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Visceral adiposity index as a marker of metabolic risk in survivors of paediatric hematopoietic stem cell transplantation after chemotherapy-only conditioning

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Background

Hematopoietic stem cell transplantation (HSCT) recipients exhibit excess adiposity that may result in an increased metabolic risk. Studies have shown that BMI is a poor predictor of body fatness in pediatric HSCT survivors population where diminished lean mass has been documented. The visceral adiposity index (VAI) has recently been proposed as a predictor of cardio-metabolic risk in both adults and children. However, the predictive value of this index in metabolic risk assessment has not been studied in survivors of childhood HSCT. Therefore, we aimed to estimate the potential relationship between VAI, markers of insulin resistance (HOMA index) and body adiposity measured by dual-energy x-ray absorptiometry (DXA) in a cohort of pediatric HSCT survivors after chemotherapy-only conditioning.

Material and methods

- Anthropometric measurements and metabolic profile were obtained from 28 paediatric HSCT survivors that were not exposed to TBI conditioning.
- Metabolic syndrome (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.

- Homeostatic model assessment index as a marker of insulin resistance and VAI index were calculated by the previously published formulas:

HOMA-IR=glucose (mg/dl) x insulin (uUI/ml) /405
VAI for males= [WC/39.68 + (1.88 × BMI)] × (TG/1.03) × (1.31/HDL-C)
VAI for females= [WC/36.58 + (1.89 × BMI)] × (TG/0.81) × (1.52/HDL-C), where WC is expressed in cm, BMI in K/m2, TG in mmol/L, and HDL in mmol/L.

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

Conclusion

Although VAI correlated with serum glucose level and HOMA index in our group of survivors of paediatric HSCT who underwent chemotherapy-only conditioning, we found no association between VAI and densitometric parameters of adiposity. Therefore, we suggest that VAI should be used with caution in this population to predict the metabolic risk

Results

- 2 patients (6.9%) in our study met the criteria for MS
- 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)

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

CLINICAL DATA	
Current age (years), mean±SD	13.05±5.39
Current BMI (z score), mean±SD	-0.82±1.41
BMI (z score) at HSCT, median(IQR)	-0.14(1.98)
WC (cm), mean±SD	68.82±13.6
Hip circumference (cm), mean±SD	74.92±14.14
Systolic BP (mmHg), mean±SD	101.4±17.96
Diastolic BP (mmHg), mean±SD	57.77±15.02
LABORATORY FINDINGS	
Fasting glucose(mg/dl), mean±SD	83.83±6.65
Blood glucose in OGTT(mg/dl), mean±SD	99.61±20.11
Fasting insulin (microUI/ml), median(IQR)	4.5(6)
Insulin in OGTT (microUI/ml), median (IQR)	16(33)
HOMA-IR, median(IQR)	0.89(1.03)
HbA1c (%), median(IQR)	5.2(0.3)
HDL-C (mmol/l), mean±SD	1.58±0.35
TG/HDL, median(IQR)	1.03(0.7)
TG (mmol/l), median(IQR)	0.69(0.32)
Visceral adiposity index, median(IQR)	1.31(1.44)
DXA PARAMETERS	
Total body fat %, mean±SD	30.33±10.05
Android fat %, mean±SD	24.15±14.77
Ginoid fat %, mean±SD	33.34±9.84
A/G, median(IQR)	0.62(0.45)
METABOLIC SYNDROME (N, %)	2(6.9%)
WC > p 75 (N, %)	6(20.7%)
BP > p 90 (N, %)	4(13.8%)
Impaired glucose leved	1(3.4%)
HDL-C <50 mg/dl in girls, <45 mg/dl in boys(N%)	5(17.2%)
TG ≥100 mg /dl (N, %)	3(10.3%)

Our study showed a statistically significant correlation between VAI and HOMA index (r^2=0.384, p=0.001) and serum glucose level (r^2=0.140, p=0.046), respectively, in survivors of pediatric HSCT (Figure 1), but we found no association between VAI and total body fat or A/G ratio in our patients.

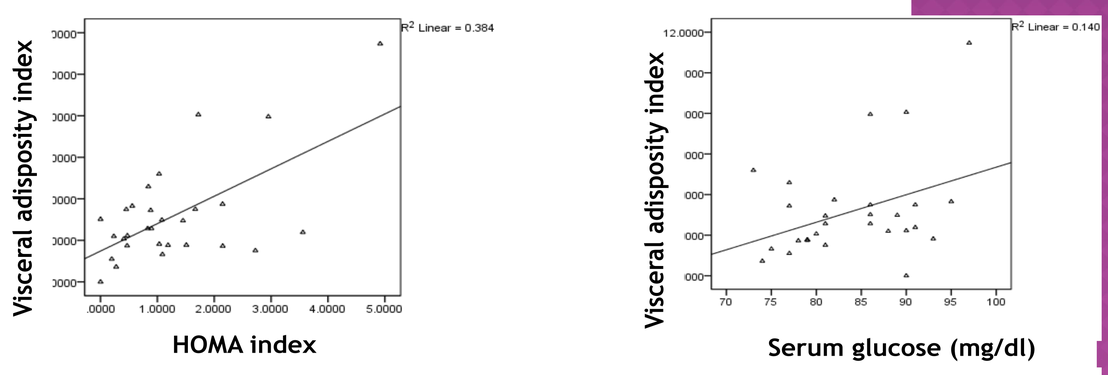

Figure 1. Correlation between VAI and HOMA index (A) and serum glucose level (B), respectively, in survivors of pediatric HSCT after chemotherapy only conditioning

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