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MAGNETIC RESONANCE IMAGING FEATURES IN MIGRAINE-ASSOCIATED ISCHEMIC STROKE: STRUCTURAL AND TOPOGRAPHICAL PATTERNS

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Abstract: Magnetic resonance imaging (MRI) is the most sensitive and informative method for detecting structural brain abnormalities in ischemic stroke. In migraine-associated ischemic stroke, MRI plays a crucial role not only in confirming the diagnosis but also in identifying early and chronic cerebrovascular changes. The relationship between migraine, particularly migraine with aura, and ischemic brain lesions remains an area of active research. Identification of specific MRI patterns is essential for improving diagnostic accuracy, understanding disease mechanisms, and developing effective prevention strategies.

Objective. The aim of this study was to analyze MRI findings in patients with migraine-associated ischemic stroke and to identify the most characteristic structural and topographical brain changes.

Materials and methods. A total of 110 patients aged 19-45 years were included in the study. The main group consisted of 65 patients with migraine-associated ischemic stroke, while the comparison group included 45 patients with migraine with aura. A control group of 30 healthy individuals was also examined.

All patients underwent brain MRI using standard protocols. The evaluation included assessment of the presence, number, size, and localization of ischemic lesions, as well as analysis of perivascular spaces, subarachnoid spaces, ventricular size, and white matter integrity. Statistical analysis was performed using descriptive statistics and chi-square tests.

Results and discussion. MRI findings demonstrated a high prevalence of structural brain abnormalities in patients with migraine-associated ischemic stroke. The most frequent changes included focal lesions in the white matter (78.5%), indicating significant microvascular damage. Enlargement of perivascular spaces was observed in 83.1% of cases, reflecting chronic cerebrovascular remodeling.

Multiple ischemic lesions (three or more) were identified in 46.2% of patients, suggesting a recurrent or progressive ischemic process. Lesions were predominantly localized in subcortical regions of the frontal and parietal lobes (40.0%), as well as in the medial regions of the parietal and occipital lobes (38.5%), which are particularly vulnerable to hypoperfusion.

Additional findings included enlargement of subarachnoid spaces (44.6%) and ventricular dilation (23.1%), indicating chronic cerebrovascular insufficiency. Analysis of lesion distribution showed that larger ischemic lesions (>1 cm) were more frequently located in the carotid circulation, particularly in the middle cerebral artery territory.

Statistically significant differences were observed for small ischemic lesions in the vertebrobasilar system ($p = 0.007$), indicating regional особенностей поражения cerebral circulation. Furthermore, the presence of leukoaraiosis and signs of normotensive hydrocephalus supports the role of chronic microangiopathic processes in disease progression.

These findings suggest that repeated migraine attacks, accompanied by vasospasm and endothelial dysfunction, may lead to cumulative structural damage to brain tissue.

MRI allows visualization of both acute ischemic lesions and chronic changes, providing a comprehensive understanding of the disease process.

Conclusions. The study demonstrates that migraine-associated ischemic stroke is characterized by pronounced structural brain changes, including white matter lesions, enlargement of perivascular spaces, and multiple ischemic foci, reflecting both acute and chronic vascular processes. MRI is a key diagnostic tool that enables not only confirmation of the diagnosis but also identification of early markers of cerebrovascular remodeling and disease progression. Its use in clinical practice improves risk stratification, prognosis, and the effectiveness of management strategies in patients with migraine-associated ischemic stroke.