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# Computerized posturography in evaluation of proprioceptive-oriented rehabilitation after anterior cruciate ligament reconstruction

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Knee joint injuries are among the most common injuries of the musculoskeletal system, with anterior cruciate ligament (ACL) ruptures representing the second most common knee pathology after meniscus tears. These injuries not only compromise knee stability but also predispose patients to chronic instability, secondary meniscal damage, and early development of osteoarthritis. The restoration of proprioception plays a critical role in regaining functional stability following ACL reconstruction.

**Aim.** The aim of this study is to assess biomechanical parameters of the knee joint function after ACL reconstruction using stabilometric assessment and to study the effectiveness of a rehabilitation program that includes balance and proprioception training.

**Materials and methods.** The study was conducted at Zaporizhzhia State Medical and Pharmaceutical University between September 2024 and April 2025. A total of 42 patients who underwent arthroscopic ACL autograft reconstruction were enrolled. All patients underwent MRI diagnostics and participated in structured rehabilitation. The main group received an enhanced program with targeted proprioceptive and balance exercises, while the control group followed the standard rehabilitation protocol. Computerized stabilometric assessment was used to quantify weight distribution and postural stability.

**Results.** Patients in the main group demonstrated significantly improved postural control. Weight distribution was more balanced (52.8 % dominant vs. 47.2 % injured limb, $p < 0.05$) compared with the control group (59.3 % vs. 40.7 %, $p < 0.05$). The mean stabilometric support coefficient reached 0.89 in the main group versus 0.71 in control group, indicating better restoration of stability and proprioception, $p < 0.05$.

**Conclusions.** Computerized posturography enabled objective assessment of postural control after ACL reconstruction. Six month after surgery, patients who underwent rehabilitation with additional balance and proprioceptive training demonstrated significantly more symmetrical weight distribution and better stabilometric stability parameters compared to those who received standard rehabilitation.

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## Комп'ютеризована постурографія в оцінюванні пропріоцептивно-орієнтованої реабілітації після реконструкції передньої хрестоподібної зв'язки

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Травми колінного суглоба є одними з найпоширеніших пошкоджень опорно-рухового апарату, а розриви передньої хрестоподібної зв'язки (ПХЗ) є другою за поширеністю патологією колінного суглоба після розривів меніска. Ці травми не лише погіршують стабільність коліна, але й можуть спричиняти у пацієнтів хронічну нестабільність, вторинні пошкодження меніска та ранній розвиток остеоартриту. Відновлення пропріоцепції відіграє ключову роль у відновленні функціональної стабільності після реконструкції ПХЗ.

**Мета роботи** – оцінити біомеханічні параметри функції коліна після реконструкції ПХЗ за допомогою стабілометричного оцінювання та вивчити ефективність програми реабілітації, що включає тренування балансу та пропріоцепції.

**Матеріали і методи.** Дослідження здійснили в Запорізькому державному медико-фармацевтичному університеті з вересня 2024 до квітня 2025 року. Обстежили 42 пацієнтів, яким виконано артроскопічну аутопластику ПХЗ. Усі пацієнти пройшли діагностику МРТ, їм призначено реабілітаційні заходи. Пацієнти з основної групи виконували розширену програму з цільовими пропріоцептивними та балансовими вправами, а обстежені з контрольної групи дотримувалися стандартного реабілітаційного протоколу. Для кількісного визначення розподілу ваги та стійкості постави виконано комп'ютеризоване стабілометричне оцінювання.

**Результати**. У пацієнтів з основної групи визначили істотне покращення постурального контролю. Розподіл ваги більш збалансований (52,8 % – домінантна кінцівка, 47,2 % – травмована, $p < 0,05$) порівняно з контрольною групою (59,3 % та 40,7 % відповідно, $p < 0,05$). Середній коефіцієнт стабілометричної підтримки досяг 0,89 у групі втручання, а в контрольній становив 0,71; це свідчить про краще відновлення стабільності та пропріоцепції, p < 0,05.

**Висновки.** Комп'ютеризована постурографія дала змогу об'єктивно оцінити постуральний контроль після реконструкції ПХЗ. Через 6 місяців після операції у пацієнтів, які пройшли реабілітацію з додатковим тренуванням рівноваги та пропріоцепції, визначено істотно симетричніший розподіл ваги та кращі стабілометричні параметри стабільності порівняно з тими, хто отримував стандартну реабілітацію.

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Anterior cruciate ligament (ACL) injuries remain among the most prevalent and functionally significant musculoskeletal injuries – particularly affecting young and physically active populations [1]. ACL ruptures are among the most serious traumatic events, as they impair limb load-bearing and gait, restrict patient mobility, and diminish social integration [2].

Chronic instability following ACL injury adversely affects joint function by precipitating sudden tibial subluxations. It is important to note that the ACL functions not only as a mechanical stabilizer of the knee but also plays a pivotal role in generating sensory input, thereby contributing to proprioception and protective neuromuscular reflexes [3]. These episodes compromise functional capacity and predispose patients to secondary meniscal tears, articular cartilage degeneration, and osteoarthritis. A review of literature indicates that in 44 % of cases, secondary ruptures arise from biomechanical asymmetry and disrupted afferent signaling in the affected limb [4].

Arthroscopic ACL reconstruction is widely accepted as the gold standard surgical intervention, offering restored mechanical stability and enabling return to physical activity. However, clinical assessments of knee function – including evaluation of standing posture and gait – are inherently subjective. Even after technically well-executed reconstructions, sensory function of the knee often remains diminished [5].

Modern rehabilitation protocols emphasize an early functional approach, progressive loading, neuromuscular control, and proprioceptive training. International guidelines (ESSKA, AOSSM, ISAKOS) recommend phased rehabilitation aimed at restoring range of motion, muscle strength, coordination, and psychological readiness to return to activity [6,7]. Nevertheless, significant variability persists regarding the optimal timing and content of these programs. In particular, the integration of balance and functional stability assessment, as well as individualized adjustment of physical therapy, remains insufficiently standardized across clinical practice worldwide.

Objective evaluation of lower limb function and the capacity to maintain upright posture following arthroscopic ACL reconstruction is afforded by biomechanical methods such as computerized posturography. Analysis of load distribution across the lower limbs enables individualized selection of optimal postoperative rehabilitation strategies, thereby accelerating recovery.

Despite rehabilitation protocols often extending from five months to one year, high complication rates persist, including those related to traumatic sequelae and post-injury knee disorders [8]. For instance, the development of knee osteoarthritis due to body imbalance under load increases in 13–42 % of cases [9]. Moreover, national expert studies have identified persistent static and dynamic balance deficits after ACL reconstruction; dynamic stability of the operated limb often fails to recover, and functional instability may persist for up to 10 months post-surgery [10].

Even when patients regain mobility and return to athletic activity, they remain vulnerable to secondary injuries during near-threshold loads. These observations underscore the need for novel methods and rehabilitation approaches that enhance sensorimotor control and joint stability.

## Aim

The aim of this study is to assess biomechanical parameters of the knee joint function after ACL reconstruction using stabilometric assessment and to study the effectiveness of a rehabilitation program that includes balance and proprioception training.

## Materials and methods

This prospective study was conducted at the Department of Traumatology and Orthopedics, Zaporizhzhia State Medical and Pharmaceutical University, in collaboration with the Department of Traumatology and Orthopedics of the Motor Sich Medical Center (Zaporizhzhia, Ukraine) between September 2024 and April 2025.

The study protocol was approved by the local Bioethics Committee of Zaporizhzhia State Medical and Pharmaceutical University (Protocol No. 8 of August 17, 2023) in accordance with ICH-GCP guidelines, the Declaration of Helsinki (2002), the Council of Europe Convention on Human Rights and Biomedicine (1977), and current legislation of Ukraine. During the preparation of this scientific article, the Bioethics Committee reviewed the materials presented therein and found no violations (Protocol No. 16 of December 25, 2025). All identified patients (n = 42) were informed about the objectives and conditions of the study and provided written informed consent for participation.

General information about groups of patients demonstrated in *Table 1*. All arthroscopic procedures were performed by a single surgeon with more than 20 years of experience in ACL reconstruction.

Inclusion criteria: age >18 years; documented ACL injury; undergoing ACL autograft reconstruction. Exclusion criteria: medical conditions contraindicating the prescribed physiotherapy and exercise program (acute cardiac or pulmonary pathology, systemic or localized infection at the site of intervention, circulatory disorders, systemic diseases such as rheumatoid arthritis, gout, systemic lupus erythematosus, etc.); advanced knee osteoarthritis (Kellgren–Lawrence grade III–IV); previous arthroscopic interventions on the knee joint; severe pain in the hip joints or lumbar spine; patient refusal to continue participation; recurrent ACL injury during follow-up.

**Table 1.** Baseline characteristics of the study and control groups (M ± SD)

| Parameter, units of measurement | Study group, n = 20 | Control group, n = 22 |
|---|---|---|
| Age, years | 30.05 ± 7.70 | 30.68 ± 8.28 |
| Sex (male / female) | 16/4 | 17/5 |
| Body Mass Index (BMI), kg/m² | 26.40 ± 2.89 | 26.98 ± 3.31 |
| Injured limb, n (%) | | |
| Right | 12 (60.0 %) | 10 (45.5 %) |
| Left | 8 (40.0 %) | 12 (54.5 %) |
| Meniscal injury, n (%) | | |
| Lateral meniscus | 5 (25.0 %) | 6 (27.3 %) |
| Medial meniscus | 13 (65.0 %) | 15 (68.2 %) |
| Both menisci | 2 (10.0 %) | 1 (4.5 %) |

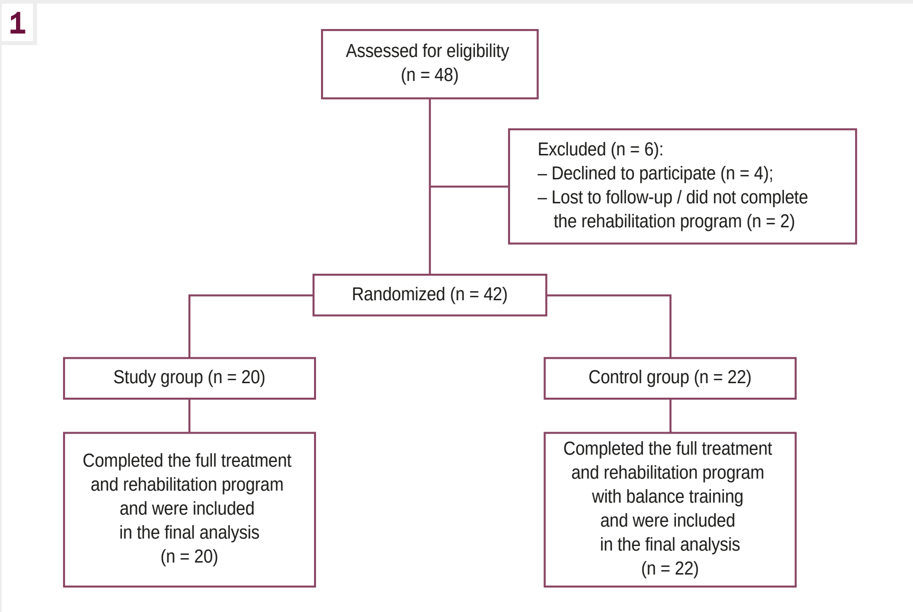


**Fig. 1.** Study design.

Depending on the applied physical rehabilitation strategy, all patients were allocated into two groups: a study group and a control group. In the study group (n = 20), patients underwent a standard postoperative physical rehabilitation program supplemented with a specifically designed balance- and proprioception-oriented training protocol developed by the authors. This program emphasized postural control, neuromuscular coordination, and sensorimotor integration of the operated limb. In the control group (n = 22), patients received a conventional physical rehabilitation program, which consisted of therapeutic exercises aimed primarily at restoring knee joint range of motion and increasing lower limb muscle strength, without targeted proprioceptive or balance training. Both rehabilitation programs were initiated in the early postoperative period and were conducted under the supervision of certified rehabilitation specialists. The overall study design and patient flow are illustrated in *Fig. 1*.

All patients underwent preoperative magnetic resonance imaging (MRI) of the knee joint at diagnostic centers in Zaporizhzhia, using scanners with a field strength ≥1.5 Tesla. In addition to the primary ACL tear, concomitant meniscal injuries were identified: medial meniscus tears in 66.67 %, lateral meniscus tears in 26.19 %, and combined injuries of both menisci in 7.14 %. Early signs of knee osteoarthritis were also detected, including grade I–II chondromalacia of the femoral, tibial, and patellar articular surfaces in 71.43 % of cases (30 patients).

Patients were hospitalized for 1–2 days. ACL reconstruction was performed using either hamstring tendon grafts (semitendinosus and gracilis tendons), bone-patellar tendon-bone grafts, or quadriceps tendon grafts. Concomitant procedures included partial meniscectomy; no meniscal repair was performed.

The study group received standard postoperative physiotherapy supplemented with a newly developed program of balance

**Table 2.** Comparison of rehabilitation programs in the study and control groups

| Rehabilitation component | Control group (standard rehabilitation) | Study group (standard + proprioceptive-oriented rehabilitation) |
|---|---|---|
| Start of rehabilitation | From postoperative day 1 | From postoperative day 1 |
| Early postoperative phase (1–7 days) | Pain and edema control; isometric exercises for thigh and calf muscles; straight leg raises in supine position; assisted knee flexion within pain-free range | Same as control group |
| Late postoperative phase (8 days – 4 weeks) | Gradual increase in knee range of motion; active-assisted knee flexion/extension; self-massage from day 8; supervised therapeutic exercises | Same as control group |
| Duration of supervised sessions | 45 minutes per session, 2–3 times per week | 60 minutes per session, 2–3 times per week |
| General strengthening exercises | Exercises aimed at restoring quadriceps and hamstring strength; closed and open kinetic chain exercises adapted to postoperative stage | Same as control group |
| Balance and proprioceptive training | Not included | Included as an additional 15-minute block during each session |
| Static balance training | Not performed | Single-leg stance exercises; controlled weight shifts; exercises with visual feedback modification (eyes open / closed) |
| Dynamic balance training | Not performed | Lunges, controlled step movements, forward / backward and lateral weight transfer tasks |
| Use of unstable surfaces | Not performed | Balance cushions, foam pads, fitball exercises (progressively introduced from weeks 5–8) |
| Sensorimotor stimulation | Limited to conventional movement tasks | Exercises with altered sensory input (unstable support, reduced visual control) |
| External resistance under balance conditions | Conventional resistance exercises only | Elastic bands and body-weight resistance combined with balance tasks (introduced from weeks 10–24) |
| Progression strategy | Based on pain reduction and range of motion recovery | Based on progressive increase in postural complexity, instability, and neuromuscular control |
| Targeted rehabilitation phases | Mainly early postoperative and functional recovery | Functional (5–10 weeks) and training – recovery phases (11–24 weeks) |
| Primary rehabilitation focus | Restoration of muscle strength and knee range of motion | Restoration of postural control, balance, and proprioceptive function in addition to strength and mobility |

and proprioceptive training exercises. The control group followed a standard rehabilitation protocol focused on strengthening lower limb muscles and restoring knee range of motion.

Patient interviews were conducted throughout the study period, beginning with admission, to determine the circumstances of injury, functional limitations, and surgical aspects of ACL reconstruction.

All patients underwent stabilometric assessment (posturography) both preoperatively and at six months postoperatively. Importantly, no external knee fixation (orthoses) was used during testing.

Balance and proprioceptive function were assessed using computerized posturography on a stabilometric platform ("Bazometr", KE 03191680.010-2005, Ukrainian Research Institute of Prosthetics, Kharkiv). Parameters included weight distribution between limbs, support coefficient, center of pressure (CoP) displacement, and CoP rotation angle.

The method is non-invasive, requires no special preparation, and provides sensitive diagnostic and prognostic indicators. Postural control is typically modeled as an inverted pendulum rotating around the ankle joints. However, since the human body is a multi-segmental system, changes in joint torques influence movements across the entire kinetic chain.

Measurements were performed in a dedicated room under physician supervision. Patients stood barefoot on the force platform in the "American position" (feet parallel, eyes open). This stance ensures parallel alignment of the subtalar joint axes with the sagittal plane.

The software recorded, in real time, the following parameters of bipedal stance: distribution of body weight between limbs (% of total body mass); support coefficient (ratio of loading between the injured and contralateral limb); displacement of the CoP in the frontal and sagittal planes (mm); rotational deviation of the limb-specific CoP relative to the global CoP (degrees).

In healthy individuals, body weight is distributed nearly evenly between both limbs, with a slight predominance toward

**Table 3.** Distribution of mean posturographic parameters in patients of the study group with ACL injury

| Study group | Limb loading distribution, % | | Support coefficient | CoP displacement, mm | | CoP rotation angle, ° |
|---|---|---|---|---|---|---|
| | | | | Frontal | Sagittal | |
| Pre-op | Injured | Healthy | 0.37 ± 0.3 | 10.5 ± 1.2 | 7.4 ± 1.1 | 7.9 ± 1.2 |
| | 27.8 ± 1.5 | 72.2 ± 1.7 | | | | |
| 6 months | Dominant | Non dominant | 0.89 ± 0.06 | 4.0 ± 0.4 | 5.0 ± 0.6 | 0.18 ± 0.08 |
| | 52.8 ± 1.9 | 47.2 ± 1.4 | | | | |
| p, value | – | – | p < 0.05 | p < 0.05 | p < 0.05 | p < 0.05 |

**Table 4.** Distribution of mean posturographic parameters in patients of the control group with ACL injury

| Control group | Limb loading distribution, % | | Support coefficient | CoP displacement, mm | | CoP rotation angle, ° |
|---|---|---|---|---|---|---|
| | | | | Frontal | Sagittal | |
| Pre-op | Injured | Healthy | 0.41 ± 0.4 | 11.6 ± 1.2 | 7.5 ± 1.2 | 7.5 ± 1.3 |
| | 24.9 ± 1.8 | 75.1 ± 1.6 | | | | |
| 6 months | Dominant | Non dominant | 0.71 ± 0.2 | 7.5 ± 0.4 | 4.2 ± 0.6 | 4.8 ± 0.8 |
| | 59.3 ± 1.7 | 40.7 ± 1.5 | | | | |
| p, value | – | – | p < 0.05 | p < 0.05 | p < 0.05 | p < 0.05 |

the dominant side. The support coefficient in healthy subjects approaches 1.

The global CoP position is a key index reflecting overall body balance. Displacements in the sagittal plane anterior to the malleolar line were considered positive, while posterior shifts were negative. Lateral deviations in the frontal plane to the right of midline were scored as positive, to the left as negative. For this study, only directional trends, not absolute values, were analyzed.

Improvements were defined as CoP displacement toward the normal reference position (intersection of the malleolar line and sagittal plane), while deterioration was defined as displacement away from this point. In addition, the rotational alignment of limb-specific CoP vectors was analyzed. The software computed the angle between the line connecting both limb CoPs and the global CoP versus a reference line in the frontal plane. In healthy subjects, this angle approximates 0°.

A clinical-biomechanical comparative analysis was performed between patients undergoing standard rehabilitation and those receiving additional balance and proprioception exercises, focusing on stabilometric outcomes during bipedal stance.

Basic rehabilitation began on the day following surgery. Patients were advised to perform straight-leg raises in the supine position and knee flexion exercises with the maximum possible range of motion without inducing pain, for 10–15 minutes, 4–5 times per day.

The first rehabilitation session with a specialist was conducted on the day after surgery, during which the rehabilitation plan for the early postoperative period was explained to the patient, including movement restrictions and recommendations for daily activities.

Self-massage was recommended from postoperative day 8, performed 2–3 times daily for 10 minutes, including prior to therapeutic exercise sessions. After suture removal on postoperative days 14–15, both the main and control groups participated in physical rehabilitation sessions (2–3 times per week) and therapeutic exercises at the rehabilitation department of Motor Sich Medical Center for a duration of 6 months. In the control group, therapeutic exercise sessions lasted 45 minutes. In the main group, the basic program was supplemented with balance and proprioception exercises, which added an additional 15 minutes to each session. Thus, the total duration of the training sessions was 60 minutes. The comparison and specifics of rehabilitation programs in the groups of this study are presented in *Table 2*.

The collected data were processed according to generally accepted principles of mathematical statistics. The following indicators were applied: arithmetic mean (M) and standard deviation (SD). Statistical analysis was performed using the parametric paired two-sample Student's t-test as well as nonparametric methods, including the Mann–Whitney U test. Statistical calculations were carried out with Microsoft Excel 360 software for tabular data processing.

## Results

Analysis of stabilometric parameters obtained using computerized posturography demonstrated pronounced disturbances of postural control in patients with ACL injury prior to surgical treatment. In both groups, preoperative assessment revealed a significant asymmetry of body weight distribution during double-leg stance, characterized by a compensatory shift of load toward the uninjured limb ($p < 0.05$). This redistribution was accompanied by a reduced support coefficient and increased displacement of the center of pressure in both frontal and sagittal planes, indicating impaired static stability and deficient proprioceptive control *(Tables 3, 4).*

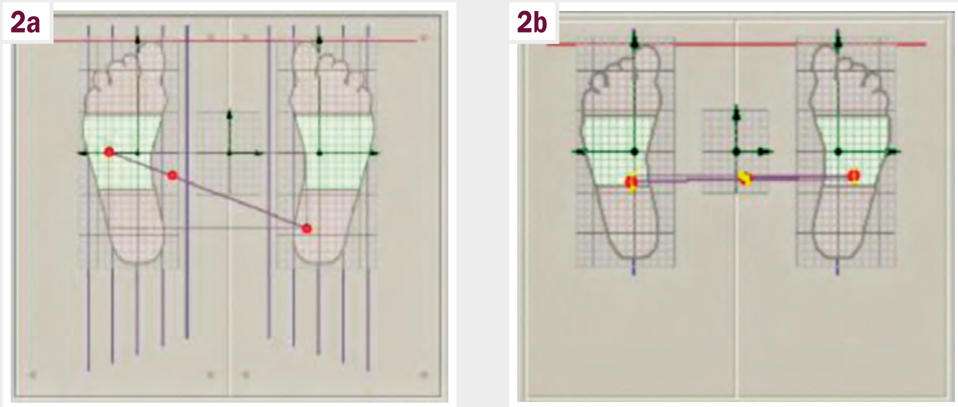


**Fig. 2.** Graphical representation of computerized posturography assessment results. **a:** patient of the study group before treatment; **b:** patient from the study group at 6 months.

Evaluation of CoP displacement patterns showed a consistent dependence on limb dominance. In right-leg-dominant individuals, CoP tended to shift toward the right side of the sagittal axis, whereas in left-leg-dominant individuals, a leftward shift was observed. Sagittal-plane CoP displacement demonstrated no systematic association with dominance and did not reveal additional destabilizing factors *(Table 3).* The mean CoP rotation angle in the study group, which underwent individualized proprioception and balance training, was 0.18 ± 0.08° at the 6-month evaluation. In healthy individuals, this parameter approaches 0° *(Table 3)*.

A similar trend was observed in the control group when assessing double-leg stance parameters after ACL reconstruction *(Table 4)*, including support coefficient, CoP rotation angle, and global CoP displacement in both frontal and sagittal planes.

At the 6-month postoperative follow-up, patients in the study group who underwent a rehabilitation program incorporating balance and proprioceptive training demonstrated a significant improvement in postural stability parameters compared with baseline values ($p < 0.05$). These improvements were reflected by restoration of near-symmetrical weight distribution between the operated and contralateral limbs, normalization of the support coefficient, and a marked reduction in CoP displacement and rotation angle during static stance. The observed CoP rotation angle approached values characteristic of healthy individuals *(Table 3).*

In contrast, patients in the control group, who followed the standard rehabilitation protocol, also showed positive postoperative dynamics; however, residual asymmetry of weight distribution and less pronounced improvements in stabilometric parameters persisted at 6 months. Between-group comparison revealed statistically significant advantages of the proprioception-focused rehabilitation program with respect to bilateral load symmetry and overall postural stability ($p < 0.05$), as summarized in *Tables 3* and *4* and illustrated in *Fig. 2.*

## Discussion

Typical complaints of patients with ACL injuries include a sensation of joint instability, insecurity during walking, and fear of descending stairs. These symptoms are related both to the mechanical insufficiency caused by rupture of the primary stabilizer of the knee joint and to the loss of sensory and proprioceptive function, which serve as subjective markers of functional impairment.

Recent meta-analyses affirmed that proprioceptive training significantly improves passive joint position sense, subjective functional assessments, and single-leg hop performance – though effects on active joint position sense and muscle strength remain less consistent [2]. Another systematic review corroborated the positive impact of proprioceptive exercises on functional outcomes and proprioceptive accuracy, while noting limited gains in range of motion and knee flexion strength [11]. Additionally, proprioceptive deficits may persist long term post-ACLR. One study reports ongoing reliance on visual feedback and limited sensory recovery for six months postoperatively [12].

Other evidence indicates bilateral proprioceptive decline after injury, with incomplete restitution even with surgical reconstruction [13].

To objectively assess these deficits and the effectiveness of treatment, we applied a hardware-software posturography system ("Bazometr"), which revealed several biomechanical features of postural control. Posturography is based on the analysis of mechanisms of upright stance and evaluates pathological changes in the musculoskeletal system by examining the displacement of the center of pressure and its angular deviations. Its advantages include short testing time, absence of special preparation, simplicity, and high sensitivity of the parameters obtained, which possess both diagnostic and prognostic value. Biomechanically, postural stability is often modeled as an inverted pendulum rotating around the ankle joints; however, the human body represents a multi-segmental chain where joint torques interact and influence the entire kinetic chain.

Our findings indicate that after ACL reconstruction using autografts, patients demonstrate partial restoration of proprioceptive function, but complete recovery to pre-injury levels is not consistently achieved. This aligns with previous studies. Dhillon M. S. et al. reported improvements in proprioception after ACL autografting but noted persistent deficits compared with healthy controls [13].

Similarly, J. S. Howard et al. demonstrated that proprioceptive recovery is often incomplete and requires targeted rehabilitation strategies [14].

In our study, significantly better outcomes were observed in patients who received an additional program of balance and proprioceptive training supervised by a rehabilitation specialist. This observation is consistent with research by L. Jiang et al., who emphasized that proprioceptive function is critical for long-term success of ACL reconstruction and prevention of re-injury [15].

Another factor influencing proprioceptive recovery is the surgical technique and graft type. Ostojic M. et al. highlighted that muscle-tendon grafts provide better integration and sensory feedback compared to other grafts [16]. Although our study did not stratify patients by graft type or surgical technique, the literature suggests that these factors may substantially affect outcomes.

Importantly, our results demonstrate that proprioceptive recovery directly influences functional outcomes. Patients with greater improvements in proprioception exhibited higher knee joint stability and a reduced risk of re-injury. These findings emphasize the clinical value of integrating proprioceptive-focused rehabilitation protocols into standard postoperative care.

Nevertheless, several limitations should be acknowledged. First, the relatively small sample size may limit generalizability. Second, the six-month follow-up period may be insufficient to assess long-term outcomes, as proprioceptive recovery and adaptation may continue beyond this period. Additional factors such as patient age, pre-injury fitness, and surgical quality could also influence results.

Future studies should focus on larger cohorts, extended follow-up periods, and stratification by surgical technique and graft choice. Moreover, the integration of modern technologies – such as virtual reality balance training, biofeedback devices, and AI-assisted motion analysis – represents a promising avenue for enhancing rehabilitation and tailoring interventions to individual needs.

Overall, proprioceptive recovery after ACL autograft reconstruction remains a complex but essential aspect of rehabilitation. Our findings underscore the importance of targeted rehabilitation protocols and the potential utility of advanced assessment tools like posturography in monitoring recovery and guiding individualized therapy.

## Conclusions

1. Computerized posturography proved to be an objective and sensitive tool for assessing biomechanical parameters of postural control in patients after ACL reconstruction.

2. Findings obtained in this study indicate that the inclusion of targeted balance and proprioceptive exercises leads to a more complete restoration of postural control mechanisms as measured by stabilometric parameters.

3. Computerized posturography can be recommended as an objective method for monitoring proprioceptive recovery and functional symmetry during rehabilitation after ACL reconstruction.

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