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Metabolic profile in survivors of pediatric hematopoietic stem cells transplantation after chemotherapy-only conditioning

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Background

Metabolic syndrome (MS) is a long-term complication of pediatric haematopoietic stem cell transplantation (HSCT) and it was described more often in patients who were exposed to total body irradiation (TBI). Since previous studies reported discrepancy in the presence of metabolic complications in HSCT survivors who underwent chemotherapy-only conditioning, we investigated the frequency of MS in our HSCT-treated children for various disorders without being exposed to TBI in the conditioning regimen.

Methods

- 29 pediatric HSCT survivors after chemotherapy-only conditioning were compared with 16 healthy subjects matched for age and sex.
- MS was defined according to the criteria of Ferranti et al. as ≥3 of the followings:

(1) fasting triglycerides ≥ 1.1 mmol/L (100 mg/dL);
(2) HDL <1.3 mmol/L (50 mg/dL), except in boys aged 15 to 19 years, in whom the cutpoint was <1.2 mmol/L (45 mg/dL);
(3) fasting glucose ≥ 6.1 mmol/L (110 mg/dL);
(4) waist circumference (WC) >75th percentile for age and gender;
(5) systolic blood pressure (BP) >90th percentile for gender, age, and height.

- Total body fat and android/gynoid (A/G) ratio were assessed by dual-energy X-ray absorptiometry (DXA) in 22 HSCT recipients. Body fatness cutoffs were chosen according to Freedman et al.

Results

- 2 patients (6.9%) met at least 3 criteria for MS in our study
- 5 patients (17.2%) presented 1 criterion of MS
- 3 patients (10.3%) met two criteria for MS (Figure 1)
- 63.63% of HSCT recipients (n=14) had an A/G ratio adjusted for age and sex higher than normal (66% of girls and 60% boys)

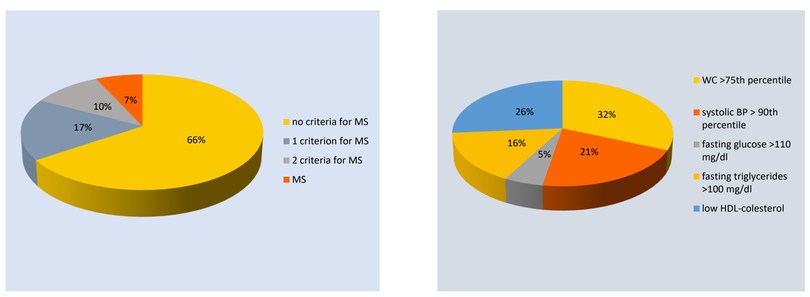

Figure 1. The frequency of MS/its components in survivors of pediatric HSCT after chemotherapy only conditioning

HSCT survivors who fulfilled at least 1 criterion of MS had higher mean BMI (0.13±1.54 kg/m² vs -1.33±1.06kg/m², p=0.009), higher mean WC (77.90±14.57cm vs 63.78±10.29 cm, p=0.006) and higher mean WC/height (0.5±0.07 vs 0.44±0.04, p=0.029) compared to the HSCT recipients with none of the MS criteria (Figure 2).

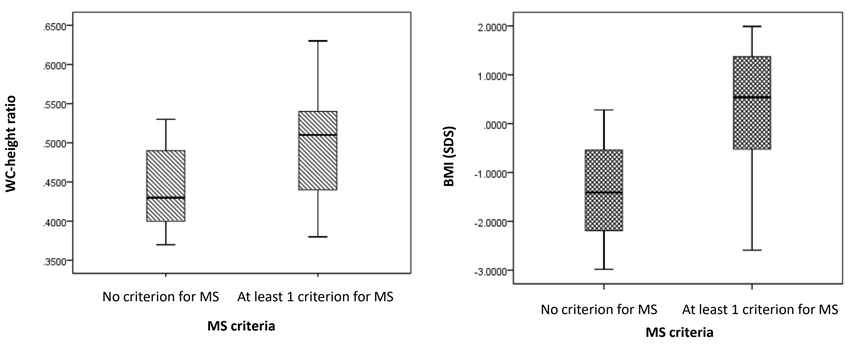

Figure 2. Comparison of WC-height ratio and BMI in survivors of pediatric HSCT after chemotherapy only conditioning compared to controls

Table 1. The characteristics of survivors of pediatric HSCT and controls in our study

	HSCT	Controls	P
CLINICAL DATA			
Current age (years), mean±SD	13.05±5.39	10.6±3.99	NS
Current BMI (z score), mean±SD	-0.82±1.41	0.14±1.15	0.026
BMI (z score) at HSCT, median(IQR)	-0.14(1.98)	NA	
WC (cm), mean±SD	68.82±13.6	67.31±13.77	NS
Hip circumference (cm), mean±SD	74.92±14.14	72.63±22.02	NS
WC/Height, mean±SD	0.92±0.07	1.61±2.9	NS
WC/Height, mean±SD	0.47±0.06	0.48±0.06	NS
Systolic BP (mmHg), mean±SD	101.4±17.96	95.69±6.12	NS
Diastolic BP (mmHg), mean±SD	57.77±15.02	60.63±5.73	NS
LABORATORY FINDINGS			
Fasting glucose(mg/dl), mean±SD	83.83±6.65	83±6.14	NS
Blood glucose in OGTT(mg/dl), mean±SD	99.61±20.11	87.53±15.39	0.049
Fasting insulin (microUI/ml), median(IQR)	4.5(6)	3(7)	NS
Insulin in OGTT (microUI/ml), median (IQR)	16(33)	17(21)	0.05
HOMA-IR, median(IQR)	0.89(1.03)	0.68(1.21)	NS
QUICKI, mean±SD	0.39±0.05	0.41±0.08	NS
HbA1c (%), median(IQR)	5.2(0.3)	5.4(0.4)	0.018
Colesterol (mg/dl), mean±SD	165.73±34.01	173.12±31.66	NS
HDL-C (mg/dl), mean±SD	61.28±13.69	58.25±10.08	NS
LDL-C (mg/dl), mean±SD	95.32±26.66	101.87±24.15	NS
TG/HDL, median(IQR)	1.03(0.7)	0.68(1.21)	NS
TG (mg/dl), median(IQR)	61(29)	55(54)	NS
Visceral adiposity index, median(IQR)	1.31(1.44)	0.87(1.84)	NS
Uric acid (mg/dl), mean±SD	4.48±1.26	4.04±0.83	NS
IGF-I (scor z), mean±SD	-0.71±1.17	0.51±0.77	NS
TSH(mUI/ml), median(IQR)	3.06(2.07)	2.06(1.88)	NS
25-OH-vitamin D (ng/ml), median (IQR)	15.42(13.27)	33.87(17.02)	0.006
DXA PARAMETERS			
Total body fat %, mean±SD	30.33±10.05	NA	
Android fat %, mean±SD	24.15±14.77	NA	
Ginoid fat %, mean±SD	33.34±9.84	NA	
A/G, median(IQR)	0.62(0.45)	NA	
METABOLIC SYNDROME (N, %)	2(6.9%)	1(6.25%)	NS
WC > p 75 (N, %)	6(20.7%)	3(18.75%)	NS
BP > p 90 (N, %)	4(13.8%)	0(0%)	0.047
Impaired glucose leved	1(3.4%)	0(0%)	NS
HDL-C <50 mg/dl in girls, <45 mg/dl in boys(N%)	5(17.2%)	2(12.5%)	NS
TG ≥100 mg /dl (N, %)	3(10.3%)	2(12.5%)	NS

Conclusions

This study demonstrates that pediatric HSCT survivors who underwent chemotherapy-only conditioning are also associated with an unfavorable metabolic profile, one third of them presenting at least one MS component.

References

1. Ferranti et al. Prevalence of the metabolic syndrome in American adolescents: findings from the Third National Health and Nutrition Examination Survey. *Circulation.* 2004
2. Freedman DS et al. Classification of body fatness by body mass index-for-age categories among children. *Arch Pediatr Adolesc Med*. 2009