MR images were processed with the CIVET pipeline (v1.1.12). (MPRAGE TI=0.9s, TR=2.3s, TE=3ms, 1mm isotropic, GRAPPA 2, 5m3s acq. time).

Anatomy assessed with 3T MRI T1-weighted sequence critical for discovery of methods of prevention and rescue.

Characterizing treatment-induced neurological damage is the impact of individual chemotherapy agents.

Mouse models of cancer care are necessary for distinguishing correlations with cognitive deficits in leukemia survivors.

Cancer treatment affects brain development and shows affect brain structure and cognitive function?

Does chemotherapy for acute lymphoblastic leukemia (ALL) Prevention and remediation require knowledge of mechanisms.

Impairments in mental health or function are a life-long burden. Long-term health problems are related to treatment.

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ALL is commonly diagnosed during early development. Treatment is based on a combination of chemotherapy agents. Methotrexate is administered directly into the CNS. Survival rates of ALL approach 95%. Long-term health problems are related to treatment. Impairments in mental health or function are a life-long burden. Prevention and remediation require knowledge of mechanisms.

**Research Question**

Does chemotherapy for acute lymphoblastic leukemia (ALL) affect brain structure and cognitive function?

**Background**

- ALL is commonly diagnosed during early development.
- Treatment is based on a combination of chemotherapy agents.
- Methotrexate is administered directly into the CNS.
- Survival rates of ALL approach 95%.
- Long-term health problems are related to treatment.
- Impairments in mental health or function are a life-long burden.
- Prevention and remediation require knowledge of mechanisms.

**Sample**

<table>
<thead>
<tr>
<th></th>
<th>Controls N=23</th>
<th>ALL survivors N=26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at testing, M (SD)</td>
<td>13.8 (2.9)</td>
<td>14.2 (2.2)</td>
</tr>
<tr>
<td>Age range, (min - max)</td>
<td>8.7 - 17.5</td>
<td>8.9 - 17.9</td>
</tr>
</tbody>
</table>

**Measures**

Anatomy assessed with 3T MRI T1-weighted sequence (MPRAGE TI=0.9s, TR=2.3s, TE=3ms, 1mm isotropic, GRAPPA 2, 5m3s acq. time).

MR images were processed with the CIVET pipeline (v1.1.12). Working memory - N-Back

0-Back Indicate when ’Z’ appears.

1-Back Indicate when letter is the SAME as 1 back.

2-Back Indicate when letter is the SAME as 2 back.

Inhibitory control - Stop Task

Press “X”.

Press “O”.

Without response.

Tone sounds AFTER presentation of the stimulus.

**Results**

Brain & Cognition

- ALL survivors had lower frontal WM volume than controls, t(42)=2.7, p < 0.05, and lower parietal WM volume, t(42)=2.4, p < 0.05 (uncorrected). ALL survivors had lower cortical volume than controls in the temporal lobe, t(42)=−2.4, p < 0.05 and in the occipital lobe, t(42)=−2.4, p < 0.05 (uncorrected).

- Working memory performance is impaired in ALL survivors, 1-back, t(43) = −3.9, p < 0.001; 2-back, t(43) = −2.5, p < 0.05.

- Inhibitory control impaired in ALL survivors, t(45) = 2.1, p < 0.05. Higher scores represent greater impairments.

**Discussion**

- Cancer treatment affects brain development and shows correlations with cognitive deficits in leukemia survivors.
- Mouse models of cancer care are necessary for distinguishing the impact of individual chemotherapy agents.
- Characterizing treatment-induced neurological damage is critical for discovery of methods of prevention and rescue.

**Acknowledgments**

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