Hematopoietic peripheral circulating blood stem cells as an independent marker of good transfusion management in patients with beta-thalassemia

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Background: Aim of the current study was to prospectively evaluate the potential role of peripheral circulating CD34+ stem cells as new independent marker of appropriate hemopoietic balance in patients with thalassemia major and intermedia.

Materials and methods: Peripheral blood samples from patients with thalassemia major (TM) and intermedia (TI) were drawn. Peripheral circulating CD34+ stem cells, CF-GEMM, CFU-GM and BFU-GM were assayed with monoclonal antibodies for CD34 and clonogenic tests, according to standard procedures and ISHAGE method (BD stem cell enumeration kit, Becton Dickinson; H4434, Stem Cell Technology). Demographic and clinical data were recorded from each enrolled subject. Results were compared with healthy controls.

Results: Overall, 56 patients with thalassemia major (median age:35 years, range:13-52 years) and 13 with thalassemia intermedia (median age:44 years, range:27-67) were evaluated. Annual red blood cells transfusion requirements ranged from 10 to 65 in all the patients except three with thalassemia intermedia, that were non transfued. One patient with TM did not accept transfusion for religion (Table 1). A statistically significant increase in peripheral circulating stem cells was observed in all the patients, in comparison with healthy controls. Mean peripheral circulating CD34+cells were 6.9±4.5/μL in patients with TM and 11.8±14.8/μL in patients with TI, significantly higher than mean CD34+ cells of healthy volunteer blood donors values (3.5±2.9/mmc, p=0.014 and p= 0.051 respectively for TM and TI). Only in patients with TI an increase in CFU-GEMM (3.0±4.8 vs 0.75±2.05, p=0.0001) was observed. Patients not treated with transfusions showed the mean highest levels of circulating stem cells (CD34: 32.5±14.8/mmc, BFU-E: 41.3±22.8, CFU-GM: 19.6±5.6, CFU-GEMM 9.0±6.1). At multivariate analysis, peripheral circulating CD34+ stem cells did not correlate with age, sex, number of red blood cells units transfused, hemoglobin levels, iron chelation, history of splenectomy and hypothyroidism.

Conclusion: Circulating peripheral CD34+stem cells are increased in patients with the highest hemopoietic stress (TI, transfusion independent) , thus their determination could represent a useful independent marker of clinical response to transfusion in patients with beta thalassemia.

Table 1.Baseline data of patients with thalassemia

	Thalassemia major (n=56)	Thalassemia intermedia (n=13)	Healthy controls (n=30)
Males	28	7	18
Females	28	6	12
Mean Age (range)	35 (18-52)	42(27-67)	34 (21-50)
BMI (range)	21.5 (15.7-27.3)	21.4 (14.7-33.5)	21.3(15.4-26.9)
Splenectomy	31	13	0
Hypothyroidism	9	1	4
Iron chelation	55	9	0
Smokers	24	8	13

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