Original Article

Gastroentrology Section

A Comparative Study of Pseudo-cholinesterase and Liver Function Test in Cirrhosis of Liver, Infective Hepatitis and Obstructive Jaundice: A Case Control Study

S. VENKATA RAO, V.S. RAVI KIRAN, S. INDIRA

ABSTRACT

Objectives: Pseudocholinesterase is a non-specific cholinesterase found in the blood plasma and may be reduced in patients with advanced liver disease. A comparative study of Pseudocholinesterase along with other liver function test parameters were undertaken in different liver disorders. The aim of the present was to investigate Pseudocholinesterase as a probable diagnostic marker in different liver disorders.

Methods: A total of 25 age and sex matched healthy controls and 25 patients each from cirrhosis of liver, infective hepatitis and obstructive jaundice were included in the study. Plasma Pseudocholinesterase and other liver function test parameters were estimated in all the subjects. ANOVA statistics was used.

Results: Pseudocholinesterase level was significantly decreased in the order of control (mean ± SD = 7.34400 ± 2.29875) > obstructive jaundice (mean ± SD = 3.23600 ± 0.61161) > infective hepatitis (mean ± SD = 2.27600 ± 0.63527) > cirrhosis of liver (mean ± SD = 1.85200 ± 0.27226) respectively. The difference in the means was statistically significant as p = 0.0000001.

Conclusions: Our study showed a significant decrease in Pseudocholinesterase level in cirrhosis of liver than infective hepatitis and obstructive jaundice. The results indicated that with more severe liver cell destruction, reduction and disease, there was corresponding significant decrease in the level of Pseudocholinesterase and could be used as diagnostic marker of liver disease.

Key Words: Pseudocholinesterase, Serum glutamate pyruvate transaminase, Cirrhosis of liver, Infective hepatitis, Obstructive jaundice

INTODUCTION

Pseudocholinesterase (EC 3.1.1.8) (BChE or BuChE), also known as plasma cholinesterase, butyrylcholinesterase, or (most formally) acylcholine acylhydrolase is found primarily in the liver. The half-life of pseudocholinesterase is approximately 8–16 hours. Pseudocholinesterase levels may be reduced in patients with advanced liver disease. The decrease must be greater than 75% before significant prolongation of neuromuscular blockade occurs with succinylcholine [1,2]. Clinically-useful quantities of butyrylcholinesterase were synthesized in 2007 by PharmAthene, through the use of genetically-modified goats [3].

Pseudocholinesterase is a non-specific cholinesterase found in the blood plasma and may be reduced in patients with advanced liver disease. Liver is the main source of Pseudocholinesterase. A comparative study of Pseudocholinesterase along with other relevant liver function test parameters were investigated in different liver disorders like cirrhosis of liver, infective hepatitis and obstructive jaundice. The aim of the present was to investigate Pseudocholinesterase as a probable diagnostic marker in different liver disorders.

MATERIAL AND METHODS

The present study was carried out at katuari medical college, Guntur and comprised of 25 known cases with cirrhosis of liver patients, infective hepatitis patients, obstructive jaundice and 25 healthy, age and sex matched controls. Patients suffering from congenital inherited disease particularly sensitive to succinylcholine, myocardial infarction, congenital liver disorders, muscular dystrophy, motor neuron disease, malnutrion where albumin decreases, pregnancy, dermatomyositis, recent surgery and patients on neostigmine and tetramethyl ammonium chloride treatment were excluded from the study. The study was carried out in diagnosed cases but before commencement of treatment. The patients of cirrhosis of liver had a typical history of ascitis and lowered nutritional status with jaundice, while in infective hepatitis, anorexia, jaundice, nausea, vomiting and passing of yellow urine was noticed. In case of obstructive jaundice typical case history of biliary obstruction was noted. Routine urine examination for bilirubin, bile salts and urobilinogen were also done as supportive parameters.

Butyryl Cholinesterase (CHE) was estimated by Colorimetric DNTB Method using Randox kit.

COLORIMETRIC METHOD(4)

Butyryl Cholinesterase hydrolyses butyrylthiocholine to give thiocholine and butyrate. The reaction between thiocholine and DTNB gives 2-nitro-5-mercaptobenzoate, a yellow compound which can be measured at 405 nm.

PRINCIPLE

$$\text{Butyrylthiocholine} + H_2O \xrightarrow{\text{Cholinesterase}} \text{thiocholine} + \text{butyrate}$$

$$\text{Thiocholine} + \text{DTNB} \longrightarrow \text{2-nitro-5-mercaptobenzoate}$$

DTNB = Dithiobis(nitrobenzoate)

All liver function test (LFT) parameters were determined using Merck company kits on MicroLab 200 semi-autoanalyzer in all the patients and same was compared with healthy controls. Total bilirubin was determined by Jendrassik and Grof [5] method and direct bilirubin was determined by Schellong and Wende method [6]. Indirect bilirubin was calculated by subtracting direct bilirubin from total bilirubin. Serum glutamate oxaloacetate transaminase (SGOT) and Serum glutamate pyruvate transaminase (SGPT) [7,8,9] were measured based on the reference method of International Federation of Clinical Chemistry (IFCC). Alkaline phosphatase was measured in accordance with the recommendations of the Deutsche Gesellschaft fur Klinische Chemie . Total protein was determined by Biuret method and albumin was determined by bromo-cresol green method.Globulin concentration was calculated by subtracting albumin from total protein concentration. Finally albumin/globulin (A/G ratio) ratio was calculated.

STATISTICAL ANALYSIS

Statistical analysis was done using SalStat statistical software. In the table, the values are shown in mean ± SD. Single factor ANOVA was used to compare the means between different groups at 5% level of significance.

RESULTS

Table/Fig-1, 2, 3.

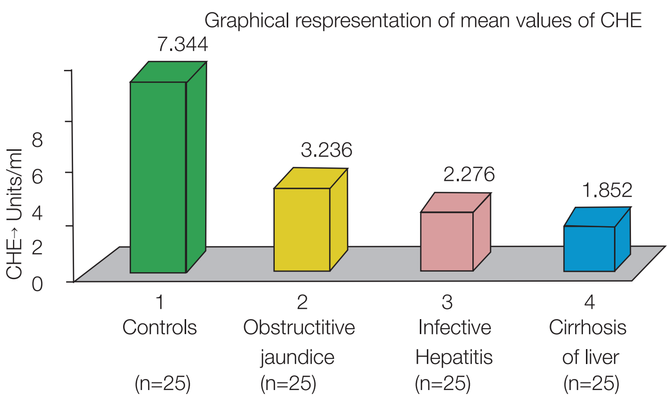
DISCUSSIONS

The present study comprises 25 age and sex matched controls and 25 cases from each cirrhosis of liver, infective hepatitis and obstructive jaundice disease. Our study showed an significant decreasing order of Pseudocholinesterase level in controls (mean ± SD = 7.34400 ± 2.29875) > obstructive jaundice (mean ± SD = 3.23600 ± 0.61161) > infective hepatitis (mean ± SD = 2.27600 ± 0.63527) > cirrhosis of liver (mean ± SD = 1.85200 ± 0.27226) respectively. The difference in the means was statistically significant as p = 0.0000001 as shown in our [Table/Fig-1]. The same was also shown in graphical representation in our [Table/Fig-2]. The Pseudo-cholinesterase level was severely decreased in cirrhosis of liver.

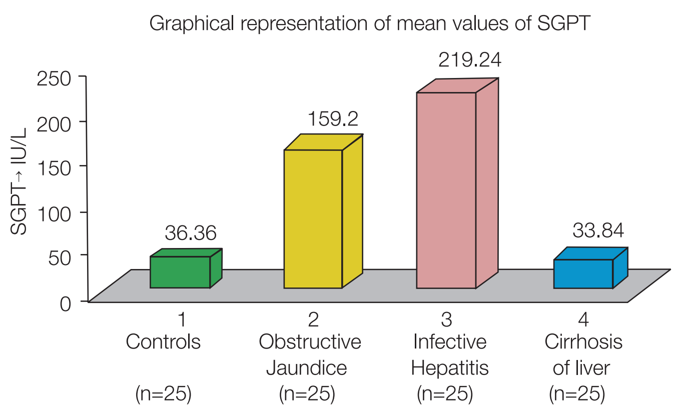
The other LFT profile parameters like total bilirubin, direct bilirubin and indirect bilirubin levels were significantly increased in obstructive jaundice as p = 0.0000001, as shown in [Table/Fig-1]. The SGOT level were significantly increased in infective hepatitis as p = 0.0000001, as shown in [Table/Fig-1]. Similarly, the SGPT level were increased significantly in infective hepatitis as p = 0.000018 and SGPT level was found to be in the normal range in cirrhosis of liver patients as shown in our [Table/Fig-1]. The alkaline phosphatase level was significantly increased in obstructive jaundice as p = 0.0000001 as shown in our [Table/Fig-1]. We did

Single Factor anova						
Parameters	Control (n = 25)	Cirrhosis of Liver (n = 25)	Infective Hepatitis (n = 25)	Obstructive Jaundice (n = 25)	Within subjects *p* value	Between subjects *p* value
Pseudo Cholinesterase (U/ml)	7.34400±2.29875	1.85200±0.27226	2.27600±0.63527	3.23600±0.61161	0.0000001	0.0000001
Total bilirubin (mg/dl)	1.00400±0.11719	2.50000±0.67700	6.83600±5.47273	6.87200±4.00172	0.0000001	0.0000001
Direct bilirubin (mg/dl)	0.22800±0.04583	1.41600±0.50140	4.98800±4.58133	5.26000±3.68827	0.0000001	0.0000001
Indirect bilirubin (mg/dl)	0.77600±0.09695	1.08400±0.40382	1.84800±1.13362	2.22000±1.29583	0.0000001	0.0000001
SGOT (IU/L)	33.64000±2.95635	40.44000±23.21652	173.44000±113.70139	150.92000±130.55073	0.0000001	0.0000001
SGPT (IU/L)	36.36000±3.94631	33.84000±10.18447	219.24000±270.95345	159.20000±132.64269	0.000018	0.000048
Alkaline phosphatase (IU/L)	86.76000±23.59604	107.96000±29.21683	122.16000±40.24165	326.28000±150.60863	0.0000001	0.0000001
Total protein (g/dl)	6.48000±0.49329	6.17600±0.59391	6.07760 ± 0.65616	6.15200±0.56944	0.079171	0.106715
ALBUMIN (g/dL)	3.80400±0.29366	3.10000±0.43780	3.11600±0.49973	3.05200±0.57671	0.0000001	0.0000001
GLOBULIN (g/dL)	2.67600±0.34675	3.07600±0.30039	2.92000±0.33665	3.10800±0.21000	0.000005	0.000009
A/G RATIO	1.43200±0.20149	0.97600±0.14799	1.02800±0.18148	0.94800±0.21237	0.0000001	0.0000001

[Table/Fig-1]: Statistical analysis of data of Pseudochloinesterase and LFT profile parameters (Values are shown in mean ± SD)



[Table/Fig-2]: Graphical representation of mean values of CHE in controls, Obstructive jaundice, infective Hepatitis and Cirrhosis of liver



[Table/Fig-3]: Graphical representation of mean values of SGPT in controls, Obstructive jaundice, infective Hepatitis and Cirrhosis of liver not find any statistically significant difference in the means of total proteins level between controls and different liver disorders as p = 0.079171 as shown in the our [Table/Fig-1]. Albumin level was decreased in all the different liver disorders when compared to the controls and p = 0.0000001 as shown in the [Table/Fig-1]. The globulin concentration was significantly increased in cases than controls as p = 0.000005. But the globulin concentration was found to be increased very much in obstructive jaundice followed by cirrhosis of liver. Similarly the A/G ratio was decreased very much in obstructive jaundice followed by cirrhosis of liver This may be due to body's compensatory mechanism in order to maintain normal total protein concentration of plasma [10].

It could be seen from our [Table/Fig-1 & 3], the SGPT level was increased very much in infective hepatitis followed by obstructive jaundice. In contrast to this, it's value remained normal and little less than controls in cirrhosis of liver. SGPT is not a very good marker of liver cell damage [11, 12]. But, so far as there is no other better marker than SGPT for liver cell damage, till to date, it is considered as a reliable marker for liver cell damage. But not always SGPT is increased in hepatitis. Especially, in hepatitis C virus (HCV) and fatty deposit it remains normal and without giving any information about intra hepatic obstruction.

Our study showed that, Pseudocholinesterase level was very much decreased in cirrhosis of liver followed by infective hepatitis as shown in our both [Table/Fig-1 & 2]. The Pseudocholinesterase level was found to be high in obstructive jaundice than these two specific liver disorders but was lesser than controls as shown in our [Table/Fig-1 & 2]. The Pseudocholinesterase level was smoothly decreased in the order of controls greater than obstructive jaundice greater than infective hepatitis greater than cirrhosis of liver respectively. This infers that, Pseudocholinesterase level would decrease very much when number of functional parenchymal cells of liver decreases as in cirrhosis of liver. This was followed by infective hepatitis, because in infective hepatitis it is the liver cell damage but not the decrease in hepatocytes as in the case of cirrhosis of liver. But in obstructive jaundice the problem is outside the liver and due to obstruction either in right and left hepatic duct or in gall bladder or in cystic duct or in common bile duct [13, 14]. The liver is the main source of Pseudocholinesterase enzyme and hence Pseudocholinesterase level was found to be decreased very much in cirrhosis of liver followed by infective hepatitis and it was higher in obstructive jaundice than these two liver specific disorders.

The diagnostic significance of other liver function test parameters were concerned, SGOT is a non-specific marker of liver cell damage, albumin is a better marker of chronic liver disease as it's half is approximately 20 days. Whereas ALP is a non-specific marker of obstructive jaundice. We did not find a statistically significant difference in the total protein levels and this may be due to increase in the globulins levels as a compensation in order to maintain a normal total proteins concentration in the blood. Changes in the concentrations of these parameter are not very much specific to liver cell damage unless the other causes for changes is not excluded.

As still SGPT level was found to be more in obstructive jaundice (not a liver cell damage) than cirrhosis of liver (specific liver cell damage and reduction), we claim and conclude that, Pseudocholinesterase enzyme is a more specific and better marker of liver disorder than SGPT itself. Hence Pseudocholinesterase enzyme could be used as diagnostic marker in different liver disorders. Our study showed Pseudocholinesterase concentration decreases correspondingly and specifically with more functional liver cell damage. This was a just basic or initial study, in establishing Pseudocholinesterase enzyme as a diagnostic marker of different liver disorders and same is to be verified on a big sample size.

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AUTHOR(S):

1. Dr. S. Venkata Rao
2. Dr. V. S. Ravi Kiran
3. Dr. S.Indira

PARTICULARS OF CONTRIBUTORS:

1. Corresponding Author
2. Department of Biochemistry, ASRAM Medical College, Eluru. Andhra Pradesh, 534005, India. E-mail: ravikiran_vs2001@yahoo.co.in
3. Department of Biochemistry, S.D.M.S.College, Vijayawada-520010, Andhra Pradesh, India. E-mail: indirabiochem@yahoo.com

NAME, ADDRESS, TELEPHONE, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. S. Venkata Rao, Bsc., M.D.,
Professor & HOD, Department of Biochemistry,
Katuri Medical College, Katuri Nagar,
Chinakondrupadu, Guntur- 522 019,
Andhra Pradesh, India.
E-mail: s_vrao11@yahoo.co.in
Mobile: +919441309881

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