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Review article:
Measures of Transaminase level in Myocardial Infarction patient

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1– ABSTRACT :

Acute myocardial infarctions are one of the leading causes of death in the developed world, with prevalence approaching three million people worldwide. Liver enzymes are associated with cardiovascular disease risk because it's receive approximately one-quarter of total cardiac output. In this short reviews we will demonstrate the Transaminases about the biochemistry, clinical significant and the efficacy in comparison to other cardiac biomarkers.

2- INTRODICATION :

Acute myocardial infarction is one of the leading causes of death in the developed world. The prevalence of the disease approaches three million people worldwide, with more than one million deaths in the United States annually. Acute myocardial infarction can be divided into two categories, non-ST-segment elevation MI (NSTEMI) and ST-segment elevation MI (STEMI). Unstable angina is similar to NSTEMI. However, cardiac markers are not elevated.[1][2][3]

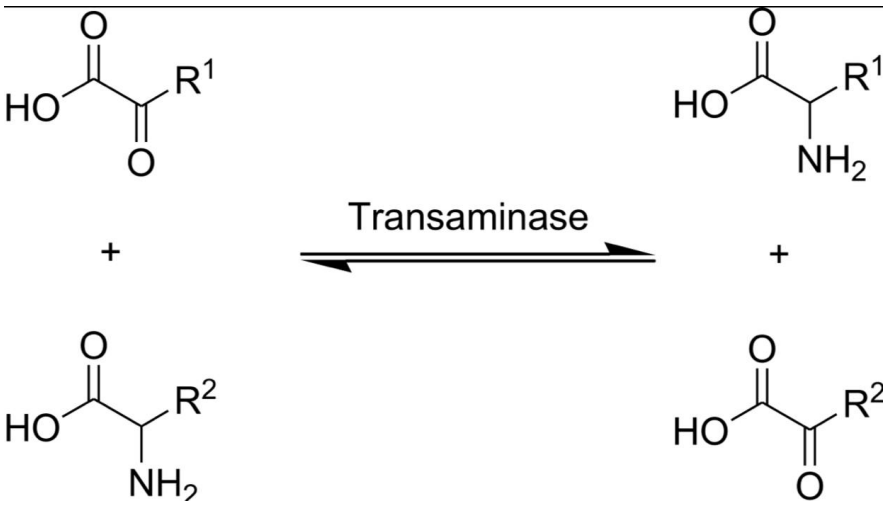
An MI results in irreversible damage to the heart muscle due to a lack of oxygen. An MI may lead to impairment in diastolic and systolic function and make the patient prone to arrhythmias. In addition, an MI can lead to a number of serious complications. The key is to reperfuse the heart and restore blood flow. The earlier the treatment (less than 6 hours from symptom onset), the better the prognosis. An MI is diagnosed when two of the following criteria are met: 1 Symptoms of ischemia 2 New ST-segment changes or a left bundle branch block (LBBB) 3 Presence of pathological Q waves on the ECG 4 Imaging study showing new regional wall motion abnormality 5 Presence of an intracoronary thrombus at autopsy or angiography.[5] [6]

3- AIM AND OBJECTIVE:-

This study aims to evaluate serum level of Transaminase in acute myocardial infarction patient to determent the risk and complication.

4- Transaminase

Transaminase, also called Aminotransferase, any of a group of enzymes that catalyze the transfer of the amino group (—NH2) of an amino acid to a carbonyl compound, commonly an a-keto acid (an acid with the general formula RCOCOOH). The liver, for example, contains specific transaminases for the transfer of an amino group from glutamic acid to a-keto acids that correspond to most of the other amino acids. Other transaminases catalyze reactions in which an amino group is transferred from glutamic acid to other compounds—e.g., to aldehydes to form amines. Transamination is one of the principal mechanisms for the formation of necessary amino acids in the metabolism of proteins. Vitamin B6 is commonly involved in the action of the transaminases. (4)



Fuger 1 :aminotransfer reaction between an amino acide and alpha_keton acide

The transaminase reaction cannot be directly monitored; however, continuous monitoring assays can be achieved by coupling to self-indicating enzyme systems that utilize as substrate either glutamate or the specific oxoacid formed in the transaminase reaction. Kinetic assays utilizing coupled enzyme systems are most commonly used in clinical laboratories. Older methods using colorimetric detection of transaminase reaction products without continuous reaction monitoring are obsolete. Proposed reference methods also recommend addition of pyridoxal phosphate to the reagent system in order to activate all of the enzyme. However, this modification introduces technical problems, compromises established clinical experience, and has not been uniformly adapted. Reagent addition of the coenzyme increases enzyme activity by 50% for AST in normal serum and by 20% for AST. Greater changes may occur in patient serum with low levels of pyridoxal phosphate caused by precursor vitamin B6 deficiency.

Serum is the specimen of choice. In vitro hemolysis causes spuriously increased activity because of enrichment by erythrocyte aminotransaminase. Heparinized, EDTA, citrated, or oxalated plasma are generally acceptable but may cause problems with specific reagent-instrument systems. Serum transaminase activity is stable at room temperature for several hours or up to 3 days at 4°C. Freezing may result in loss of activity and is not recommended. (7)

Basic Science: _

Aminotransferases catalyze the redistribution of nitrogen between amino acids and corresponding oxoacids participating in both protein metabolism and gluconeogenesis. They are ubiquitous in their cellular distribution.

Tissue activity for AST is as follows in decreasing concentration: heart, liver, skeletal muscle, kidney, pancreas, spleen, lung, and erythrocyte. Two distinct forms have been identified: a cytoplasmic, or soluble isoenzyme, and a mitochondrial isoform. Selective measurement of these isoenzymes has no currently demonstrated clinical application.

The distribution and relative tissue concentration of ALT is similar but importantly different. Highest activity is found in the liver, followed by kidney, myocardium, skeletal muscle, pancreas, spleen, lung, and erythrocyte. ALT activity is found in the cytosol; organ- or organelle-specific isoenzymes have not been demonstrated. The concentration of ALT in hepatic cell cytoplasm is comparable to AST; however, a mitochondrial ALT isoform is not found. In all other tissues, ALT activity is significantly less than AST.[7]

5- Normal range

The reference ranges for aspartate aminotransferase (AST) are as follows. Adults: 0-35 units/L or 0-0.58 µKat/L (SI units) (Values tend to be slightly lower in females than males.) Elderly: Values are slightly higher than those of other adults.

Children:

- 0-5 days: 35-140 units/L
- < 3 years: 15-60 units/L
- 3-6 years: 15-50 units/L
- 6-12 years: 10-50 units/L
- 12-18 years: 10-40 units/L

Physiologic Factors Associate with the Serum ALT Level.

The impact of some physiological factors has been shown to be associated with the serum ALT level. Extreme physical exertion can induce a short-term, reversible elevation in ALT. In a study focused on Thai boxers, the ALT level was 2-2.25-fold higher than the baseline value after a fight in 20 male adolescent Thai boxers In addition, an elevation in ALT was also observed in 9 runners who took part in a 1600 km ultra-marathon specifically, a 4-fold increase in ALT activity was observed on the 4th day of running compared to the baseline value.

Many authors attribute the elevation in ALT after physical exertion to muscle injury In contrast, modest physical .[7]

Pathological cases of elevated AST/ALT:-

Hepatic-related causes:-

- Viral hepatitis (mainly hepatitis B virus [HBV] and hepatitis C virus [HCV] infections)
- Alcohol intake
- Some medications Such as

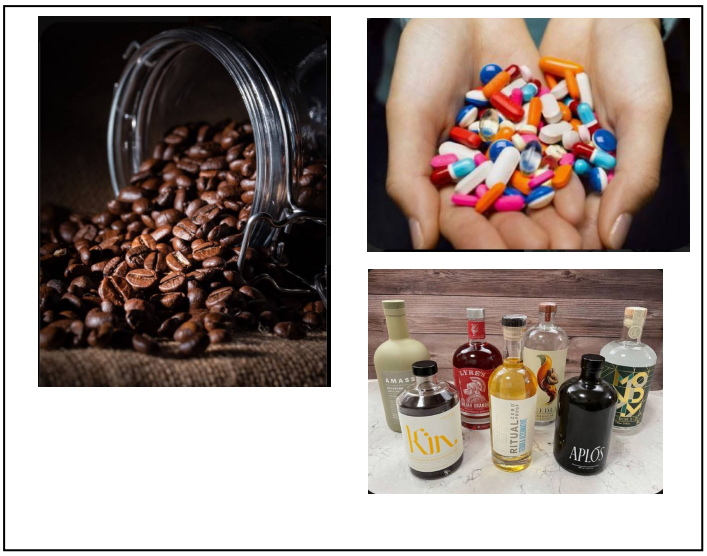


Figure 2. some causes of elevated ALT/ AST

(acetaminophen,hydromorphone+acetaminophen, morphine+acetaminophen, and oxycodone+aceta-minophen and statin)

- Coffee consumption
- Non-alcoholic fatty liver disease (NAFLD)
- Autoimmune hepatitis

Non-hepatic cause:-

- Metabolic covariates • Hemochromatosis[7]

6- CLINICAL IMPORTANT OF TRANSAMINASES

The primary clinical application of serum AST and ALT measurement is the detection and differential etiologic diagnosis of hepatic disease. Hepatic cell injury is manifested by elevated serum transaminase activity prior to the appearance of

clinical symptoms and signs (such as jaundice). Comparable elevations of both AST and ALT are highly characteristic of acute viral, toxic, or nonethanol drug-induced hepatitis. The similar serum transaminase levels in these conditions are thought to be caused by cellular release of only cytoplasmic enzymes associated with reversible hepatic cell damage. In chronic hepatitis and cirrhosis, serum AST levels are higher than ALT; this may reflect hepatic cell necrosis with release of mitochondrial AST. In alcohol hepatitis, AST is more significantly increased than ALT.

Cholestatic lesions associated with either intrahepatic or posthepatic diseases are manifested by modest transaminase elevations, with AST usually exceeding ALT. In these conditions, elevations of serum alkaline phosphatase (ALP) and gamma glutamyltransferase (GGT) are more dramatic.

Since aminotransaminases are ubiquitous in their cellular distribution, serum elevations may occur with a variety of nonhepatobiliary disorders. However, elevations exceeding 10 to 20 times the reference are uncommon in the absence of hepatic cell injury. Since the concentration of ALT is significantly less than AST in all cells except hepatic cytosol, ALT serum elevations are less common in nonhepatic disorders. Following myocardial infarction, AST activity is consistently increased; ALT is associated with passive congestion of the liver. AST and only occasionally ALT serum activity increase in inflammatory skeletal muscle diseases and progressive muscular distrophy.

Measurement of serum ALT activity is routinely used to screen blood donors at risk of transmitting hepatitis, particularly the non-A, non-B type, since no specific serologic test is available. Use of ALT as a surrogate test for non-A non-B hepatitis expectedly reduces the incidence of post-transfusion hepatitis by 29%. (7)

7- THE DIAGNOSTIC VALE OF BIOCHEMICAL CARDIAC MARKERS IN ACUTE MI

The serum markers of myocardial injury are used to help in establishing the diagnosis of myocardial infarction. The older markers like aspartate amino-transferase, creatine kinase, lactate dehydrogenase etc. lost their utility due to lack of specificity and limited sensitivities. Among the currently available markers cardiac troponins are the most widely used due to their improved sensitivity specificity, efficiency and low turnaround time. Studies have shown that cardiac troponins should replace CKMB as the diagnostic 'gold standard' for the diagnosis of myocardial injury. The combination of myoglobin with cardiac troponins has further improved the accuracy in the diagnosis of acute coronary syndromes and thereby reducing the hospital stay and patients' money. Among the other new markers of early detection of myocardial damage, heart fatty acid binding protein, glycogen phosphorylase BB and myoglobin/carbonic anhydrase III ratio seem to be the most promising. But the search for the most ideal marker of myocardial injury is still on.(8)

8- CONCLUSION

Serum aspartate transaminase (AST) is mainly found in the liver, cardiac muscle, and other tissues while serum alanine transaminase (ALT) is predominantly found in the liver. The ratio of AST to ALT is commonly used to assess liver cell injury and AMI, AST and ALT are often elevated, especially in STEMI patients

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