Frontal Hypergyria in Prodromal States and Early Onset Schizophrenia

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Gyrification is an early neurodevelopmental phenomenon that takes place during pregnancy and approximately first year of childhood. A longitudinal study has shown that the gyrification is robust thereafter and can be taken as a measure for the relative convolutedness of the outer brain surface [1].
Hypergyria is a finding reported both post mortem [2] and in vivo in patients with schizophrenia [3,4]. The gyrification index (GI) is used to quantify the relative degree of folding of the cortical surface in different brain regions [5]. In this study, the GI was measured in subjects at risk with prodromal states of schizophrenia (PS) and adolescents with early onset schizophrenia (EOS). Based on the concept of hypergyria as a neurodevelopmental phenomenon that predisposes for the development of schizophrenia, it was assumed that in both diagnostic groups frontal hypergyria could be detected.

Image Analysis

MR images were scanned with 1.5 T and stored in 3D-data with 1mm^3 voxel size. The images were realigned to AC-PC. Slices were chosen in the frontal and the parieto-occipital region at the anterior and the posterior border of the corpus callosum (Fig. 1). To calculate GI, an outer contour was measured by tracing a line along the crests of the gyri (Fig. 2), and an inner contour was measured by tracing a line connecting the crests of gyri (Fig. 3). GI was calculated as the ratio of the length of the inner to the outer contours.

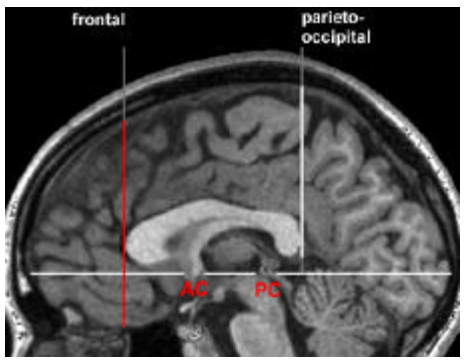


Fig. 1: Location of slices in sagittal view.

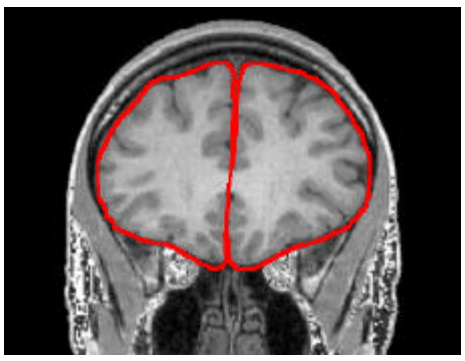


Fig. 2: Outline of the outer contour.

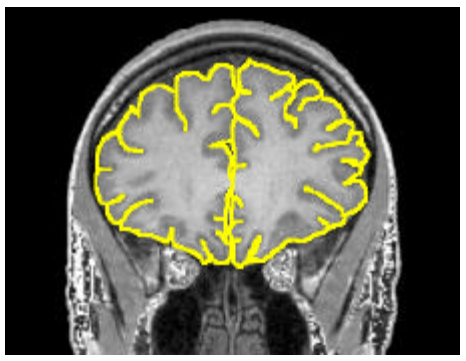


Fig. 3: Outline of the inner contour.

Patients and Controls

	Sample I		
	Controls	PS	Schizophrenics
N	22	22	22
Age (mean, SD)	24.7 (4.3)	24.8 (4.5)	24.5 (4.8)
Sex (m/w)	12/10	11/11	11/11
Duration of illness (mean, SD)			6.4 (5.3)

Table 1: Demographic data of sample I: Controls, subjects at risk with prodromal states of schizophrenia (PS) and patients with schizophrenia.

	Sample II	
	Controls	EOS
N	16	14
Age (mean, SD)	16.4 (1.0)	17.0 (1.2)
Sex (m/w)	8/8	8/6

Table 2: Demographic data of sample II: Controls versus adolescents with early onset schizophrenia (EOS).

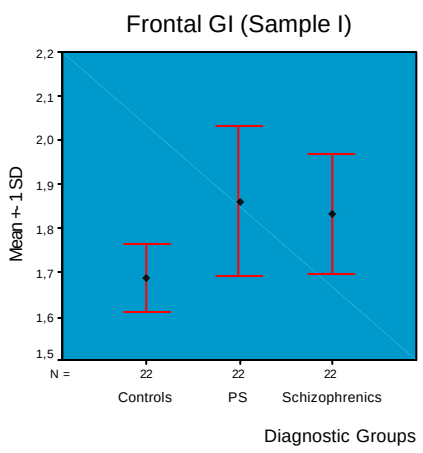
Results

Sample I:

A oneway ANOVA shows a significant effect of diagnosis ($F=10.68$, $p<0.001$).

PS revealed a significant frontal hypergyria ($T=-4.37$, $p< 0.001$) as well as the age-matched group of schizophrenic patients ($T=-4.35$, $p< 0.001$), both compared to healthy controls.

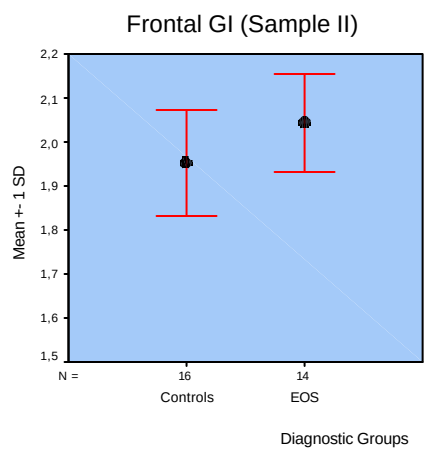
There was no significant difference between PS subjects and schizophrenic patients. In the parieto-occipital we found no difference between the diagnostic groups.



Sample II:

In the adolescent EOS group the frontal GI showed a significant bilateral increase in schizophrenic patients as compared to control subjects (mean GI: $F = 4.73$, $p < 0.05$).

In the parieto-occipital we found no difference between the diagnostic groups.



Conclusions

The study on early stages of schizophrenia and early onset schizophrenia supports the view that frontal hypergyria indicates neurobiological changes, putatively neurodevelopmental in origin, that predispose for the acquisition of schizophrenia during adolescence or early adulthood. This suggests that hypergyria is a phenomenon that is potentially interesting in the early detection of schizophrenia.

References

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