Studying the early developing brain

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Contrast changes in early development (T1 and T2w)

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Rapid Change: First year of Development

ICV Growth

Ventricular Growth

2 weeks

1 year

Movie
Longitudinal design: Same subject at 2w, 1yr, 2yrs

- Inversion of contrast between the neonate and the 1 and 2 years olds
- Still only partial myelination in peripheral cortical white in the 1 years old subject.
- ICV of the 2 weeks old is only 31% of the 2 years old, and at 1 year increases to 90%. 

<table>
<thead>
<tr>
<th>ICV subject 0034 (ml)</th>
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</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>2 weeks: 445</td>
</tr>
<tr>
<td>1 year: 1304</td>
</tr>
<tr>
<td>2 years: 1456</td>
</tr>
</tbody>
</table>
4 and 6 month old subjects

Please note the intermediate stage of contrast flip between white and gray, with no differentiation in T1w at 4mt and in T2 at 6mt.
Tissue Segmentation of subject 0034 at 1 year and 2 years

Brain Growth year 1 to 2 (subject 0034)

<table>
<thead>
<tr>
<th>Tissue</th>
<th>1 year</th>
<th>2 years</th>
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</thead>
<tbody>
<tr>
<td>gm</td>
<td>308</td>
<td>338</td>
</tr>
<tr>
<td>wm</td>
<td>675</td>
<td>753</td>
</tr>
<tr>
<td>csf</td>
<td>126</td>
<td>123</td>
</tr>
<tr>
<td>icv</td>
<td>1109</td>
<td>1214</td>
</tr>
</tbody>
</table>

1yr

2 yrs
White matter maturation shown by DTI

Side by side comparison of the neonate DTI FA atlas (left) co-registered to the 1 years DTI FA atlas (right) by affine registration.
Quantitative DTI Analysis: Neonate

FA and MD along genu and splenium tracts
Quantitative DTI Analysis: Neonate and 1 year old

FA and MD along genu and splenium tracts:

Neonate (dashed) vs. 1yr old (solid)