Cardiopulmonary exercise testing, body composition and metabolic status after allogeneic hematopoetic stem cell transplantation in childhood

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KEY MESSAGES
✓ An unfavorable metabolic profile after alloHSCT is associated with low physical fitness
✓ Emphasis on a healthy, active lifestyle remains important long after alloHSCT

INTRODUCTION
Well-known long-term complications of alloHSCT in childhood include endocrine system damage and secondary malignancies. In addition, survivors of childhood alloHSCT are at risk of cardiovascular (CV) and metabolic disturbances.

OBJECTIVES
Cross-sectional investigation of exercise performance by cardiopulmonary exercise testing (CPET) and metabolic parameters in boys and girls, who underwent alloHSCT for a hematological malignancy in childhood, in comparison to healthy peers.

METHODS
Cardiopulmonary exercise testing: Maximal oxygen consumption (VO2peak), maximal load (PPeak), exercise duration (time), VE/VCO2 slope, oxygen uptake efficiency slope (OUES) ventilatory anaerobic threshold (VAT)
DXA: Whole body fat and lean mass
Hormones: leptin/adiponectin ratio (L/A ratio), homeostatic model assessment for insulin resistance (HOMA-IR)

Participants:
Inclusion criteria:
- Boys and girls of 15 to 25 years
- AlloHSCT: ≥2-year interval since alloHSCT
Cases:
- AlloHSCT: n=21 (10 males, 11 females)
- Controls: n=21 (11 males, 10 females)
Diagnosis and treatment:
- Age at alloHSCT: 9.2±4.91 years.
- Diagnosis:
  ▪ Acute lymphoblastic leukemia: n=15
  ▪ Acute & chronic myeloid leukemia: n=2 & n=2
  ▪ Anaplastic large cell lymphoma and myelodysplastic syndrome: n=1 & n=1
  ▪ Myeloablative conditioning regimens:
    ▪ Total body irradiation based (1200 cGy): n=14
    ▪ Busulfan based: n=7
    ▪ +Cytopharma (≥ 120 mg/kg): n=10
  ▪ Acute GVHD (grade II to IV): n=8
  ▪ Chronic GVHD: n=1

RESULTS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients</th>
<th>Controls</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>Age at evaluation (y)</td>
<td>19 ± 3</td>
<td>20 ± 3</td>
<td>20 ± 3</td>
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<tr>
<td>Interval (y)</td>
<td>9.3 ± 5.06</td>
<td>12.5 ± 3.56</td>
<td>NA</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>170.2 ± 6.72</td>
<td>164.9 ± 4.67</td>
<td>171.9 ± 5.05</td>
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<td>BMI (kg/m²)</td>
<td>20.0 ± 2.37</td>
<td>22.3 ± 3.72</td>
<td>21.3 ± 2.71</td>
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<tr>
<td>BSA (m²)</td>
<td>1.61 ± 0.14</td>
<td>1.64 ± 0.15</td>
<td>1.68 ± 0.13</td>
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L/A ratio and whole body fat percentage were negatively correlated with predicted VO2 percentage
No correlation was seen with HOMA-IR

CONCLUSIONS
Adolescents and young adults after HSCT have lower maximal exercise performance and a less favorable metabolic profile in comparison with healthy controls. Leptin/adiponectin ratio and whole body fat percentage are negatively correlated with physical fitness, stressing the importance of healthy lifestyle promotion and physical rehabilitation in this patient population.

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