DO PANCREATIC FUNCTIONS PREDICT CARDIAC AND LIVER IRON LOADING IN TRANSFUSION-DEPENDENT BETA THALASSEMIA MAJOR PATIENTS USING CARDIOVASCULAR AND LIVER T2-STAR (T2*)MAGNETIC RESONANCE ?

Galila M. Mokhtar[1], Wafaa E. Ibrahim[1] , Nancy S. Elbarbary[1] , Randa M. Matter[1], Ahmed S. Ibrahim[2], Safa M. Sayed[1]

[1] Departments of Pediatrics, Faculty of Medicine, Ain Shams University & [2]Department of Clinical Radiology, Faculty of medicine , Cairo, Egypt

INTRODUCTION

- In Egypt, beta thalassemia is the most common genetically determined chronic hemolytic anemia . Cardiac complications are the most important cause of death in the transfusion-dependent thalassemic patients whose iron overload is not adequately chelated . Iron overload-related cardiomyopathy is reversible, but the diagnosis is often delayed due to the late appearance of symptoms and echocardiographic abnormalities; once heart failure develops the prognosis is usually poor. Therefore an early diagnosis is fundamental for a proper tailored treatment .

AIM OF THE WORK

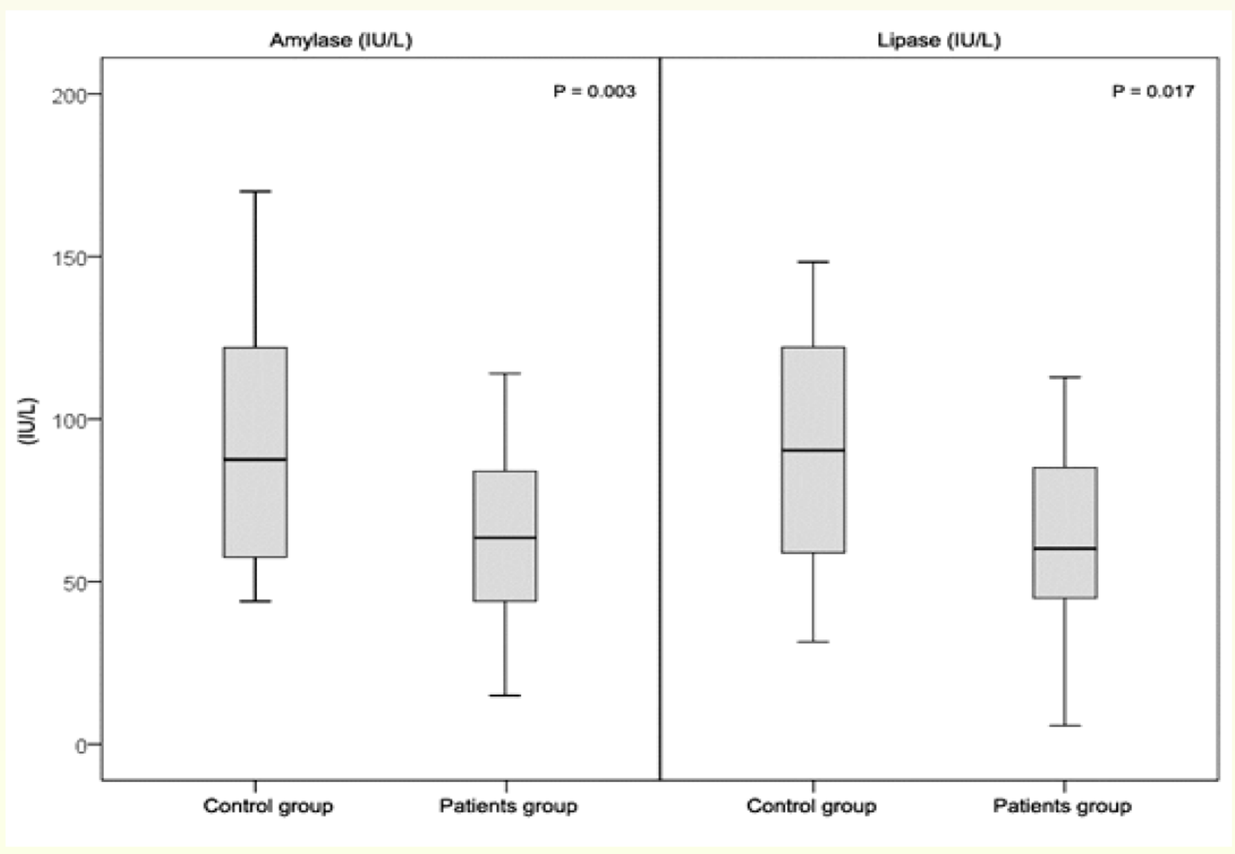
- The purpose of this study to evaluate cardiac and hepatic iron overload by the non-invasive T2-star (T2*) magnetic resonance imaging (MRI T2*) in transfusion dependent beta thalassemia major young patients and to correlate it with glucose disturbances , exocrine pancreatic functions , marker of insulin resistance , serum ferritin, splenectomy ,and hepatic siderosis as expressed by liver iron content.

SUBJECTS AND METHODS

- **This is a cross sectional study which was conducted at Pediatric hematology Clinic Children's Hospital, Ain Shams University over one year period on transfusion dependent β-TM (n=44) from those regularly attending the Hematology clinic and they were sequentially collected.**
- **All patients were diagnosed as β-thalassemia major based on clinical and hematological evaluation. Those having acute systemic infection were excluded from the study to omit the influence of infection on ferritin as well as those with any systemic disease rather than β-TM . Forty four healthy volunteers (20(45%) males and 24(55%) females) with no obvious medical disorder and not receiving any medication served as a control group.**

Methods:

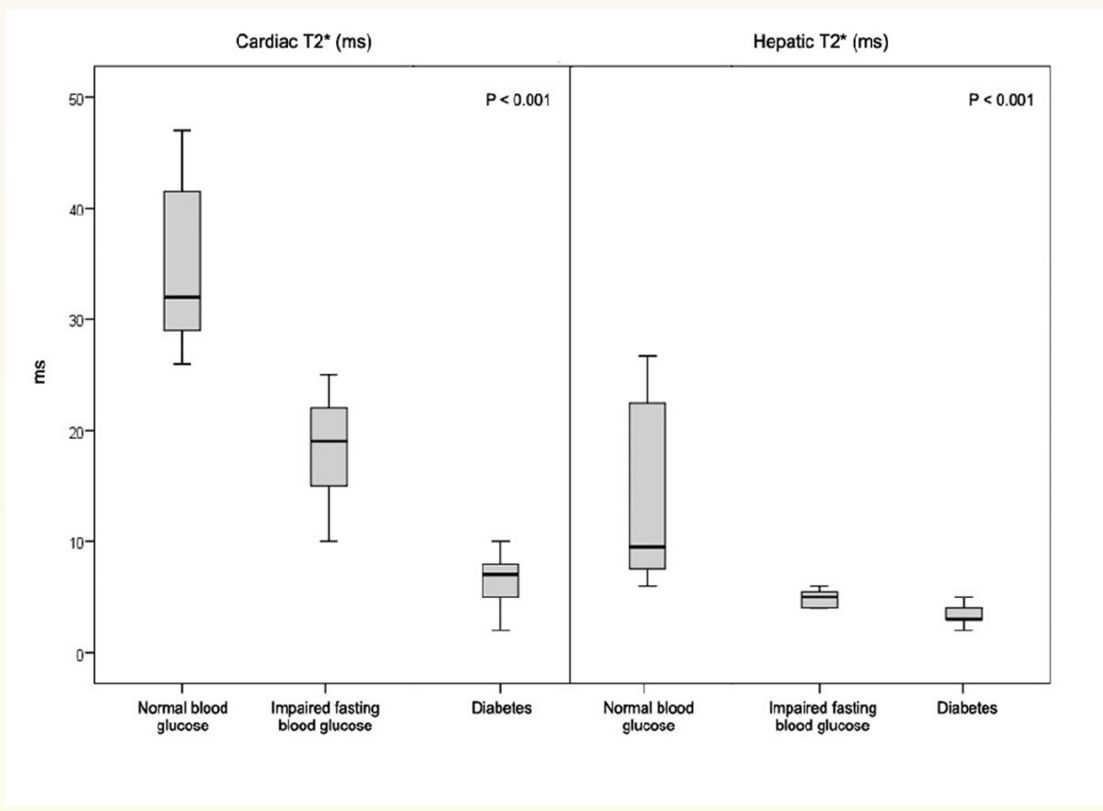
- **All subjects enrolled in the study were subjected to history taking including duration of disease, frequency of blood transfusion and calculation of transfusion index (TI) (ml/Kg/year). Chelation therapy (type, dose, duration and compliance to treatment were also be reported; and physical examination which includes: Anthropometric measurements, blood pressure, signs of anemia and hemosidrosis . The following investigations were done: (1)Complete blood count (CBC), hemoglobin level and platelet count. (2) Serum ferritin (3) Liver functions tests (ALT, AST, total protein, serum albumin , total and direct bilirubin) and (4) ECG and Echo findings were recorded. Oral glucose tolerance test (OGTT)was performed for all patients as described by WHO . The triglycrides glucose (TyG) index, was calculated from fasting plasma triglyceride and glucose concentration as log [fasting triglycerides (mg/dL) × fasting glucose (mg/dL) / 2] . Magnetic resonance imaging T2*study (T2*MRI imaging) of heart and liver.**



Figure(1): Box and Whisker plot showing comparison between patients and control as regards serum amylase and lipase

RESULTS

- **Patients mean age was 16.27 ± 4.48 years , range (10 to 19 years) with equal sex distribution.**
- **Overt diabetes was found in 9.4% and 45.5% of patients had impaired fasting glucose.**
- **Median cardiac T2* was 22ms (12-31 ms) and LIC was 6ms (4-9 ms). CardiacT2* was less than 10ms in 21.4% indicating heavy load with iron in cardiac tissues.**
- **There is a significant decrease in serum amylase (87.5 vs. 63.5 IU/L, p =0.003) and lipase (94 vs.70 IU/L, P=0.056) among enrolled patients in comparison to control group.(Fig.1)**
- **Thalassemic diabetic showed low serum amylase (32.5 vs. 59.5 ,p = 0.0005) ,serum lipase (39.5 vs. 68, p = 0.0007) ,low cardiac T2* was found (7 vs. 22 ms ,p =0.0006) and low LIC (2 vs. 6ms ,p = 0.0006) than other β-TM patients without diabetes(Fig.2).**
- **Inverse correlation was found between triglyceride index with cardiac T2*(r= - 0.376, P=0.014) and low LIC (r=-0.376, P=0.014 respectively) but not with serum lipase (r= -0.099,P=0.533),(r= -0.222,p=0.1570) and serum amylase (r =-0.191P=0.225) ,(r=-0.053 ,P= 0.738) respectively.**
- **The mean age of patients with diabetes was 15.75±3.5 years ,mean serum Ferritin was 5103 (ng/dl) , median cardiac T2 * was 7 ms and hepatic T2* was 2, serum amylase was 32.5(IU/L) , and serum lipase was 39.5 (IU/L) . High serum triglycerides level among diabetic patients was found with a mean value of 185 (154-222) mg/dl and TYG index of 3.3381.**
- **The mean age of patients with impaired fasting blood glucose was 15.09±5.06 years , mean serum Ferritin was 1643 (ng/dl) , median cardiac T2 * was 22 ms and hepatic T2* was 7ms, serum amylase was 63(IU/L) , and serum lipase was 76(IU/L) .**
- **Patients with impaired fasting blood glucose had lower cardiac T2* (20 vs. 30 ms, p=0.031) and higher TYG index (8.174 vs. 7.227 p=0.022) than patients with normal glucose metabolism.**



Figure(2): Box and Whisker plot of Cardiac T2* and Hepatic T2* MRI among diabetic thalassemic patients.

CONCLUSION

- **The endocrine and exocrine pancreatic functions might become an equivalent predictor to cardiac and hepatic iron over load, especially, in countries where MRI is not available or expensive.**
- **These abnormalities occurred so early in our population that warrants more intensive chelation therapy .**

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