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The Effects of Low Level Laser Irradiation (LLLI) on Liver Function

Huda Kadhem Mohseen†

1.AL-Qadisiya University, College of Medicine.

Abstract:- The purpose of this study was to examine the effects of a 532 nm laser on liver function. Specifically, the laser was used to determine alkaline phosphatase activity and transaminases. The study used a 4 mw laser, and the samples were divided into two groups: one that was exposed to the laser for 15 minutes, and another that served as a control. Women between the ages of 45 and 50 had their blood samples drawn. This study found that the amount of laser light used determined the extent to which the alterations were noticeable.

Keyword:- Laser, Serum, Blood.

Supplementary information The online version of this article (https://doi.org/xx.xxx/xxx.xx) contains supplementary material,which is available to autho-rized users.

Corresponding Author: Huda Kadhem Mohseen. AL-Qadisiya University, College of Medicine.

Introduction

In the field of practical medicine, aspartate aminotransferase (also known as glutamic oxalotransferase, or GOT) is used. Injured cells in the organs of the liver, heart, kidneys, and brain secrete this enzyme (4). Aspartate aminotransferase is detected directly in serum, tears, and saliva, and it is associated with degenerated and dead cells in extracellular fluid during tissue degradation (2). To mitigate ammonia's harmful effects, activating AST could be useful (3). Oxaloacetate and glutamate are produced when aspartate transaminase catalyses the reversible transfer of an amino group to 2-oxoglutarate. No other transaminase in brain tissue is as active as this one. From the cytoplasm into the mitochondria, oxaloacetate is converted into malic acid, which then enters the Krebs cycle. Enzyme cytoplasmic and mitochondrial isoforms exist in mammals (4).

In addition to humans, other bacterial species include alkaline phosphatase, an orthrophosphoric monoester phosphohydrolase. When exposed to acid, this enzyme becomes inactive. The ideal pH is dependent on the substrate type and concentration (5). The bile is the end product of the production of serum alkaline phosphatase by several tissues, the most common of which are the intestines, placenta, liver, and bones. Almost every kind of damage causes an increase in serum alkaline phosphatase. It was discovered that bile acid can increase the production of alkaline phosphatase and also clean the canalicular membrane, enabling it to leak into the serum. When cholestatic injuries occur, the concentrations are at their maximum (6). Circulating ALP has a half-life of around one week (7). In an alkaline pH range of 8.2 to 10.7, the ALP enzyme facilitates the hydrolysis of phosphmonoesters substrate, which includes Tyr/Ser/Thr-phosphates in phosphoproteins, resulting in the release of inorganic phosphate and alcohol (8). This study examines the effects of a 4 mw laser on liver function, specifically measuring transaminases and alkaline phosphatase activity. The laser has a wavelength of 532 nm.

Blood sample collection

Between 8 and 10 o'clock in the morning, blood samples were taken. The anticubital vein on either the left or right side of the body supplied the blood. The skin was bound with a torniquet around 7 centimetres above the collection location. The syringe needles utilised are 22 or 23 gauge. There were two sets of labelled tubes used: one set contained EDTA, which prevented the blood from clotting, and the other set was used to measure blood parameters. To prepare sera for additional biochemical examination, blood was drawn into the second set of tubes, which do not contain anticoagulant (gel tubes). After letting the blood samples in gel tubes coagulate for around 15 minutes, they were spun at 3000 rpm for 5 minutes to separate the components. Serum samples were collected using a micropipette and transferred to epindroff tubes once centrifugation was complete. In addition to being labelled with the patient's name and serial number, the serum samples were stored in a deep freezer at -20 C.

Materials and methods

1. **Determination of AST and ALT activity**

Following these reactions is the procedure for colorimetrically determining AST and ALT activity:

$$\text{Aspartate} + \text{a keto glutarate} \xrightarrow{AST} \text{oxaloacetate} + \text{glutarate}$$

$$\text{Alanine} + \text{a keto glutarate} \xrightarrow{ALT} \text{pyruvate} + \text{glutarate}$$

Procedure

- Formation of standard curve

Pipetted into test tubes (ml):

Tube no.	1	2	3	4	5	6
Distilled water	0.2	0.2	0.2	0.2	0.2	0.2
Reagent 1 or R2	1	0.9	0.9	0.7	0.6	0.5
Reagent 4	-	0.1	0.1	0.3	0.4	0.5
Reagent 3	1	1	1	1	1	1
The reagents were mixed. Let stand for 20 minutes at room temperature.						
NaOH 0.4 N	10	10	10	10	10	10
Mixed. Waited 5 minutes. Measure.						
GOT units/ml	0	22	55	95	150	215
GPT units/ml	0	25	50	83	126	-

For every serum sample, the following tubes were prepared:

Reagents	AST	ALT
Reagent 1 Reagent 2	1 ml -	- 1 ml
Incubated for 5 minutes at 37°C.		
Serum	0.2 ml	0.2 ml
Mixed and incubated at 37°C for:	Exactly 1 hour	Exactly 30 min
Reagent 3	1 ml	1 ml
Mixed and stand for 20 minutes at room temperature		
NaOH 0.4 N	10 ml	10 ml
Mixed and waited 5 minutes. Measure wavelength505nm		

2 –Determination of alkaline phosphatase

phosphatase alkaline-Kit

Principle:

Assay for alkaline phosphatase activity by colorimetry based on the following reaction:

Phenylphosphate phenol + phosphate

4-Aminoantipyrine and potassium ferricyanide are used to quantify the liberated phenol. Sodium arsenate, an ingredient in the reagent, inhibits the enzyme process. At a wavelength of 510 nm, the absorbance of the reaction was measured. (As stated by bioMérieux, the business).

Procedure: The following tubes were set up:

Reagents	Serum sample	Serum blank	Standard	Reagent blank
Reagent 1	2 ml	2 ml	2 ml	2 ml
Incubated for 5 minutes at 37°C.				
Serum Reagent 2	50 µl -	- -	- 50µl	- -
Incubated for exactly 15 minutes at 37°C.				
Reagent 3	0.5 ml	0.5 ml	0.5 ml	0.5 ml
				Mixed well or preferably vortex.
Reagent 4 Serum Distilled	0.5 ml - -	0.5 ml 50 µl -	0.5 ml - -	0.5 ml - 50 µl
Mixed and let stand for 10 minutes in the dark. Measure the absorbance at 510 nm.				

The color intensity was stable 45 minutes.

Calculation

Kind and King U/100 ml : n = 20

U/I : n = 142

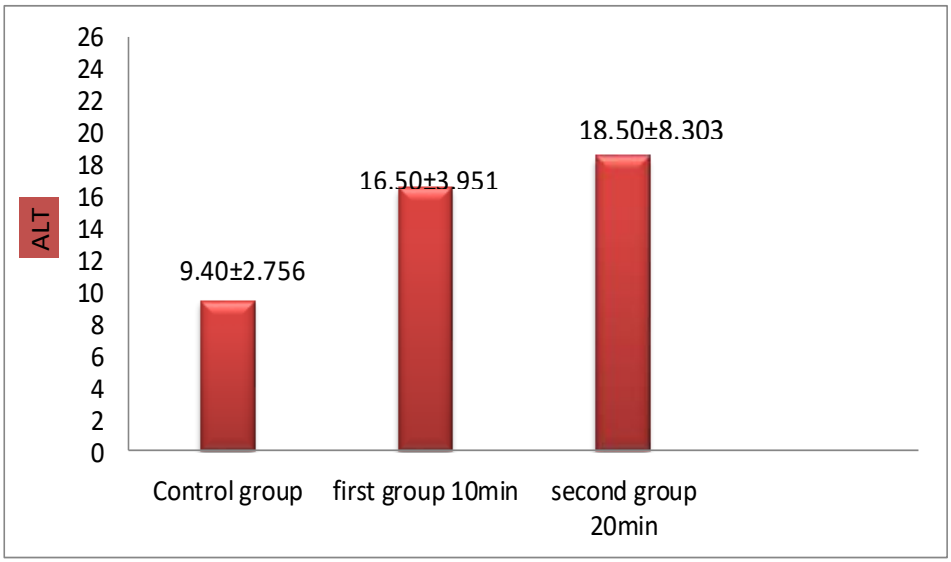
Statistical analysis

The means plus or minus the standard deviation (SD) showed all the data. A computer programme called SPSS was used to analyse the data. According to Daniel (1999), the differences between distinct groups were examined using Student's t-test, with $p<0.05$ being set as the lowest significant limit.

Result and Discussion

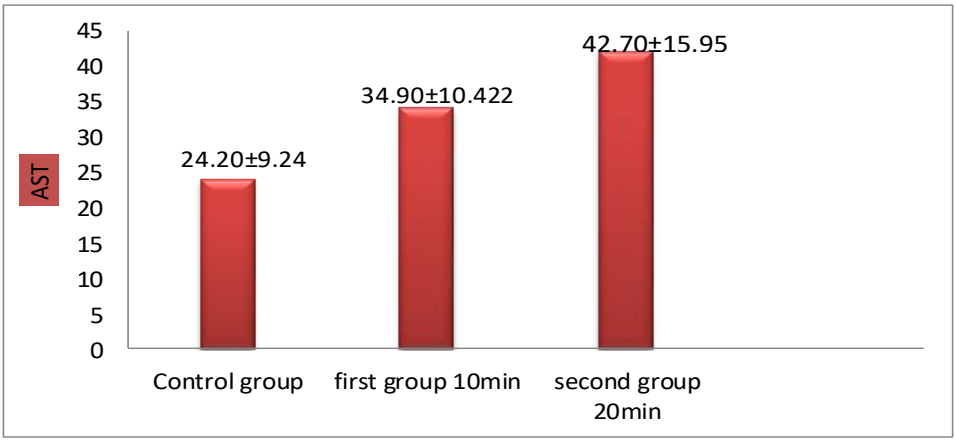
Level of alanine aminotransferase activity (ALT)

Results of ALT activity which are presented in table (1) show an insignificant elevation ($p>0.05$) in woman patients after of effect laser 10 min,20min (16.50±3.951, 18.50±8.303 IU/mL, respectively), when compared to control woman group (9.40±2.756 IU/mL).



Level of aspartate aminotransferase activity (AST)

Result of AST which are presented in table (1) showed a significant elevation ($p<0.05$) in woman patients after of effect laser 10 min,20min(34.90±10.422, 42.70±15.951 IU/mL, respectively), when compared to control woman group (24.20±9.247 IU/mL).



Level of alkaline phosphatase activity (ALP)

ALP values which are explained in table (1) were significantly increased ($p<0.05$) in woman patients after of effect laser 10 min, 20min (14.56±3.286, 16.33±3.637 U/100mL, respectively), when compared to control woman group (8.97±2.636 U/100mL).

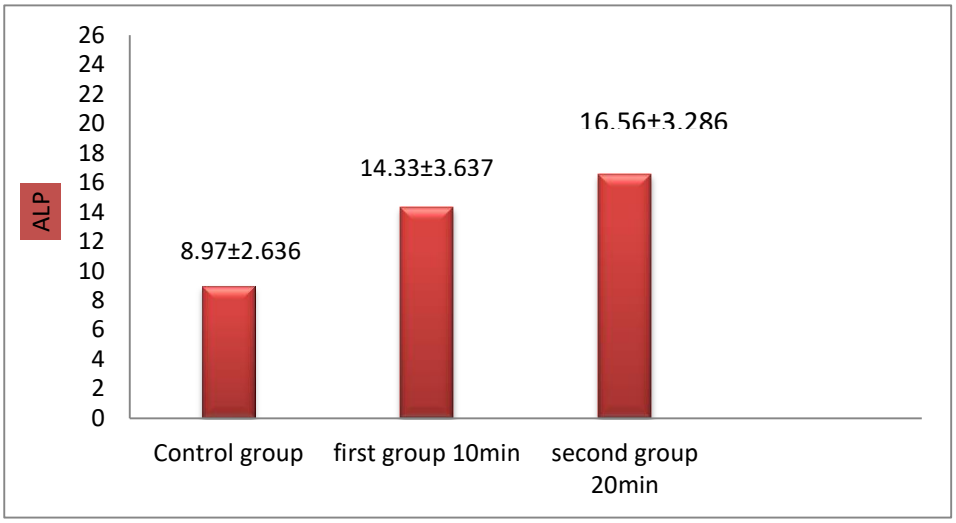


Table (1). Alanine aminotransferase activity (ALT IU/ml), aspartate aminotransferase activity (AST IU/ml), and alkaline phosphatase activity (ALP U/100mL) of control and effects laser 10min and 20min.

Groups parameters	control group	15min	20min
ALT (IU/ml)	9.40±2.756	16.50±3.951	18.50±8.303
AST (IU/ml)	24.20±9.247	34.90*±10.422	42.70*±15.951
ALP (U/100mL)	8.97±2.636	14.56*±3.286	16.33*±3.637

-Values are means ±SD

-Means with asterisk * are significantly different at $p<0.05$

Discussion

The recorded enzymes Values of ALP were in agreement with this study for ALP activity when subjected to a laser beam with an extreme height ($p<0.05$). AST, ALT, and ALP all reach their peaks between 50% and 200% from baseline when compared to normal levels. Cell death and the release of hepatic enzymes into the bloodstream can result from an upsurge in edoema development. The most sensitive indicators of harm to the liver cells are enzymes like (ALT) and (AST). In a typical human body, AST and ALT levels are quite low. Nevertheless, these enzymes are released into the bloodstream in response to cellular damage or alterations in the permeability of cell membranes. Since elevated AST levels are also associated with cardiac arrest and muscle injury, ALT is the better marker and more specific test for hepatocyte damage. A higher level of serum (ALP) indicates that the bile channels, both intrahepatic and extrahepatic, are all open and functioning properly. The creation of edoema, hypoperfusion, pro-inflammatory cytokines, and other cell death signals along by the release of hepatic enzymes induce thermal injury to harm the liver.

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