Neuropsychiatric Disorders Diagnoses using Magnetic Resonance Imaging

Technology #2855

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Neuropsychiatric Disorders Limited by Late Stage Diagnosis and Poor Sensitivity and Specificity Over 25 percent of Americans suffer from diagnosable neuropsychiatric disorders. Unfortunately, diagnosis is based on qualitative judgment of a patient’s clinical symptoms that typically only present themselves in late stages of disorders. This frequently leads to misdiagnosis and misclassification of patients, especially those with comorbidity or other underlying conditions with similar symptoms. More often than not, mistrust of doctors and stigma against disorders causes only patients with severe or late stage conditions to seek out a physician. Although some biomarkers have been developed for detection of a few neuropsychiatric disorders, they are limited to late stages and have poor sensitivity and specificity. Thus, there is great need for an objective measure of neuropsychiatric condition that, like a test for blood cholesterol, would be a reliable aid to diagnosis and personalized treatment planning.

Magnetic Resonance Imaging (MRI) Aids in Accurate Diagnosis of Neuropsychiatric Disorders This invention opens the door to highly accurate diagnosis of many neuropsychiatric disorders, as well as comorbidity, based solely on measuring physiology and pathology of the brain using images obtained by magnetic resonance imaging (MRI). Changes in size and structure of brain regions, such as the amygdala and hippocampus, have long been known to be involved in neuropsychiatric disorders. This invention takes into account the spatial pattern of subtle variations in morphology simultaneously across the entire surface of many brain regions. By creating a library of the underlying morphological patterns for each neurological disorder, a patient is diagnosed by matching its individual pattern with those in the library. The matching of the pattern not only determines the disorder(s) a patient has, but also the brain regions and brain networks implicated in the disorder(s).

Applications: • Patient care - test results can be provided to patients, demonstrating severity of their disorder • Clinical decision support - assist clinicians in patient diagnosis by providing a second opinion • Clinical trials - confirmed diagnosis can be used as inclusion criteria for therapeutic trials • Early diagnosis - standard test when neurological problems are suspected • Assess disease progression and treatment response - monitor changes in brain morphology • Academic and pharmaceutical research - validation and quantitative assessment of results from animal models or human studies

Advantages: • Extremely high accuracy of diagnosis (>95%) for many neurological disorders, including Tourette Syndrome, Bipolar Disorder, Schizophrenia, and Attention Deficit/Hyperactivity Disorder. • Early diagnosis and detection of comorbidity • Provides comprehensive assessment of the brain regions and brain networks involved in a disorder

Patent Status: Patent Pending

Licensing Status: Available for Licensing or Sponsored Research Support
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