinesterase found in the human blood are acetyl cholinesterase("true" cholinesterase) in red cells and butyryl cholinesterase (non-specific, pseudo cholinesterase) in serum [3]Cholinesterase is synthesized mainly in hepatocytes and released into the blood. Cholinesterase activity is reduced in liver dysfunction due to reduced synthesis [4].The predominant hepatic source of serum cholinesterase, the marked decrease in its synthesis with hepatocyte dysfunction and restoration of synthesis with hepatocyte recovery suggests that serum cholinesterase

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activity might be a more specific indicator of liver dysfunction than the traditional liver function test [5]. Cholinesterase is closely correlated with the damage severity of liver cells and may respond to the liver reserve function of cirrhotic patients [6].

Serum level of cholinesterase showed excellent correlation with albumin and reasonably good correlation with serum bilirubin which indicate that serum cholinesterase level reflect the functional integrity of liver [7]. Serum cholinesterase is useful both as a liver function test and in the diagnosis of jaundice [8].

Materials and methodology:

This was a Descriptive study that was conducted in PRAVARA RURAL HOSPITAL and Medical College, Department of Medicine, for a period of 2 years, starting from 30th September 2017 to 30th September 2019.

Study population was included patients having liver diseases of age group 18-70 years of either sex admitted in the medicine department of Pravara Rural Hospital between time period of September 2017 to September 2019

SAMPLE SIZE- Minimum 55

INCLUSION CRITERIA

All patients were selected on the basis of:

1) Patients or relatives consenting for the study.

2) Established liver disease.

3) All patients aged 18-70 years with any liver diseases having any four of SGPT, SGOT, ALP, BILIRUBIN, ALBUMIN and INR abnormal.

EXCLUSION CRITERIA

1) The patients with acute infection other than viral hepatitis, chronic malnutrition, patients with haemolytic anaemia, poisoning from organophosphate will be excluded.

2) Female patients taking oral contraceptive pills will be excluded from the study.

3) Refusal to give consent.

Results:

In our present study 45 % patients were above 41 -60 years old while only 3% patients were less than 20 years old.

In our present study , all liver function test results are highly increased , SGOT found 181.18 IU/L Mean as compared to normal range (5 -40) IU/L .

SGPT found 103.16 IU/L Mean as compared to normal range (7 – 56) IU/L .

APL was highly increased with mean 199.52 IU/L as compared to mean (44-147) IU/L

Serum bilirubin & serum albumin are also observed highly increased.

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Table 1) Laboratory test results in patients of liver disease.

Laboratory Test	Mean (M)	Standard Deviation (SD)	Normal Range	Interpretation
SGOT (IU/L)	181.18	278.72	5 – 40	Highly Increased
SGPT (IU/L)	103.16	118.74	7-56	Highly Increased
APL (IU/L)	199.52	92.45	44 - 147	Highly Increased
Serum Bilirubin (mg/dl)	8.28	6.13	0.2 – 08	Highly Increased
Serum Albumin (mg/dl)	2.86	0.53	3.4 – 5.4	Highly Increased
INR	1.72	0.68	<1.1	Highly Increased

Table 2) Correlation between s. cholinesterase, albumin and bilirubin :

Related pairs	Correlation Index	P value
S. Cholinesterase – albumin	r= 0.219	0.0042
S. Cholinesterase – bilirubin	r=0.142	0.0032

When comparing & correlated s. cholinesterase with albumin & bilirubin statistically correlation index was found highly significant. (P values = 0.0042 with albumin, P= 0.0032 with bilirubin)

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Table 3) Correlation between s. cholinesterase, SGPT and SGOT:

Related pairs	Correlation Index	P value
S. Cholinesterase – SGPT	r= 0.11	0.00021
S. Cholinesterase – SGOT	r=0.90	0.0034

When comparing & correlated s. cholinesterase with SGPT & SGOT statistically correlation index was found highly significant. (P values = 0.00021 with SGPT , P= 0.0034 with SGOT)

Discussion:

In our present study, we found , when comparing & correlated s. cholinesterase with albumin & bilirubin statistically correlation index was found highly significant. (P values = 0.0042 with albumin, P= 0.0032 with bilirubin) When comparing & correlated s. cholinesterase with SGPT & SGOT statistically correlation index was found highly significant. (P values = 0.00021 with SGPT, P= 0.0034 with SGOT) Laboratory tests, often known as liver function tests (LFTs), are useful in the evaluation and treatment of patients with hepatic dysfunction, comprising serum aspartate and alanine transaminases, alkaline phosphatase, bilirubin and albumin. These tests often reveal abnormal results in patients with clinical problems other than liver dysfunction (9).

Tests of the biosynthetic capacity of the liver include serum albumin, ceruloplasmin, ferritin, α1-antitrypsin, lipoproteins and blood-clotting factors. These substances are synthesized in the liver for transport into the circulation. Cholinesterase is synthesized mainly in hepatocytes and is released into the blood (1). Serum cholinesterase activity is reduced in liver dysfunction due to reduced synthesis. This is in contrast to other serum enzymes associated with the clinical assessment of liver function whose activities increase as a result of enhanced release from their cellular sources following cell membrane damage (2).

In gastroenterology, the Child-Pugh score (also known as the Child-Turcotte-Pugh score) is used to assess the prognosis of chronic liver disease, mainly cirrhosis. Although originally used to predict mortality during surgery, the Child-Pugh score is now used to determine the prognosis as well as the required strength of treatment, and the necessity for liver transplantation. As two main clinical measures in Child-Pugh score, serum protein and blood-clotting factors are important in evaluating the liver reserve function of cirrhotic patients (3).

However, the cirrhotic patients, particularly those with Child grades B and C with ascites or hemorrhagic tendency, are usually treated with albumin or blood transfusion, which may affect the real numerical value for calculating the Child-Pugh score (54). In biochemistry, cholinesterase is a family of enzymes that catalyzes the hydrolysis of the

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neurotransmitter acetylcholine into choline and acetic acid, a reaction necessary to allow a cholinergic neuron to return to its resting state after activation (7).

There are two types of cholinesterases acetylcholinesterase (AchE), also known as RBC and erythrocyte cholinesterases or acetylcholine acetylhydrolase, found primarily in the blood and neural synapses. AchE exists in various molecular forms. In the mammalian brain the majority of AchE occurs as a tetrameric, G4 form with much smaller amounts of a monomeric G1 form (8). Pseudocholinesterase, also termed plasma cholinesterase, butyrylcholinesterase or acylcholine acylhydrolase, is found primarily in the liver (10,11).

Estimation of the level of activity of the cholinesterase found in serum was first suggested by McArdle (1940)(12), as a useful means for differentiating hepatic from post-hepatic jaundice. The evidence which has accumulated suggests that cholinesterase activity is an assessment indicator for liver function in patients with liver disease. In China, cholinesterase has been included in scores to distinguish hepatitis severity by society of liver disease (7).

However, few studies are available regarding the value of cholinesterase in evaluating liver reserve function of cirrhotic patients. The Child-Turcotte-Pugh scoring system is the first of its kind in stratifying the seriousness of end-stage liver disease, mainly cirrhosis (13). The liver performs an important role in biosynthesis. Cholinesterase, albumin and blood-clotting factors are synthesized in the liver to be transported into the circulation. Thus, LFTs include cholinesterase, albumin and prothrombin time and may provide useful information concerning the state of a cirrhotic patient's liver. In our study, in cirrhotic patients, cholinesterase was positively correlated with albumin .

Conclusion:

In conclusion, findings of the present study have demonstrated that the level of cholinesterase is closely correlated with the damage severity of liver cells and may respond to the liver disease.

References:

1. Weisinger RA;Cecil Textbook of Medicine",21st edn: Laboratory tests in liver disease and approach to the patients with abnormal test, p.775-777.
2. Whicher J, Spence C. When is serum albumin worth measuring? *Annals of Clinical Biochemistry* 1987; 24(6):572-580
3. Brimijoin S Koenigsberger C. Cholinesterase in neural development: new findings and toxicological implications. *Environ Health Perspectives.* 1999; 1071(1):59-64
4. Moss DW, Henderson AR,; ,, Teitz Textbook of Clinical Chemistry",2ndedn: p.735-89
5. Brown SS, Kalow W, Pliz W, Whittaker M. The plasma cholinesterases: A neperspective.Adv *Clin Chem*.1981; 22:1-123, Ruchi
6. Fanping Meng,Xiaojuan yin,Xuemei Ma,Bo jin, Hanwei Li.Assesment of the value of serum cholinesterase as a liver function test for cirrhotic patient.2013.60 p.265-26
7. Ramachandran,J., Sajith, K. G.,Priya, S., Dutta, A. k., & Balsubramanian, K. A. Serum Cholinesterase is an excellent biomarker of liver cirrhosis. *Tropical Gastroenterology*. 2014;35(1), 15-20.
8. W.Burnett-Gut,1960-gut.bmj.com,an assessment of value of serum cholinesterase as a liver function test and in the diagnosis of jaundice.
9. Sheila SH, James D; ,,Diseases of the Liver and Biliary System" , 11thedn: 2, p.19-35

www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

10. Nosek, Thomas M. Essentials of Human Physiology. Section 6/6ch2/s6ch2_30
11. Elias, H.; Bengelsdorf, H. (1 July 1952). "The Structure of the Liver in Vertebrates". Cells Tissues Organs. **14** (4): 297–337
12. Abdel-Misih, Sherif R.Z.; Bloomston, Mark (2010). "Liver Anatomy". Surgical Clinics of North America. **90** (4): 643–653.
13. "Anatomy and physiology of the liver – Canadian Cancer Society". Cancer.ca. Archived from the original on 2015-06-26.