PERSONALIZATION OF TREATMENT AND PREVENTION TACTICS IN THE EARLY STAGES OF AVASCULAR NECROSIS OF THE HIP BONE BASED ON CLINICAL AND GENETIC PROFILING

Saidov Maksud Arifovich, Roshan Asvar Asadollakh, Khasanboev Sultonbek Kholikjon ogli
National Medical Center, Tashkent, Republic of Uzbekistan
e-mail: rixiatm.opg7@gmail.com

Introduction. Avascular necrosis of the femoral head (ANFH) is a progressive degenerative-dystrophic disease that leads to persistent pain, limited mobility, and a significant decrease in the quality of life in patients of working age. The traditional assessment of patients' condition, which is based primarily on the radiological characteristics of the disease stage, does not always allow for predicting the rate of progression and the individual response to conservative therapy. Therefore, the integration of molecular genetic parameters into the algorithms for selecting treatment and rehabilitation strategies is of particular interest. One of the promising areas is the study of PPARγ gene polymorphism, which is associated with lipid metabolism, osteogenesis, and bone remodeling, and may have a direct impact on the course of ANFH and the effectiveness of early pathogenetic intervention.

The purpose of the study. To evaluate the effectiveness of a personalized approach to the treatment and prevention of the progression of early stages of ANFH, taking into account the polymorphism of the PPARγ gene (Pro12Ala), compared to standard treatment tactics.

Materials and methods. A comparative clinical study was conducted, including patients with ANFH stages I–II. The main group consisted of 86 patients, in whom the medical and rehabilitation program was formed taking into account the PPARγ genotype and included a combination of PRP-therapy with systemic use of alendronate. The comparison group included 128 patients who received traditional treatment without taking into account their molecular and genetic characteristics. In both groups, the severity of pain was assessed using a visual analog scale, the functional state of the hip joint was evaluated using the Harris Hip Score, and the dynamics of laboratory and metabolic parameters were monitored. A comparative analysis was performed 6 and 12 months after the start of treatment.

Results. It was found that the use of personalized tactics was accompanied by a more pronounced clinical and functional improvement compared to the standard approach. After 12 months, the main group showed a significant decrease in pain intensity: the

Visual analogue scale score was 1.5±0.2, compared to 2.5±0.2 in the comparison group. At the same time, a more significant restoration of hip joint function was recorded: the Harris Hip Score reached 86.2±1.2 points against 79.2±1.4 points, respectively. Of particular importance was the more favorable morphological dynamics: the frequency of disease progression in the main group was 14.0%, whereas with standard tactics this indicator reached 36.7%. Complete morphological regression of focal changes was achieved in 37.2% of patients with personalized management and only in 17.2% of patients in the comparison group.

The analysis also showed the prognostic significance of the genetic factor. The Ala/Ala genotype was associated with the most unfavorable course of the disease, a higher probability of structural progression, and less resistance to standard therapy. This allows us to consider PPARγ genotyping not only as an additional research tool, but also as a practically significant element of risk stratification in patients with early stages of ANFH.

Along with the clinical and functional results, the main group showed more favorable changes in the metabolic profile. The frequency of dyslipidemia was 26.7% versus 48.4% in the comparison group, insulin resistance was 22.1% versus 44.5%, and metabolic syndrome was 11.6% versus 29.7%. In addition, patients who received personalized treatment were less likely to have osteopenia, osteoporosis, and signs of bone marrow fatty degeneration. These data indicate that an individualized approach affects not only the local course of the pathological process in the femoral head, but also the systemic metabolic mechanisms that determine the effectiveness of rehabilitation and the sustainability of the clinical outcome.

Discussion. The obtained results confirm that the early stages of ANFH require not only timely diagnosis, but also a differentiated selection of medical and preventive measures. Taking into account genetic polymorphism allows us to identify patients with a high risk of progression, determine in advance the need for more active pathogenetic correction, and thereby increase the targeting of conservative therapy. It is especially important that this strategy not only temporarily reduces symptoms, but also stabilizes the process in a more stable functional and structural manner, which is crucial for delaying organ-preserving and even more so, endoprosthetic interventions.

Conclusions. A personalized approach to the treatment and rehabilitation of patients with stage I-II ANFH, based on the consideration of PPARγ (Pro12Ala) polymorphism and the use of combined therapy, provides a more pronounced reduction in pain syndrome, improvement in functional status, a decrease in the frequency of morphological progression, and a favorable correction of concomitant metabolic disorders. The inclusion of clinical and genetic profiling in the practical algorithm for

managing patients with early stages of ANFH appears to be a promising direction for improving the effectiveness of treatment and preventing further destruction of the hip joint.