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# Resting state functional magnetic resonance imaging: Basic principles and challenges in clinical applications

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**Abstract**

Resting state functional magnetic resonance imaging (rs-fMRI) has emerged as a novel tool to supplement task-based fMRI in evaluation of brain function. Spontaneous low frequency fluctuations in regional cerebral blood flow have been demonstrated with BOLD imaging; these spatially distinct however temporally synchronous fluctuations constitute "functionally related" brain areas, whose regions form intrinsic brain networks. Although a universal set of intrinsic networks has not been agreed upon, several major networks have been investigated in detail such as the default mode network.

Disruptions of brain networks have been demonstrated in various diseases, and several clinical rs-fMRI applications can be demonstrated. Rs-fMRI may serve as an adjunct tool for clinical or preclinical diagnosis. Rs-fMRI may also allow for better subsegmentation of heterogenous diseases or to identify patients in whom pharmacological intervention may or may not be successful based on intrinsic connectivity prior to treatment. Rrs-fMRI may also be used as a potential biomarker for outcome.. An especially important use of rs-fMRI, that of presurgical mapping, is emerging. In this setting, rs-fMRI has several benefits over task-fMRI, including being potentially applicable in situations where the patient is not able to undergo task-fMRI or when the accuracy of the results may be questionable due to issues related to effort or task understanding, for example in severely debilitated patients or in the pediatric population. Due to large intersubject variation, whether rs-fMRI can replace task-fMRI is to be determined, but at the very least it may serve as a supplementary tool in select situations.

**Biography**

Following subspecialty Neuroradiology training at Massachusetts General Hospital, Sair joined the faculty of Johns Hopkins Radiology in 2010. In addition to involvement in clinical fMRI for presurgical mapping, Sair leads the resting state fMRI effort at JHU and in addition to numerous research collaborations exploring alterations in brain functional connectivity in topics such as traumatic brain injury and neurodegeneration, Sair is working to apply resting state fMRI at the single subject level for clinical use.