ELECTRO CARDIO GRAPHIC (ECG) CHANGES IN PATIENTS WITH APLASTIC ANEMIA[+]

التغيرات الحاصلة في مخطط القلب الكهربائي في مرضى فقر الدم اللاتنسجي

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Abstract:

Background

Often found anemia or "anemia" in heart patients, and often it determines a heart failure

Have demonstrated the results of 16 studies conducted in the past that anemia was a major

cause of heart failure or death in the first thirty days for patients with heart attack. It was

found in these studies that a slight change occurs in the percentage of hemoglobin is the

cause of infarction or severe privations of blood to the heart muscle

Objective

To *evaluate the* ECG changes in patients with Aplastic Anemia

Method

A descriptive study was conducted at Baghdad Teaching Hospital during the period from 15th October 2010 to15[th] May 2011 .A random sample consisted of (50) patient suffering from Aplastic Anemia who were selected one by one from those admitted to the Hamatology Ward . 12 leads ECG and Hemoglobine concentration was carried out on these patients

Results:

The results of the study show that (32%) of patients with Aplastic Anemia with ECG changes and (30%) of them with acute reduction of hemoglobin concentration to 6 g\dl with ST- segment depression and the same percentage with T inverted 1mm

Conclusion:

This study indicated that patients with aplastic anemia with ECG (ST segment) changes had higher heart rate than those without ECG changes at the same concentration of Hemoglobin Level (6 g\dl)

Recommendation:

Carrying out further research on larger samples and longer period to *evaluate the* ECG changes in patients with Aplastic Anemia and after discharge

Key Words: Electro Cardio Graphic, Aplastic Anemia

المستخلص:

المقدمة: كثيرا ما يتواجد فقر الدم أو "الأنيميا" بين مرضى القلب، وغالبا فانه يحدد حدوث قصور القلب. وقد أثبتت نتائج ١٦ دراسة اجريت في الماضي أن فقر الدم كان سببا رئيسيا لقصور عضلة القلب أو الوفاة في الأيام الثلاثين الأولى لمرضى النوبة القلبية. وتبين في هذه الدراسات أن تغيراً طفيفاً يحدث في نسبة الهيموجلوبين يكون سبباً في إحتشاء أو فاقة دموية حادة لعضلة القلب.

الهدف: تقويم تغيرات التخطيط الكهربائي لمرضى فقر الدم اللاتنسجي

الطريقة : أجريت دراسة وصفية في مستشفى بغداد التعليمي للفترة من ١٥تشرين الاول ٢٠١٠ولغاية ١٥ ايار ٢٠١١

اختيرت عينة عشوائية تتكون من خمسين مريضا مصابا فقر الدم اللاتنسجي ومن الذين ادخلوا إلى ردهة إمراض الدم بالتتابع واحد بعد الآخر . اجري لهم فحص تخطيط القلب الكهربائي ذي الاثنى عشر قطب وفحص نسبة الهيموكلوبين بالدم

النتائج: أشارت نتائج الدراسة بأنه (٣٢%) من مرضى فقر الدم اللاتنسجي لديهم تغيير في تخطيط القلب منهم كان عندهم انخفاض حاد في نسبة الهيموغلوبين يصل الى(٦جم /ديسيليتر) (30%الكهربائي و الكهربائي و) ST Segment depressionلديهم و نفس النسبة في مقطع T inversion

الاستنتاجات : دلت نتائج الدراسة الى ان مرضى فقر الدم اللاتنسجي لديهم تغيير في تخطيط القلب تسارع في ضربات القلب مقارنة باولئك الذين ليس لديهم ST Segmentالكهربائي في مقطع عند نفس مستوى تركيز الهيموغلوبين (٦جم /ديسيليتر) ST Segment تغيير في مقطع

التوصيات :الاستمرار في اجراء بحوث من هذا النوع وعلى عدد اكبر من المرضى ولفترة طويلة لتقويم تغيرات التخطيط الكهربائي لمرضى فقر الدم اللاتنسجي في المستشفى وبعد خروجهم من المستشفى

Introduction:

Anemia" is not a diagnosis in itself, but merely an objective sign of the presence of disease. The correct diagnostic terminology for a patient with anemia requires the inclusion of the pathogenesis of the anemia. The reason for this is simple and fundamental: the correct treatment requires an understanding of the pathogenesis of the condition. The term "anemia", as it is generally used in clinical medicine, refers to reduction below normal in the concentration of hemoglobin or red blood cells in the blood. It must be remembered that the mean normal value and the lower limits of the "normal" range depend upon the age (childhood or adult life) and gender[1]

Aplastic anemia (AA)is a rare but extremely serious disorder that results from the unexplained failure of the bone marrow to produce blood cells. AA most often occurs in people under or over 40 years of age, and is associated with viral infections, such as hepatitis, or exposure to toxins or certain drugs. However, over 70 percent of acquired cases are from unknown causes. In many instances, there may be an underlying defect in the synthesis of blood cells, which may be triggered by other factors to become overt. The disease may be constitutional rather than acquired, such as the inheritable abnormalities of Fanconi's anemia (FA) or dyskeratosis congenita (DC). Pallor and bruising are usual symptoms, while infection and hemorrhage are less common and signify a potentially poor outcome [2].

Detailed study of clinical features and electrocardiograms of patients with anemia was undertaken ,so that greater awareness could be created about the fact that ECG in anemia could simulate ischemic heart disease (IHD) and that anemia must be corrected first and foremost{3}

Biopsy of the bone marrow is essential and reveals reduced numbers of blood cell precursors and an increased number of fat and inflammatory cells. Only 20 percent of children with severe AA survive one year from diagnosis when given only supportive care. Antibiotic treatment and transfusions are used as needed. Curative treatment of acquired AA may be achieved by bone marrow transplantation or by suppression of

immune function [3]. Objective of the study was to *assess the* ECG changes in patients with Aplastic Anemic

Methodology:

Adescriptive study was conducted during the period from 15th October 2010 to May 2011

A purposive sample of   (50) patient who were selected from those admitted to the Hematology Ward in Baghdad teaching hospital .Those who met the criteria for selection were:

-The patients were diagnosed as having a definite Aplastic Anemia

The definite diagnosis was done by the same specialist hematologist in that center
-Informed consent was obtained from the legal guardians in all cases.

Six patients refused to participate, five   patients had coronary artery disease, seven patients had heart failure and two patients had pregnancy and two cases associated with hyperthyroidism and pulmonary diseases were excluded

Content validity of the questionnaire was determined through a panel of (10) experts in Al-Kadhmia Teaching Hospital and Baghdad teaching Hospital.

A detailed history and physical examination was performed for each patient in this study. ECG were done in the standard method of 12 leads with voltage 1 millimater and speed of 25mm\sec. Deviation (elevation or depression) of the ST−segment from the baseline is the most common use of ECG for diagnosis of ischemia usually defined by significant ST-depression as horizontal ST- segment depression of at least 0.1 MV measured 0.06 second .

By using the cyanmethaemogloin method to determine the Hb concentration
The blood taken directly into pipette and heparinzed capillary tube in order to find Hb concentration and Packed Cell Volume (PCV)

Statistical analysis:

Mean standard deviation and T-test value were computed to estimate the differences between negative and positive ECG changes

Results:

Table-1- Sociodemographic Characteristics of the Patients with Aplastic Anemia

Sociodemographic Characteristic		F	%
Sex	Male	30	60
	Female	20	40
	Total	50	100
Age	11-20	16	32
	21-30	14	28
	31-40	6	12
	41-50	4	8
	51-60	8	16
	61-70	2	4
	Total	50	100
	Mean	31.96	
	SD	15.45	
Marital Status	Single	10	20
	Married	40	80
	Total	50	100
Level of Education	Illiterate	8	16
	Primary school	18	36
	Secondary school	18	36
	University	6	12
	Total	50	100
Occupational Status	Government employee	4	8
	Self employed	**16**	**32**
	House wife	18	36
	Student	12	24
	Total	**50**	**100**

SD=Standard. Deviation

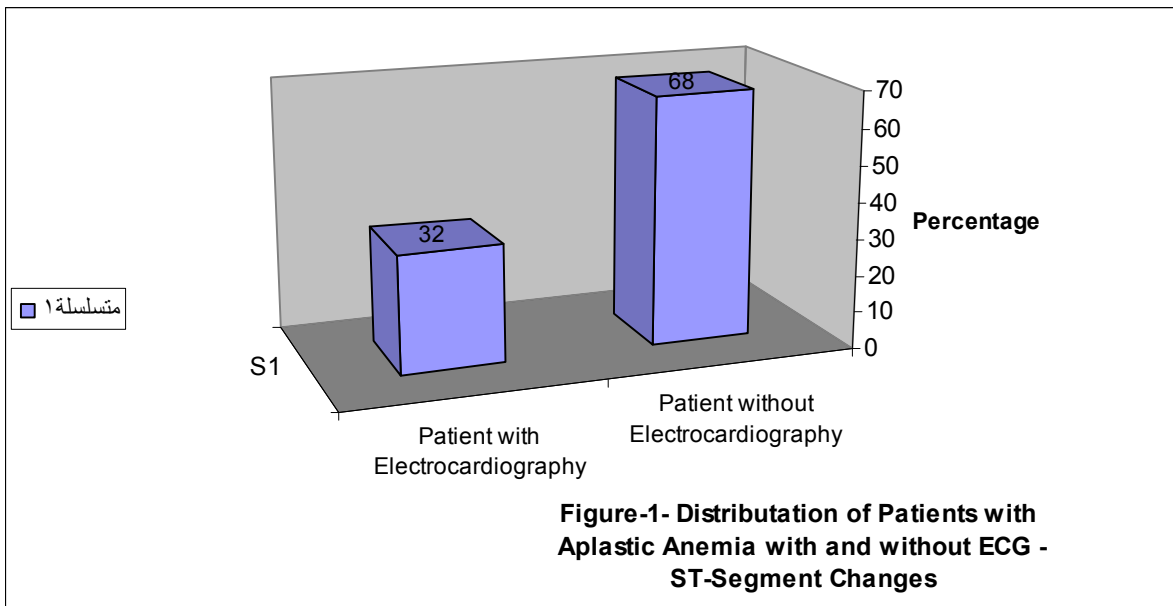Table -1-shows that the highest percentage (30 (60%)of patients were males.

According to their age ; (16(32%)) of the patients with Aplastic Anemia were from age range between (11-20) years with a mean age (31.96) years

Related to marital status ,the majority of patients (40(80%) were married and the lowest percentage of patients (10(20%) were in single status.

Regarding their level of educational, most of the patients (18(36%)) were primary school and the same percentage were secondary school and the lowest percentage of patients (6(12%)) was at the university level.

Concerning the occupational status, the majority of patients (18 (36%)) were house wife and the lowest percentage of patients (4(8%) was among the government employee group.

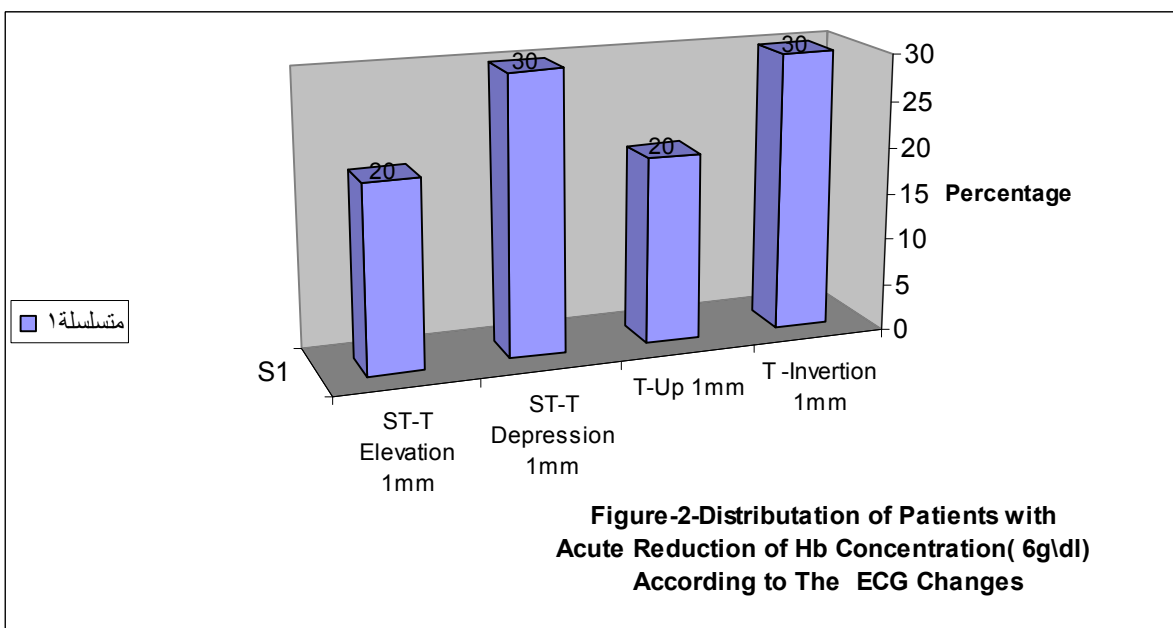**Table-2-Presentation of Symptoms of the Patients with Aplastic Anemia**

Variables	No.	%
Pallor	50	100
Exertional dyspnea	26	52
Fever	10	20
Dizziness	10	20
Chest pain	20	40
Palpitations	12	24
Weakness and fatigue	14	28
Vomiting	8	16
Lose of appetite	6	12
Joint Pain	2	4
Abdominal pain	2	4
Anxiety	14	28

N0=Number; %= percentage

Table-2- shows that highest percentage (50(100%)) was Pallor also shows that (26(52%)) with exertional dyspnea; (20(40%)) with chest pain ;(14(28%)) with weakness and fatigue and the same percentage with anxiety and (12(24%)) with palpitations

Figure-1- Distribution of Patients with Aplastic Anemia with and without ECG - ST-Segment Changes

This figures indicated that the highest percentage of patients with Aplastic Anemia without ECG ST- segment changes (68%)

Figure-2-Distributation of Patients with Acute Reduction of Hb Concentration(6g\dl) According to The ECG Changes

This figures indicated that the highest percentage (30%) of patients with acute reduction of hemoglobin concentration to 6 g\dl with ST- segment depression and the same percentage with T inversion 1mm

Table-3- Comparison of patients with and without ST-T changes according to the same concentration of Hemoglobin Level (6 g\dl)

ST-T changes	Heart rate	C.S *

	Mean	SD	
Positive	98.05	16.06	
			S
Negative	77.95	11.89	

*T-Test; C.S=Comparative significant; S= significant

Table-3- shows that there is significant difference between positive and negative ECG ST-T changes according to the heart rate when analysized by t-test

Table-4- Comparison   of patients with and without ECG ST-T changes according to the Hemoglobin Level (6g\dl)

ECG ST-T changes	Hemoglobin Level (6g\dl)		C.S *
	Mean	SD	
Positive	6.54	1.39	N.S
Negative	6.93	1.99	

*T-Test; C.S=Comparative significant; N.S= Not Significant

Table-4- shows that there is no significant difference between positive and negative ECG ST-T changes according to the hemoglobin level (6g/dl) when analyzed by t-test

Discussion:

Electrocardiographic studies were made in 50 selected patients with aplastic anemia in
which there was no clinical evidence of cardiovascular disease.

This study described that the cardiac symptoms were exertional dyspnea (52%), palpitations(24%) , and chest pain (40%) (Table 2) .

Cardiac symptoms such as dyspnea, palpitations and sometimes sterncardiac pain may develop in the course of anemia[4].

This study revealed that normal sinus rhythm was present in all patients except in four with ventricular extrasystoles respectively. The P-R interval was within the usual limits. Lengthening of the intraventricular conduction time was never observed. ECG abnormalities were found in (32%) of anemic patients (Figure-1-). As for the ECG changes the   ST segment depression was (30%) of them and the same percentage T wave inversion (figure-2-).

The incidence of ECG abnormalities varies significantly in different studies ranging from 10-80%) [5].

The prevalence of ECG abnormalities in patients with Aplastic Anaemia was 63%. As for the individual ECG changes the prevalence of ST segment depression was 33%, T wave inversion 10%, prolonged QT interval 27%, increased R difference 30%[6].

The incidence of ECG abnormalities (ST segment depression and T wave inversion) was markedly higher after the stress test. The recorded electrocardiographic changes may result not only from heart diseases but also from anaemia as a sign of myocardial ischaemia[7]

This study showed that patients with ECG changes had significant increase in heart rates than those without ECG changes at the same level of hemoglobin concentrations (6 g\dl) (Table-3-)

When evaluating the entire study period, the subjects who had ECG ST-segment changes had significantly maximum heart rates than those without ECG changes, despite having similar baseline values [8].

ECG ST-segment depression was seen in three (5%) of the study subjects by Holter monitoring, at hemoglobin concentrations of 5-7 g/dl. The subjects with ECG changes overall had higher heart rates during the episodes of ST-segment changes than did the other volunteers at similar hemoglobin concentrations. [3] [10]

The study concluded that using ECG ST-segment monitoring must be used as a marker of myocardial ischemia and not to predict the likelihood of the patients having an obstructed coronary artery. Myocardial ischemia can occur in the absence of obstructive coronary artery lesions. The marked tachycardia observed during the periods with ECG changes may have contributed to the development of an imbalance between myocardial supply and demand

Recommendation:

Based on the results and conclusions of the present study; the researcher recommends the following:

1. Education programs should be developed and implemented focusing on the anemic symptoms and the importance of early presentation
2. The development and implantation of educational instructional program for nurses (theory and practice) for the care of patients with anemia are very important .
3. Develop the nursing staff's knowledge and enable them to be more capable of anemic diagnosis by ECG , symptoms and any other means of diagnosis.
4. Attention to the underlying mechanisms of ischemia is important when managing Aplastic Anaemia

References:

1-Johansen, D., Ytrehus, K. & Baxter, G:Exogenous hydrogen sulfide (H2S) protects against regional myocardial ischemia –reperfusion injury .*Basic Research in Cardiology* .Vol.101 ;2006 P.P.53-60

2- Webb, David K.H: Aplastic anemia: continued cause for concern, *British Medical Association j*ournal; 1990:P.P:88-98

3- Leung, Jacqueline M et al., : Electrocardiographic ST-segment Changes during Acute, Severe Isovolemic Hemodilution in Humans *Anesthesiology J*:
Volume 93 - Issue 4 :2004: pp 1004-1010

5- World Health Organization Department of Health Statistics and Informatics in the Information, Evidence and Research Cluster (2004). *The global burden of disease 2004 update. Geneva: WHO. ISBN 9241563710*

6-Greenberg G, et al .,:Hematocrit level as a marker of outcome in ST-segment elevation myocardial infarction. *Am J Cardiol.* 15;Vol.105 No.4; 2010 :P.P.435-40.

7. Hebert P, et al.,:Transfusion requirements in critical care investigators Canadian Critical Care Trials Group. A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. *N Engl J Med* ; Vol. 340 ;1999: P.P. 409-17

. 8-Spahn D,et al.,: Hemodilution tolerance in elderly patients without known cardiac disease. *Anesthesiology J*; Vol.82; 1996:P.P. 681-6

9-Johnson R, et al.,: Comparison of two transfusion strategies after elective operations for myocardial revascularization. *J Thorac Cardiovasc Su*rg ; Vol.104;1992: P.P. 307-14

10-Stanojević M,and Stankov S: Electrocardiographic changes in patients with chronic anemia .*Public Medical Journ*al .1998 Nov-Dec;126(11-12):461-6.