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СЕКЦІЯ XV. МЕДИЧНІ НАУКИ ТА ГРОМАДСЬКЕ ЗДОРОВ'Я

OBESITY AS A CONTRIBUTING FACTOR TO EARLY POSTOPERATIVE PAIN FOLLOWING ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Andrii V. Drokin

ORCID ID: 0009-0009-0553-3942

PhD student of the Department of Emergency and Urgent Medical Care, Orthopedics,
Traumatology and Prosthetics
Kharkiv National Medical University, Ukraine

Scientific supervisor: Mykola I. Berezka

Doctor of Medical Sciences, Professor

Professor in the Department of Emergency and Urgent Medical Care, Orthopedics,
Traumatology, and Prosthetics
Kharkiv National Medical University, Ukraine

The anterior cruciate ligament (ACL) is one of the principal stabilizers of the knee joint, as it controls anterior tibial translation, limits pathological rotation, and contributes to the maintenance of frontal plane stability of the knee. Injury to the ACL is associated not only with a loss of mechanical stability, but also with alterations in neuromuscular control, movement biomechanics, and overall joint function, thereby creating the conditions for subsequent degenerative changes [1–3].

Particular interest should be given to isolated ACL injuries, in which there is no concomitant damage to the menisci or other ligamentous structures. This injury model allows for a clearer assessment of the clinical manifestations of knee instability and facilitates analysis of the factors that may influence treatment outcomes, particularly after reconstructive procedures [4].

ACL injuries are among the most common knee joint injuries, and their prevalence has shown an upward trend in recent years. According to current epidemiological data, the incidence of such injuries in the general population ranges from 29 to 78 cases per 100,000 person-years, whereas among

individuals with a high level of physical activity these rates are even higher [5]. Accordingly, the demand for reconstructive surgical procedures has also increased, and these interventions now rank among the most commonly performed arthroscopic procedures in clinical orthopedics [6].

One of the factors that may substantially affect both the risk of ACL injury and the course of the postoperative period is obesity. Excess body weight alters the distribution of mechanical load across the knee joint, contributes to overloading of its stabilizing structures, and is associated with a less favorable recovery after surgical treatment [7]. From a clinical perspective, this is particularly important in the early postoperative period, when pain severity directly affects patient mobilization, tolerance of rehabilitation measures, and the pace of recovery.

Obesity, commonly defined as a body mass index (BMI) of $\geq 30 \text{ kg/m}^2$, has become a global medical problem over recent decades [8]. Its adverse effects on the musculoskeletal system are explained not only by excessive biomechanical loading, but also by altered movement patterns, impaired proprioceptive control, muscle imbalance, and metabolic changes [9]. In patients with obesity undergoing ACL reconstruction, longer operative time, a higher risk of early postoperative complications, and less favorable long-term outcomes, including progression of osteoarthritis, have been reported [10–12].

Current concepts view obesity not merely as an anthropometric characteristic, but as a complex mechanical and metabolic factor capable of influencing the clinical course of ACL injury, the features of its surgical treatment, and recovery outcomes. For this reason, patients with elevated BMI require more careful preoperative assessment, individualized postoperative management, and separate analysis of factors associated with pain syndrome in the early period after arthroscopic reconstruction [13–15].

Against this background, identifying factors associated with more severe pain syndrome in the early postoperative period in patients with isolated ACL injury and obesity is of important practical significance. Such an approach may improve prediction of postoperative recovery, facilitate individualization of surgical strategy and rehabilitation programs, and reduce the likelihood of further complications.

A prospective single-center comparative study was conducted. The primary outcome measure was postoperative pain intensity assessed using the visual analog scale (VAS) in patients with isolated ACL injury and obesity (BMI $\geq 30 \text{ kg/m}^2$). The use of the VAS enabled standardized and quantitative assessment of pain severity after arthroscopic reconstruction of the knee joint.

Between 2022 and 2024, 90 patients aged 19–67 years with isolated ACL injury of the knee joint were examined while receiving treatment in the trauma department of the Municipal Non-Profit Enterprise of the Kharkiv Regional Council “Regional Clinical Hospital.” Depending on the presence of obesity, two clinical groups were formed: the main group, comprising 38 patients with obesity, and the control group, comprising 52 patients without obesity.

To determine the influence of medical history, clinical, and laboratory factors on pain severity during the second month after arthroscopic ACL reconstruction, univariate and multivariate regression analyses were performed. Based on the obtained coefficients, the corresponding regression models were constructed.

According to the results obtained, at 2 months after ACL reconstruction, obesity and baseline preoperative pain remained the leading predictors of pain intensity according to the VAS. In the main models, obesity was associated with a higher level of postoperative pain ($\beta=0.317$ – 0.351 ; $p=0.002$ – 0.005), while the preoperative VAS score retained an independent prognostic effect ($\beta=0.232$ – 0.259 ; $p \leq 0.002$). In the final multivariate model ($R^2=0.459$), obesity ($\beta=0.333$; $p=0.004$) and pre-arthroscopy VAS score ($\beta=0.218$; $p=0.002$) remained statistically significant; at the same time, anticoagulant use ($\beta=-0.265$; $p=0.086$), triglyceride level ($\beta=0.118$; $p=0.058$), leukocyte count ($\beta=-0.050$; $p=0.055$), eosinophil count ($\beta=-0.060$; $p=0.082$), and basophil count ($\beta=-0.338$; $p=0.115$) showed only a trend toward an association with pain severity.

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