

BRAIN MAGNETIC RESONANCE SPECTROSCOPY IN MIGRAINE

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Migraine is a common neurological disorder that is characterized by episodes of moderate to severe headache. Magnetic resonance spectroscopy (MRS) is a noninvasive method that enables *in vivo* studying of tissue metabolism by utilizing the magnetic properties of certain atomic nuclei, mainly hydrogen (¹H) and phosphorous (³¹P).

¹H-MRS is most commonly used to measure the concentration of gamma aminobutyric acid (GABA), glutamate, phosphocreatine (PCr), creatine, choline, N-acetylaspartate (NAA), myo-inositol, aspartate and lactate.

³¹P-MRS enables noninvasive *in vivo* measuring of concentration of compounds containing phosphorus nuclei. This allows the measurement of metabolites involved in brain energy metabolism including concentrations of phosphocreatine (PCr), inorganic phosphate, creatine, adenosine diphosphate (ADP) and adenosine triphosphate (ATP).

¹H-MRS studies reported significant differences in levels of GABA, glutamate, lactate and NAA between migraine patients and controls, measured in various brain regions, while most of the studies found no significant differences in levels of myo-inositol, choline and total creatine.

The main consistent findings using ³¹P-MRS are concomitantly decreased PCr and increased inorganic phosphate, that is, a decreased PCr/inorganic phosphate ratio, as well as decreased magnesium measured in cortical regions of migraine patients.

For identifying a biomarker in migraine it is necessary for future MRS studies to obtain additional information of the ictal state in migraine as well as before and after interventions. Severity of the disease (disease duration and migraine attack frequency) has to be taken into account to detect possible correlation with MRS findings which also needs further research.

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