INTRODUCTION

Multiple sclerosis (MS) is an inflammatory disease of the central nervous system (CNS) characterized by demyelination and axonal loss for which the exact immunopathogenic mechanisms underlying disease initiation and progression are unknown. In the last two decades, magnetic resonance imaging (MRI) has become the most important laboratory diagnostic and monitoring tool in MS . ***(Miller and Leary., 2007)***.

As new uses for conventional MRI are developed and non-conventional MRI methods continue to advance, we are gaining insight into the full extent of tissue damage in patients with MS. However, there is a need to refine the techniques and clinically validate the available tools so that they can be properly applied ***(Bakshi et al., 2008)***.

The sensitivity of T2-weighted images (T2-WI) in detection of MS lesions, together with the ability of gadolinium (Gd)-enhanced T1-WI to reflect increased blood–brain barrier (BBB) permeability associated with active inflammatory activity, allows the demonstration of spatial and temporal dissemination of MS lesions earlier than possible from clinical assessments. Therefore, in the last decade, metrics derived from conventional MRI have been widely employed in therapeutic clinical trials **.**

(Neema et al., 2007).

However, although conventional MRI has substantially contributed to the diagnosis and prognosis of MS, the sensitivity and specificity of conventional MRI is limited ***(Filippi et al., 2003).***

For example, hyperintense lesions on T2-WI are not sensitive to disease affecting normal-appearing gray and white matter .Hyperintensity on T2 WI of MS lesions is related primarily to increased water content and thus cannot distinguish inflammation, edema, demyelination, Wallerian degeneration and axonal loss ***(McFarland et al., 2001).***

Although the presence of Gd-enhancing lesions on T1-WI indicates disruption of the BBB, it does not provide sufficient information about the extent and severity of the inflammatory phase, the constitution of its cellular components or resultant tissue damage ***(Filippi et al., 2003).***

In the past few years, a host of nonconventional MRI techniques, which are able to monitor disease evolution, have been introduced for the assessment of MS. Magnetization transfer imaging (MTI), diffusion-weighted imaging (DWI), proton MR spectroscopy (MRS), Fiber Tractography Using Diffusion Tensor-MRI Data and others are emerging as promising tools for improving our understanding of the pathophysiology of MS ***(Johnson et al., 2004 and Zivadinov et al.,2005).***