

Hematologic Abnormalities in Cyanotic Congenital Heart Disease Patients

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ABSTRACT

Introduction: Patients with cyanotic heart disease may have an acceptable quality of life. However, they are invariably prone to several complications. The aim of this study is search about hematologic abnormalities in cyanotic congenital heart disease patients.

Materials and Methods: In this cross-sectional study, every cyanotic congenital heart disease patients who was referred to the adult congenital heart disease clinic was selected and asked of any possible hyperviscosity symptoms, gingival bleeding, epistaxis, hemoptysis, hypermenorrhagia, and gouty arthritis irrespective of their age, gender and primary diagnosis in a six-month period. In this regard, O₂ saturation was obtained via pulse oximetry, an abdominal ultrasound was done in order to discover any gallstones and laboratory tests including CBC, coagulation parameters (bleeding time(BT),clotting time(CT), prothrombin time(PT),international ratio(INR), Ferritin, blood urea nitrogen (BUN) and creatinine (Cr) were provided as well.

Results: A total of 69 patients were enrolled in the present study. The mean age of the patients was 22.44±5.72. Twenty two (34.4%) of them were female and 45(65.6%) were male. In our research, 23% of the patients had serum levels of uric acid more than or equal to 8 mg/dl. 59%of patients presented with depleted iron storage. Mean hemoglobin (Hg), level was (16.9±2.5 mg/dl), mean hematocrit (HCT) level was (55.47±9 mg/dl), mean Ferritin level was (32.5±0.4). Our collected data also revealed that plasma creatinine concentration was normal (0.9±0.2 mg/dl). Furthermore, thrombocytopenia of less than 160000 was found in 30% of the patients. Hyperviscosity symptoms also found in 1.3% of patients.

Conclusion: Our patients had less hyperuricemia, there is no correlation between hyperviscosity symptoms and haematocrit level and an inverse correlation between the Ferritin level and hyperviscosity symptoms were seen.

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Introduction

Erythrocytosis is an isolated increase in the number of red blood cells. Primary erythrocytosis is an increased red cell mass which surfaces in the absence of a definable stimulus, whereas secondary erythrocytosis refers to an isolated increase in the red cell mass in response to such stimulus as low systemic arterial oxygen saturation in the context of cyanotic congenital heart disease. Polycythemia could often be

beneficial. Yet, it poses certain risks to the microcirculation. This is mainly because the capillary diameter is significantly smaller than the red cell diameter and this mismatch could cause viscosity to increase at the capillary level.

Patients with cyanotic heart disease may have an acceptable quality of life (1). However, they are invariably prone to several complications. For instance, hyperviscosity, hyperuricemia (mainly

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due to age-related impairment of uric acid excretion in adults), thrombocytopenia (decreased level of platelet production), blood clotting abnormalities (reduced synthesis of clotting factors and/or deranged platelet aggregation), cerebral abscess, cerebral embolism and endocarditis (1, 2). The aim of this study is to determine the Hematologic abnormalities in Cyanotic Congenital heart disease patients.

Materials and Method

All cyanotic congenital heart disease patients in this cross-sectional study, who were referred to the adult congenital heart disease clinic on 1390, in a one year period, were selected irrespective of their age, gender and primary diagnosis in a six month period. Written consent was obtained from all patients. This study was approved by the Ethical Committee of Rajaei Hospital (RHC), Tehran, Iran. The subjects were asked of any possible hyperviscosity symptoms (headache, faintness, dizziness, lightheadedness, slow mentation, impaired alertness, irritability, blurred or double vision, paresthesia of fingers, toes or lips tinnitus, fatigue, lethargy, myalgia, muscle weakness, easy bruising, fragile skin, gingival bleeding (fragile gums), Epistaxis, hemoptysis, hypermenorrhagia and gouty arthritis).

Afterwards, O₂ saturation was obtained via pulse oximetry, an abdominal ultrasound was done so as to discover any gallstones, and laboratory tests including CBC, coagulation parameters (BT, CT, PT, INR), Ferritin, blood urea nitrogen (BUN) and creatinine (Cr) were provided as well.

Result

A total number of 69 patients were enrolled in the present study. The mean age of the subjects was 22.44±5.72 with a minimum of 15 and the maximum of 46 years old. Twenty two (34.4%) of them were female and 45 (65.6%) were male.

According to the results of Table 1, there were no statistically significant differences in O₂ saturation, mean corpuscular haemoglobin concentration (MCHC), creatinine, (Cr), platelet count, prothrombin time and gallstones between male and female subjects. However, there proved to be statistically significant differences in hemoglobin (Hg), hematocrit (HCT), Uric acid, Ferritin, bleeding time (BT), clotting time (CT) and blood urea nitrogen (BUN) between both groups of men and women. Our collected data also revealed that plasma creatinine concentration was normal (0.9±0.2 mg/dl). Furthermore, thrombocytopenia of less than 160000 was found in 30% of the patients. Consequently, erythrocytosis did not prove to be associated with hyperviscosity symptoms in our study. Table 1

illustrates that Hg, HCT, Uric acid, Ferritin, BT and BUN were considerably higher in men and CT was noticeably higher in women.

On the other hand, Erythrocytosis level was not correlated to O₂ saturation, Cr, age and coagulation factors (PT, INR, CT, BT).

Hyperuricemia equal to or more than 8 ml/dl was found in 23.5% of the patients which was unrelated to the age factor and appeared to be higher in men.

We also came to the conclusion that the symptoms of hyperviscosity develop as Ferritin level drops. Thus, if Ferritin level is more than 40 mg/dl, there will be no hyperviscosity symptoms. P=0.001

Ultimately, no association was found between the type of Cyanotic Congenital heart disease and O₂ saturation or the severity of erythrocytosis. Gallstone prevalence was about 7%.

In our research, 23% of the patients with

Table 1. Demographic and laboratory data of patients

Variable	Sex	Number	Mean ± SD	P-value
O ₂ sat	Female	18	76.83±8.44	0.953
	Male	39	77.00±10.46	
Hg	Female	20	15.81±3.06	0.006
	Male	39	18.06±2.71	
HCT	Female	20	51.83±10.78	0.005
	Male	39	59.12±8.05	
MCHC	Female	19	30.45±1.59	0.969
	Male	39	30.43±2.70	
Cr	Female	21	0.88±0.19	0.069
	Male	38	0.98±0.22	
Uric acid	Female	20	5.67±2.69	0.051
	Male	35	6.96±2.06	
PLt	Female	20	176400.00±40230.13	0.582
	Male	35	166828.57±70804.82	
PT	Female	19	16.43±3.59	0.198
	Male	31	17.73±3.32	
INR	Female	19	1.50±0.55	0.285
	Male	31	1.67±0.56	
Gallstone	Female	19	0.16±0.50	0.215
	Male	33	0.12±0.41	
Ferritin	Female	19	22.53±16.95	0.004
	Male	34	42.60±74.37	
BT	Female	18	2.07±0.62	0.004
	Male	30	2.20±0.75	
CT	Female	18	5.27±1.04	0.004
	Male	30	5.14±1.28	
Hypervisc	Female	19	1.42±1.12	0.040
	Male	35	1.29±0.96	
BUN	Female	20	13.95±6.81	0.002
	Male	37	15.45±6.81	

Mean corpuscular haemoglobin concentration (MCHC)
Creatinine (Cr)
Hemoglobin (Hg)
Hematocrit (HCT)
Bleeding time (BT)
Clotting time (CT)
Blood urea nitrogen (BUN)
Platelet (PLt)
Prothrombin time (PT)

Cyanotic Congenital heart disease had serum levels of uric acid more than or equal to 8 mg/dl which was less than that of other studies (43%) (2).

An association between elevated hematocrit and thrombosis has been established in these patients; treatment guidelines also recommend maintaining hematocrit <45% (3).

A large number of our patients (59%) presented with depleted iron storage (Ferritin).

Discussion

Results of the present study showed less hyperuricemia, no correlation between hyperviscosity symptoms and haematocrit level but an inverse correlation between the Ferritin level and hyperviscosity symptoms.

Depleted iron storage was rather a higher figure than that of any previous studies (4), this may be due to the protein content of our patients diet. Lower level of serum uric acid in our patients also could be the result of the ethical parameters and the eating habits of Iranian people.

With regards to previous studies (5-7), a significant association was noted between thrombocytopenia (Plt<=160000) and high hematocrit level in our Cyanotic patients. (P=0.024) However, unlike other studies, (8-10) we found no association between hyperviscosity symptoms and haematocrit level. Symptoms of hyperviscosity develop as the Ferritin level drops.

We realized that if the Ferritin level is over 40 mg/dl, there will be almost no hyperviscosity symptoms.

The prevalence of gallstone disease did not increase in our patients which we believe might be related to the limited number of the subjects in our case.

Conclusion

We realized that if the Ferritin level is over 40mg/dl, there will be almost no hyperviscosity symptoms.

Conflict of interests

The author has no conflict of interests.

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