# Streszczenie w języku angielskim

**The use of new imaging techniques** in **patients with CNS inflammatory diseases**

Due to the multiform course, inflammatory CNS diseases are often a difficult diagnostic and clinical problem. Many of these diseases are characterized by severe course, which is often associated with long term neurological sequelae. The pathomechanisms of many neuroinfections are not fully understood, which makes research in this area particularly justified for scientific and practical reasons. Diffusion weighted imaging (DWI), MR spectroscopy (MRS) and perfusion studies (PWI) are unique MR techniques that provide complex data concerning the assessment of the degree of CNS damage during and after the inflammatory process.

The objectives of the research were:

* 1. Evaluation of cerebral perfusion in patients with tick-borne encephalitis based on MR perfusion studies.
	2. Determination of the long-term effects of CNS damage in patients after herpetic encephalitis based on MR studies with evaluation of metabolic consequences in MR spectroscopy.

***A group of patients with tick-borne encephalitis***

The examined group consisted of 12 patients with tick-borne encephalitis (TBE) in average age of 48.0±9.5 years in the acute phase of TBE, 8 patients with meningitis only, and 4 patients with encephalomeningitis. In the study group, MR was performed 3-5 days after the diagnosis of TBE using a 3.0T (Titan, Toshiba Medical, Japan) scanner. MR examination included routine image sequences and perfusion DSC examination.

In the perfusion study, parametric maps were evaluated: cerebral blood volume (CBV), cerebral blood flow (CBF), time to peak (TTP) and mean transit time (MTT) were obtained with the Olea Sphere software (Medical SAS, France). In both cerebral hemispheres, in the frontal, parietal, temporal and bilateral flanges, 8 symmetrical ROIs of 50-100 mm2 were placed in the morphologically unchanged cortico-subcortical region and gray matter.

Three patients (25%) showed non-specific, hyperintensive in T2-weighted images, single (from 1 to 5) lesions up to 5 mm in subcortical or periventricular white matter
in routine MR sequences. None of the patients had focal lesions with contrast enhancement
or with restriction of diffusion in DWI images. In the group of patients with TBE, a small, statistically insignificant (p> 0.05) increase in CBF and CBV values in the frontal and parietal region was observed. In all subcortical areas, TTP elongation was found, while MTT values were comparable to those in the control group. In the study group there was a statistically significant increase in CBF (p <0.001) and CBV (p <0.05) in the thalami. A slight decrease
in MTT (p> 0.05) and an increase in TTP (p <0.001) were also observed in this area. Patients with encephalitis had slightly higher CBF values in the thalami than patients with meningitis (p> 0.05). There were no statistically significant correlations between the results
of serological tests and perfusion rates.

**Conclusions**

* 1. In patients in the acute phase of TBE there is an increase in cerebral flow in various areas of the brain, the most severe in the thalami.
	2. DSC MR perfusion imaging provides important information on the pathomechanisms and the nature of changes in the course of TBE.

***A group of patients with herpes encephalitis***

The study group consisted of 8 patients with a mean age of 53.4±6.5 years with herpes simplex encephalitis (HSE). In this group, MR studies in the acute phase of the disease were analyzed (3-5 days after the onset of symptoms), after one month of aciclovir treatment and 9 months, 1 year, and 3 years after symptoms onset (±1 month).

MR examinations were performed using 1.5T and 3.0T scanners (Picker International Inc., Highlands Hts, OH, USA and Toshiba, Toshiba Medical System Corporation, Japan). Imaging studies were assessed using routine sequences, DWI examination and MR spectroscopy with single voxel method. Voxels with dimensions 2x2x2 cm were placed
in both temporal lobes.

Typical for HSE bilateral, hyperintensive in T2-weighted lesions occurred in 6/8 patients, unilateral in 2/8. One of the patients had a hiperintensive focus in T2-dependent images in the thalamus, while in 2 patients, the cortical hiperintensity in T1-weighted images was found. Leptomeningeal and cortical gyral enhancement was observed in 6/8 patients,
in 2/8 the contrast enhancement was absent. In the acute phase, in 3 patients, a restriction
of diffusion in DWI was observed, in follow-up examinations after a month the signal in DWI was slightly elevated and became hipointensive in subsequent studies. In subsequent follow-up studies after 9 months, 1 and 3 years, progressive cystical encephalalisation was found with the loss of volume of occupied structures connected to the gliosis zone. In the MR spectroscopy, in the acute phase, the NAA/Cr reduction, the slight Cho/Cr growth and the presence of lactate and lactide bands were found. The MRS control showed partial normalization of NAA level and an increase in myoinositol (mI) level.

**Conclusions**

1. Changes in the follow-up MR studies indicate that the HSE virus is a serious factor damaging CNS, and the elimination of the effects of inflammatory changes and the formation of glial scars is distant in time.
2. Ischemic mechanisms play an important role in the course of HSE.

MR spectroscopy and DWI are useful techniques in the diagnosis and monitoring
of HSE and can be used to assess the activity of the inflammatory process.