Title

S184. MACHINE LEARNING REVEALS DEVIANCE IN NEUROANATOMICAL MATURITY PREDICTIVE OF FUTURE PSYCHOSIS IN YOUTH AT CLINICAL HIGH RISK

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Authors

Chung, Yoonho
Addington, Jean
Bearden, Carrie
et al.

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S182. CHANGE IN CORTICAL MORPHOMETRY IN INDIVIDUALS WITH PERSISTING PSYCHOTIC EXPERIENCES: A LONGITUDINAL PILOT STUDY

Leon Fonville*[,1], Mark Drakesmith[2], Avi Reichenberg[3], Derek Jones[2], David Linden[4], Anthony David[5]
[1]University of Westminster; [2]Cardiff University Brain Research Imaging Centre; [3]Icahn School of Medicine at Mount Sinai; [4]MRC Centre for Neuropsychiatric Genetics & Genomics, Cardiff University School of Medicine; [5]Institute of Psychiatry, King's College London

Background: There is an increasing interest in the presence of psychotic symptoms in the general population that do not meet the threshold for psychotic disorder. Such psychotic experiences (PEs) are more prevalent than conditions such as schizophrenia and often manifest during childhood and adolescence. PEs are a risk factor for psychotic disorders and a range of adverse psychosocial outcomes. PEs can become abnormally persistent with a corresponding increase in psychiatric morbidity. Previous research has highlighted subtle deviations in brain structure associated with the presence and persistence of PEs, but longitudinal assessments are needed to gauge if these deviations continue, perhaps as part of an atypical neurodevelopmental trajectory.
Methods: Longitudinal imaging data, taken at ages 20 and 25, were available for 25 young adults who were part an MRI nested case control study within the Avon Longitudinal Study of Parents and Children. They were selected originally on the basis of presence or absence of PEs. Cortical surface data were analysed using Freesurfer. Presence of PEs was assessed at ages 18, 20, and 25 and we defined persistence as endorsing PEs at multiple time-points. Average cortical volume and thickness were extracted from each brain parcellation. We additionally calculated fractal dimensionality (FD) of each parcellation using a box-count algorithm to capture shape complexity. We compared the rate of change between healthy controls (HC) and those with persistent PEs in each parcellation and used permutation testing to control for multiple comparisons.
Results: Both HC and PEs showed the expected age-related net loss in brain volume; an increase in white matter volume offset by a greater reduction in grey matter. We identified greater volume loss in PEs in the left parietal lobe and further examination of local volume highlighted additional changes. PEs were associated with a greater rate of volume loss in the anterior cingulate, postcentral, and lingual gyrus in the left hemisphere and in the right inferior parietal lobule and pars orbitalis. Thinning of the left inferior parietal lobule was greater in those with PEs. There was further converging evidence of focal abnormalities in the left postcentral gyrus in terms of reductions in cortical thickness and FD in PEs. Similarly, we found reduced FD relative to HC in the left rostral anterior cingulate. There was additional evidence for reductions in FD in the left hemisphere in the cuneus, isthmus cingulate, and middle frontal gyrus.
Discussion: Our findings highlight a deviation from typical age-related changes in brain volume in individuals with persisting manifestations of PEs. Though these changes could reflect an acceleration of the typical volume loss that is seen with aging, there are several points of evidence against this. We found no differences in global volume changes and only the left parietal lobule was found to show a greater volume loss in PEs. On a local scale, findings seemed to mostly converge on parietal and cingulate regions in the left hemisphere with some evidence of aberrations in frontal regions. These pilot data are, uniquely, unconfounded by illness and treatment related factors and highlight the continued need for longitudinal assessments of brain structure in relation to PEs; there is an increasing risk of transitioning to a psychotic disorder with persistence of PEs and our findings may reflect the neuroanatomical basis for an anomalous developmental trajectory related to psychotic disorders.

S183. ABNORMALITIES OF FRONTO-SUBCORTICAL PATHWAYS IN SCHIZOPHRENIA AND THE DIFFERENTIAL IMPACTS OF ANTIPSYCHOTIC TREATMENT: A DTI-BASED TRACTOGRAPHY STUDY

Anaïs Vandevelde*[,1], Elise Leroux[1], Maxime Tréhout[1], Sonia Dollfus[1]
[1]Normandie University

Background: The fronto-striato-thalamic circuitry is a key network associated with several symptoms observed in patients with schizophrenia (SZPs). In this study, we use diffusion tensor imaging (DTI) to investigate the integrity of white matter (WM) pathways involved in this network in SZPs relative to healthy controls (HCs). We also evaluate the differential impact of chronic exposure to clozapine as well as other atypical and typical antipsychotics on fasciculi integrity in this network in schizophrenia.
Methods: 63 HCs and 41 SZPs were included in this study. Of the SZPs, 16 were treated with clozapine (SZPsC), 17 with atypical antipsychotics (SZPsA), and 8 with typical antipsychotics (SZPsT). We reconstructed three tracts belonging to the fronto-striato-thalamic network in the left hemisphere using tractography: one fronto-subcortical tract (FSC), one prefronto-subcortical tract (PFSC), and one prefronto-frontal tract (PFF). Diffusion parameters were individually extracted in each tract.
Results: SZPs exhibited lower integrity in both the FSC and PFSC relative to HCs, and SZPsT patients showed altered integrity compared to SZPsC patients. There were no WM integrity differences in the PFF between SZP groups or between SZPs and HCs.
Discussion: These results suggest that SZPs exhibit structural connectivity abnormalites in the prefronto-fronto-subcortical network that are specifically and differentially impacted by the type of antipsychotic treatment. Additional studies are needed to separate the contributions of clozapine-mediated neuroprotection, neurotoxicity related to typical antipsychotics, and the illness itself to the observed differences.

S184. MACHINE LEARNING REVEALS DEVIANCE IN NEUROANATOMICAL MATURITY PREDICTIVE OF FUTURE PSYCHOSIS IN YOUTH AT CLINICAL HIGH RISK

Yoonho Chung*[,1], Jean Addington[2], Carrie Bearden[3], Kristen Cadenhead[4], Barbara Cornblatt[5], Daniel Mathalon[6], Thomas McGlashan[1], Diana Perkins[7], Larry Seidman[8], Ming Tsuang[4], Elaine Walker[9], Scott Woods[1], Sarah McEwen[3], Theo van Erp[10], Tyrone Cannon[1]
[1]Yale University; [2]University of Calgary; [3]University of California, Los Angeles; [4]University of California, San Diego; [5]The Zucker Hillside Hospital; [6]University of California, San Francisco; [7]University of North Carolina; [8]Harvard Medical School; [9]Emory University; [10]University of California, Irvine

Background: Both early (pre- and perinatal) and late (adolescent) neurodevelopmental disturbances are hypothesized to contribute to the pathophysiology of schizophrenia. Disturbances originating earlier in life (e.g., resulting from the interplay of genetic factors and obstetric complications) would be expected to affect brain integrity from birth onwards and could therefore help to explain cases with subtle deficits in premorbid functioning during childhood and earlier ages at onset of full psychosis (i.e., early to mid-teens). In contrast, disturbances that emerge during late adolescence and early adulthood (e.g., via abnormal neuromaturational events and/or environmental factors) could help to explain cases with normal premorbid

psychological health and a more acute onset of psychotic symptoms and functional impairment in the late teens and early twenties. However, it is yet unclear whether neuroanatomical data among individuals at clinical high risk (CHR) for psychosis can be modeled to detect early versus late neurodevelopmental influences that is predictive of future psychosis onset. Therefore, in this study, we investigated whether the timing of the appearance or course of the deviation from normal brain maturation, as determined using a machine learning algorithm trained on structural MRI data to estimate age, is potentially relevant to the early versus late neurodevelopmental framework among CHR individuals.
Methods: A neuroanatomical-based age prediction model was trained using a supervised machine learning technique with T1 MRI scans from 953 typically developing healthy controls (HC) from the Pediatric Imaging, Neurocognition, and Genetics study (PING) study. The trained model was then applied to 109 HCs and 275 CHR, including 39 converters (CHR-C), from the North American Prodrome Longitudinal Study (NAPLS2) and 14 cases of first episode psychosis patients (FE) for external validation and clinical application. Discrepancy between neuroanatomical-based estimated age and chronological age was computed for each individual (i.e., brain age gap) and compared across clinical groups.
Results: The PING-derived model for estimating age accurately predicted NAPLS HC subjects' chronological ages, explaining 51% of the variance ($P < 0.001$) in chronological age, with a mean absolute error of 1.41 years, providing evidence of independent external validation. CHR subjects and FE adolescents showed a significantly greater overestimated gap between model-predicted age and chronological age compared with HC (Ps < 0.01). This effect was significantly moderated by chronological age, with neuroanatomical-based estimated age systematically overestimating CHR cases aged 12–17 years, but not among those aged 18–21 years. In the ROC analysis, brain age gap was a significant predictor of conversion to psychosis with an area under the curve of 0.63 ($P < 0.05$) among younger adolescents. In addition, increased deviation of brain age gap predicted pattern of stably low functioning over time ($P < 0.05$) among CHR individuals. In contrast, previously reported evidence of an accelerated reduction in cortical thickness among CHR-C was found to apply only to those cases who were 18 years or older.
Discussion: These results are consistent with the view that both early and later neurodevelopmental disturbances contribute to the onset and course of schizophrenia, with the two sets of influences having differing implications for the intercepts and trajectories in structural brain parameters as a function of age. The results also suggest that baseline neuroanatomical measures are likely to be useful in prediction of psychosis especially (or only) among CHR cases who are below 18 years of age at the time of ascertainment.

S185. DTNBP1 IS ASSOCIATED WITH THE AGE AT ONSET OF KOREAN PATIENTS WITH SCHIZOPHRENIA

Kyuyoung Lee*[,1], Eun-jeong Joo[2]
[1]Eulji General Hospital, Eulji University School of Medicine; [2]Eulji General Hospital

Background: The dysbindin gene (DTNBP1) is located in chromosome 6p22.3, one of the regions of positive linkage for schizophrenia. In particular, dysbindin protein has been found to play a role in the glutatmate neural transmission in the brain. A strong genetic association between DTNBP1 and schizophrenia has been replicated through many recent studies. However, we have not replicated positive association between DTNBP1 and schizophrenia in our Korean sample. Because schizophrenia has been regarded as a disease with a quite heterogeneous origin and evolvement, it is useful to categorize patients with schizophrenia into relatively homogeneous subsets based on clinical characteristics including age at onset (AAO). We investigated the association between DTNBP1 and AAO of schizophrenia.
Methods: We assessed age at first occurrence of positive psychotic symptoms of 197 patients with schizophrenia with DSM IV diagnosis, which was re-evaluated by Korean version of Diagnostic Interview for Genetic Study. Five SNPs, SNPA, P1763, P1320, P1635 and P1655 of DTNBP1 were genotyped and genetic association analyses were performed using the PLINK program.
Results: In SNPA, patients with AT (N=10) showed significant earlier AAO than those with AA (N=187) ($p<0.0001$). The patients with heterozygote for SNP P1763 (TG, N=40) or P1320 (CT, N=41) also showed significant earlier AAO than those with homozygote ($P<0.0001$, $P<0.0001$, respectively). In addition, haplotype of all SNPs (SNPA-P1320-P1635-P1655-P1763) analysis showed significant association with AAO ($p=0.000953$).
Discussion: In conclusion, although we were unable to support an association between DTNBP1 and schizophrenia, DTNBP1 might play a role in disease modifying. However, considering the several limitations of this study, further research involving different polymorphisms in DTNBP1 and various clinical subsets with sufficient numbers will be required to evaluate the contribution of DTNBP1 to schizophrenia.

S186. KCNH2 POLYMORPHISM ASSOCIATED TO ALTERED EEG FUNCTIONAL NETWORK MODULATION IN SCHIZOPHRENIA

Alba Lubeiro Juárez*[,1], Vicente Molina Rodriguez[1], Maria Guardiola[2], Javier Gómez Pilar[1], Mar Fatjó-Vilas[3]
[1]University of Valladolid; [2]FIDMAG Sisters Hospitallers Research Foundation; [3]University of Barcelona, Biomedicine Institute of the University of Barcelona (IBUB), Centre for Biomedical Research Network on Mental Health (CIBERSAM)

Background: The rs3800779 polymorphism at KCNH2 gene, which encodes for a Voltage-Gated Potassium Channel Subunit, has been associated with the risk for schizophrenia (SZ) and with changes in the expression of a brain isoform with specific electrophysiological characteristics (Huffaker et al., 2009). It has been hypothesized that the KCNH2 gene variability could be involved in SZ by means of modulating the neuronal excitability. Graph-theory parameters applied to electroencephalographic (EEG) activity are useful to assess functional connectivity in the brain and have shown altered patterns of global connectivity in schizophrenia. We aimed to investigate whether KCNH2 contributes to functional connectivity alterations replicated in SZ patients.
Methods: EEG data were acquired during the performance of an odd-ball task in 50 schizophrenia patients and 101 matched healthy controls. The rs3800779 at KCNH2 was genotyped. From the EEG activity, the Small World index (SW, a measure of network efficiency) was calculated as the coefficient between clustering coefficient (CLC, a measure of network segregation) and path length (PL, a measure of network integration). SW was calculated in two temporal windows with respect to the target tone (pre-stimulus and response). Functional SW modulation (SWm) was calculated as the difference in SW between pre-stimulus and response windows. Finally, the association between KCNH2 polymorphism and functional connectivity modulation was assessed.
Results: Patients carrying the A allele (AA or AC, n=25) showed smaller SW modulation in comparison with patients with the CC genotype (n=25) ($t=-2.84$, $df=48$, $p=0.007$). Moreover, patients carrying the A allele showed smaller SW modulation than healthy controls with the A allele (n=45) ($t=-3.41$, $df=68$, $p=0.001$) or without the A allele (n=56) ($t=-3.87$, $df=79$ $p<0.001$). There were no significant SW modulation differences between healthy controls carrying or not the A allele. Patients with the AA/AC genotype showed an inverse SW modulation pattern (decreased SW at response) in comparison with patients without the A allele and controls (increased SW at response).
Discussion: Our data indicate that, within SZ patients, the A allele is associated with smaller SW modulation and lower SW values at response, which might be interpreted as an altered ability to coordinate the activity