Late Fetal Growth Restriction: Functional organization of neonatal brain networks

E Eixarch, D Batalle, E Muñoz-Moreno, E Gratacos

Fetal and Perinatal Medicine Research Group, IDIBAPS
Maternal-Fetal Medicine Department, ICGON, Hospital Clínic, Universitat de Barcelona
Centro de Investigación Biomédica en Red de Enfermedades Raras
Barcelona, Spain
• MRI has demonstrated differences in brain structure in IUGR
• Brain connectivity might be useful to assess brain organization
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To assess differences in functional organization in resting state networks assessed by functional MRI in late-onset IUGR

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- Brain connectivity might be useful to assess brain organization
- Diffusion connectomics has demonstrated less efficient brain networks in IUGR
controls

**n = 9**

IUGR

**n = 11**

<table>
<thead>
<tr>
<th>GA at delivery (weeks)</th>
<th>39.2 (2.3)</th>
<th>38 (2.3)</th>
<th>n.s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight (gr)</td>
<td>3155 (542)</td>
<td>2097 (634)</td>
<td>0.001</td>
</tr>
<tr>
<td>Birth weight centile</td>
<td>53.8 (34.6)</td>
<td>2.9 (2.9)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender distribution  (m/f)</th>
<th>4/5</th>
<th>6/5</th>
<th>n.s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding</td>
<td>77.8%</td>
<td>90.9%</td>
<td>n.s</td>
</tr>
<tr>
<td>Age at MRI scan (weeks)</td>
<td>4.6 (2.3)</td>
<td>5.2 (3.8)</td>
<td>n.s</td>
</tr>
</tbody>
</table>

**Methods**

- **Natural sleep**
  - 4 weeks
  - 11 (2)

- **Partial correlations**

- **Individual connectomes**
  - Global characteristics
  - Regional characteristics

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www.medicafetalbarcelona.org/
Zhang et al. Biological Psychiatry. 2011

Results

Group connectomes

Global efficiency

Local efficiency

Adjusted by GA delivery, gender, breastfeeding and age at MRI
Pattern of altered regional features in IUGR

NODAL EFFICIENCY AND NODAL STRENGTH

Control > IUGR
IUGR > Control

Adjusted by GA delivery, gender, breastfeeding and age at MRI
• First study demonstrating differences in functional organization of brain networks in neonatal period after IUGR.

• Results support the existence of functional brain reorganization in late-onset IUGR during resting state.

• Further studies are needed to confirm these results and to assess whether fMRI network parameters are related with neurodevelopmental tests.