Neuroimaging Signatures of Early-Onset Bipolar Disorder: Insights from the ABCD Study

Nicole Sanford1, Ruiyang Ge1, Sophia Frangou1,2
(1) Department of Psychiatry, University of British Columbia; (2) Icahn School of Medicine, Mount Sinai Hospital

1. BACKGROUND
- Bipolar disorder symptoms often emerge several years prior to the onset of major episodes.
- While offspring of parents with mental illness are at heightened risk, family history does not account for all cases of bipolar disorder.
- This study aimed to identify early neuroimaging biomarkers of bipolar disorder and their interactions with familial risk, using measures that capture key neurodevelopmental changes.

2. METHODS
Participants
- Youth ages 9-11 years participating in the Adolescent Brain Cognitive Development (ABCD) study.
- Groups comprised typically developing controls (mean age = 9.9 years; 47% males) and youth with bipolar disorder symptoms (mean age = 9.9 years; 45% males), subdivided by parental history of mental illness.

Neuroimaging markers
Structural and diffusion MRI scans yielded the following measures:
1) Cortical (68 regions)
   - Thickness
   - Peri-cortical neurite density
   - Surface area
   - Grey-white matter contrast
   - Neurite density
2) Subcortical (16 regions)
   - Volume
   - Neurite density

Analysis
- Multivariable ANOVAs were performed on all markers to examine diagnosis, parental history, and age interactions, with sex as a covariate.
- Post hoc analyses were performed with false discovery rate correction.

3. RESULTS
Significant main effects of diagnosis

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<thead>
<tr>
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<th>+ Parental mental illness</th>
<th>No parental mental illness</th>
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<tbody>
<tr>
<td>Controls</td>
<td>n = 1,171</td>
<td>n = 1,652</td>
</tr>
<tr>
<td>Bipolar</td>
<td>n = 145</td>
<td>n = 161</td>
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Grey-white matter contrast
- Cortical neurite density
- Peri-cortical neurite density

Sub-cortical volume

Significant diagnosis × parental history × age interactions for grey-white matter contrast

4. CONCLUSIONS
- This study identifies potential biomarkers for bipolar disorder that are robust to parental history of mental illness.
- Selective abnormalities in grey-white matter differentiation in those with familial risk could indicate early signs of more severe future manifestations.

REFERENCES
1) Dean, K et al. (2010) Arch Gen Psychiatry, 67, 822–829.