Clinical Aims of Psychoradiology

In the past 2 decades, radiological imaging techniques have rapidly evolved to become powerful tools in studying the human brain in both healthy and diseased conditions. For psychiatry, this is particularly true with the advances of MR imaging, where the development of the multi-modal MR imaging has allowed quantification of brain tissue at the structural, functional, and molecular levels. While early experience using brain scans in psychiatry with traditional visual image inspection failed to establish meaningful benefit to patient care, improved and novel image acquisition strategies and semi-automated quantitative image analysis approaches have established the clinical relevance of brain imaging studies of psychiatric patients. Using these advances, the field of Psychoradiology has developed to utilize neuroimaging approaches to advance differential diagnosis and individualized patient care for common psychiatric illnesses. Given the high prevalence of psychiatric disorders and the potential impact on workflow and training programs in Radiology of this evolving field, the aim of this series of articles will be to summarize these developments, describe future challenges, and spur involvement of radiologists in optimally advancing this fast-evolving field.

Using high-field MR imaging (ie, 3.0 Tesla MR), the structural and functional correlates of a number of psychiatric disorders have been identified. Taking advantage of new approaches and techniques for the acquisition and analysis of the imaging data, numerous clinical studies have revealed imaging biomarkers for mental disorders and clarified their pathologic mechanisms. Other studies have identified MR imaging biomarkers associated with risk for developing mental disorders prior to their emergence, which is important for illness prevention strategies. The results support the current focus on the biological investigation of mental disorders advocated by the US National Institute of Mental Health’s Research Domain Criteria initiative and provide the basis for a major step toward the translational use of psychiatric imaging for diagnosis, prediction of treatment response, and monitoring therapeutic interventions.

In this issue, we invited internationally renowned experts in the emerging field of psychoradiology, including individuals who developed the imaging data acquisition and sophisticated analytical methods, to review and discuss the state of their fields as pertains to radiological applications for psychiatry. This issue will also contain selected clinical applications of psychoradiology for the major neuropsychiatric illnesses. In the first section of contributions, following an overview of the field of psychoradiology, the major psychiatric imaging methods will be reviewed, including resting state functional MRI imaging and MR spectroscopy. Then, state-of-the-art image analysis protocols for psychiatry are reviewed. This will cover structural and functional brain imaging analysis, and the connectome analysis for psychiatric illnesses. The second section will discuss the most general issues related to subtyping heterogeneous psychiatric syndromes, monitoring and predicting treatment...
response using imaging biomarkers. Finally, in the third section, the applications of psychiatric imaging to common psychiatric disorders, including schizophrenia, major depression, bipolar disorder, autism spectrum disorder, and attention deficit hyperactivity disorder, will be reviewed to provide an up-to-date review of clinically useful developments relevant to each of these disorders.

We hope the proposed issue brings greater awareness of the emerging and promising field of psychoradiology. In contrast to other traditional radiology subspecialties, psychoradiological techniques (ie, clinical psychiatric imaging) involve the use of both qualitative and quantitative “radiological signs” (ie, imaging biomarkers) of mental disorders. These could be utilized in a clinical context similar to the current methods that neuroradiologists use to manage neurologic diseases. In particular, the development of fast multimodal imaging facilities, standardization of imaging data acquisition and quality control, and the efficient and increasingly semi-automated computational models for image analysis will expedite the translation of psychoradiological discoveries into patient care. And, hopefully it will inspire some of the best young minds in our field to contribute to progress in this field.

Qiyong Gong, MD, PhD
Clinical Professor of Radiology
Director of Huaxi MR Research Center (HMRRC)
Section of Neuroradiology
Department of Radiology
West China Hospital of Sichuan University
Chengdu, Sichuan Province, China

President
Shenjing Hospital of China Medical University
Shenyang, Liaoning Province, China

Associate Editor
American Journal of Psychiatry

E-mail address:
qiyonggong@hmrrc.org.cn