

Cell and Organ Transplantation. 2022; 10(1): 4-8.
<https://doi.org/10.22494/cot.v10i1.133>

Comparative analysis of the use of L-PRP/L-PCP injections, arthroscopic partial resection and non-steroidal anti-inflammatory drugs in the treatment of the meniscus tears



Bondariev G., Strafun S., Holiuk Ye.*, Saulenko K., Darovskyi O., Syvak A.

State Institute of Traumatology and Orthopedics the National Academy of Medical Sciences of Ukraine, Kyiv, Ukraine

*Corresponding author's e-mail: holyuk@yahoo.com

ABSTRACT

Recent studies show that among people with an active lifestyle about 6-10 % of injuries are acute injuries of the knee joints, namely – meniscus tear. The main treatment options for traumatic meniscus tears include surgical arthroscopic partial meniscectomy or meniscus repair, and conservative regenerative injection techniques. Today, the choice of treatment tactics remains controversial.

THE PURPOSE of the study was to evaluate the effectiveness of regenerative injection techniques in comparison with partial resection of the menisci and non-steroidal anti-inflammatory drugs (NSAIDs) in combination with the systematic use of kinesiotherapy for traumatic meniscus injuries.

MATERIALS AND METHODS. The results of treatment of 154 patients with traumatic meniscus injuries were evaluated. Group 1 ($n = 53$) received intra-articular injection of plasma rich in growth factors with a high platelet concentration of at least 1 million/ μL and a high number of leukocytes (L-PRP/L-PCP) in combination with low molecular weight hyaluronic acid; the number of injections from 3 to 6 with an interval between injections of 2 weeks. Group 2 ($n = 49$) received NSAIDs therapy (Ibuprofen, 200 mg 2 times/day, 7 days with a break of 1 week) for 2 months and a course of physiotherapy exercises. Patients in group 3 underwent arthroscopic partial meniscectomy, followed by recommendations for physical activity. Evaluations were performed using VAS scale, WOMAC questionnaire and KOOS survey scale at 3, 6, 12, 24, and 36 months after the end of treatment.

RESULTS. The obtained results demonstrated the effectiveness of intra-articular use of L-PRP/L-PCP in the treatment of traumatic meniscus tears in the short term (up to 3 months) and in the long term (up to 3 years), represented by the improvement of joint function and a significant reduction in the level of pain, which was observed in patients of group 1 after 36 months: by VAS 1.2 ± 0.5 cm, KOOS 94.5 ± 4.8 points, and WOMAC questionnaire 4.0 ± 1.9 ($p < 0.05$ compared to primary data). The use of NSAIDs and physiotherapy exercises is not effective in the short term (3-6 months), and over time the condition of patients only worsens: after 36 months VAS 7.6 ± 1.9 cm, KOOS questionnaire 24.9 ± 3.9 points ($p < 0.05$), and WOMAC 72.2 ± 7.1 ($p < 0.01$ compared to primary data). Partial arthroscopic meniscal resection can reduce pain and restore functional status to satisfactory within one year, with further progression of pain symptoms and functional limitations in the second and third year of the study, which is showed after 36 months: for VAS 5.7 ± 1.9 cm, KOOS questionnaire 47.1 ± 5.7 points, and WOMAC 64.1 ± 5.9 ($p < 0.05$ compared to primary data).

CONCLUSION. Intra-articular administration of L-PRP/L-PCP with hyaluronic acid can improve functionality and reduce pain in patients with traumatic meniscus injuries for up to 3 years. The use of NSAIDs and kinesiotherapy is not effective at all stages of follow-up. As for the use of arthroscopic partial resection, it provides an opportunity to get rid of pain and improve the capabilities of patients with traumatic meniscus tears for up to 12 months.

KEY WORDS: knee joint; meniscus injuries; regenerative injection techniques; platelet-rich plasma; L-PRP

According to the results of modern research in people with an active lifestyle, about 6-10 % of injuries are acute injuries of the knee joints, namely – meniscus tear [1, 2, 3]. The number of acute meniscus injuries per 1,000 people per year ranges from 0.5 to 0.7 [4], with men suffering more often (0.7 per 1,000 per year) than women (0.3 per 1,000 per year) [5]. The medial meniscus is affected in 60-75 % of cases [3].

Traumatic meniscus tears can occur independently, but are usually found in combination with damage to the ligaments of the knee joint. The odds ratio of osteoarthritis after isolated meniscus injury or combined anterior cruciate ligament injury and meniscus tear is approximately 6.3 and 6.4, respectively [6]. Degenerative lesions of the meniscus develop slowly; they are common in the general population, and the prevalence of these types of injuries increases with age: from 16% in people 50-59 years old to more than 50 % in patients aged 55-70 years [7]. The ratio of degenerative and traumatic meniscus tears increases with age: in the age group from 30 to 39 it is 7:8, and almost 4:1 in people over 40 [8].

The main options for surgical treatment of meniscus injury are arthroscopic partial meniscectomy or meniscal repair. Arthroscopic partial meniscal resection is one of the most popular surgical procedures, and the choice of treatment tactics in favour of surgical techniques is constantly increasing in many countries around the world [9]. Thus, in France in the period from 2005 to 2017, 156,461 meniscectomies and 63,142 surgeries to restore the meniscus were performed [11]. However, since 2002, most randomized controlled trials for the treatment of degenerative meniscus injuries (except for Gauffin et al.) have shown no additional benefits of arthroscopic recovery over conservative treatment in short- and medium-term follow-up [11-15]. Another disadvantage of meniscus surgery is the high risk of osteoarthritis after arthroscopic partial resection [10]. Phenomena such as disorders of joint surfaces congruence, distribution and absorption of stress axial loads, lubrication and static and dynamic stabilization of the knee joint invariably lead to the development of the so-called post-meniscectomy syndrome, which is essentially a predictor to gonarthrosis. And, while there is some short-term improvement in post-meniscectomy pain control, research shows that symptoms such as pain and instability return after a while and persist for many years after the surgery.

Today, modern medical practice offers to abandon surgical treatments and provides an opportunity to use more effective and modern technologies. Such technology in the treatment of meniscus damage is regenerative injection techniques [16]. The use of platelet-rich plasma (PRP) has a suppressive effect on the proinflammatory cytokine interleukin-1 in cell culture of chondrocytes from patients with osteoarthritis, which reduces the manifestations of catabolic and inflammatory changes in cartilage. The development of biological trend in stimulating the restoration of meniscus anatomical integrity is quite promising, because the use of platelet-enriched plasma as a tissue containing a large number of growth factors has a stimulating effect on meniscus regeneration. Moreover, the procedure has advantages due to low costs of its preparation and pronounced activity against chondrocytes.

The **PURPOSE** of the study was to evaluate the effectiveness of regenerative injection techniques in comparison with partial resection of the menisci and non-steroidal anti-inflammatory drugs (NSAIDs) in combination with the systematic use of kinesiotherapy for traumatic meniscus injuries.

MATERIALS AND METHODS

The study was conducted in the Centre for Tissue and Cell Therapy of the State Institute of Traumatology and Orthopedics NAMS Ukraine during 2015-2020. The results of the treatment of 154 patients were evaluated. All patients were informed and agreed to participate in the study. The patients' distribution in the study was determined randomly into 3 groups: group 1 (n = 53) with age range from 18 to 68 years (42 ± 16 years, $\bar{x} \pm S$), 20 women and 33 men. Medial meniscus injury was found

in 40 (75.4 %) patients, lateral meniscus damage in 6 (11.3 %) and combined lateral and medial meniscus injury in 7 (13.3 %). By localization, 44 (83 %) patients had injuries of the posterior horn, 9 (17 %) – injuries of the body and posterior horn of the meniscus. According to the Stoller's classification, 41 (77.3 %) patients had 2nd stage injuries and 12 (22.7 %) – 3rd stage injuries (**Table 1**).

Group 2 (n = 49) included 24 women and 25 men; the age of patients ranged from 26 to 71 years (34 ± 18 years, $\bar{x} \pm S$). According to MRI, 41 (83.6 %) patients had the injury of the medial meniscus, and 8 (16.4 %) – the injury of the lateral and medial menisci. By localization, 38 (77.6 %) patients had injuries of the posterior horn, 11 (22.4 %) – the injuries of the body and posterior horn. According to the Stoller's classification, 35 (71.4 %) patients had 2nd stage injuries and 14 (28.6 %) – 3rd stage injuries.

Group 3 (n = 52) included 33 women and 19 men; the age of patients ranged from 28 to 70 years (36 ± 21 years, $\bar{x} \pm S$). 45 patients (86.5 %) had medial meniscus injury, 3 patients (5.8 %) had lateral meniscus injury, and 4 patients (7.7 %) had lateral and medial meniscus injury. By localization, 40 patients (76.9 %) had injuries of the posterior horn, 12 (23.1 %) – the injuries of the body and posterior horn. According to the Stoller's classification, 42 patients (80.8 %) had 2nd stage injuries and 10 (19.2 %) – 3rd stage injuries.

 **Table 1.** Distribution of patients and characteristics of the study groups (n = 154).

Parameters	Group № 1 (n = 53)	Group № 2 (n = 49)	Group № 3 (n = 52)	
Age (years), $\bar{x} \pm S$	42 ± 16	34 ± 18	36 ± 21	
Sex, n (%)	Male	33 (62.2 %)	25 (51 %)	19 (36.5 %)
	Female	20 (37.8 %)	24 (49 %)	33 (63.5 %)
Localisation of the injury, n (%)	Medial meniscus	40 (75.4 %)	41 (83.6 %)	45 (86.5 %)
	Lateral meniscus	6 (11.3 %)	–	3 (5.8 %)
	Injury of both menisci	7 (13.3 %)	8 (16.4 %)	4 (7.7 %)
Injury classification by Stoller, n (%)	2 nd stage	41 (77.3 %)	35 (71.4 %)	42 (80.8 %)
	3 rd stage	12 (22.7 %)	14 (28.6 %)	10 (19.2 %)

After randomization, the groups were offered a certain type of treatment: the treatment of group 1 included intra-articular injection of plasma enriched with growth factors with a high platelet concentration of at least 1 million/ μ L and high white blood cell number (L-PRP/L-PCP) in combination with low molecular weight hyaluronic acid (*Hialurom*, Romania), which was used as a scaffold. The number of injections ranged from 3 to 6, depending on the degree of Stoller's classification, at a dose of 15 mg/mL hyaluronic acid and 3 mL PRP with an interval between injections of 2 weeks [22].

It was recommended to stop taking anti-inflammatory and analgesic drugs 10 days before the procedure and during the whole period of treatment. During the treatment period, all patients were advised to follow the restrictions of physical activity: stair descent/ascent, lifting heavy objects, flexion of the knee joints, deep squats.

Group 2 received NSAIDs therapy with Ibuprofen (*Borschagivsky* CPP, Ukraine) 200 mg 2 times/day, 7 days with a one-week break for 2 months and a course of physiotherapeutic exercises that included tractions, strengthening exercises for *m. quadriceps femoris*, and stretching exercises (25-30 minutes, 3 times a week).

Patients in group 3 underwent partial resection of the meniscus under arthroscopic control, followed by recommendations for physical activity

within 1 month after surgery. Criteria for non-inclusion of patients were: acute meniscus injury (up to 1 month after injury), bucket handle meniscus tear, a block in the joint and stage 2-3 knee osteoarthritis.

Study methods. The pain syndrome was assessed using the Visual Analogue Scale (VAS); the clinical status of patients was assessed using the Knee Injury and Osteoarthritis Outcome Score (KOOS) and the Western Ontario and McMaster Universities Arthritis Index (WOMAC) questionnaire [10]. All patients underwent MRI examination of the knee joints at the time of the initial examination and 3 years after the treatment. Clinical evaluation of the results was performed after 3, 6, 12, 24 and 36 months, respectively.

Statistical methods. Statistical analysis of the study data was performed with the MedStat software using descriptive statistics, calculating such quantitative indicators in the study groups as mean values (M) and mean error (m), qualitative indicators are presented as frequencies and their percentages. The statistical significance of differences was determined using the Student's t-test. Differences at $p < 0.05$ were considered statistically significant for all types of analysis.

RESULTS AND DISCUSSION

The assessment of the quality of life and functional status of patients according to WOMAC. The parameters of functional status of the knee joint on the WOMAC scale between groups had no statistically significant differences in treatment: thus, the general index (score) in group 1 was 50.6 ± 8.7 points, in group 2 – 49.4 ± 7.4 points, and in group 3 – 42.2 ± 8.1 points, ($p > 0.05$). After injection therapy during routine re-examinations in patients of group 1 there was a statistically significant improvement in functional status according to the results of the questionnaire, which was maintained throughout the observation period: in 3 months the score was 20.8 ± 9.4 points ($p < 0.01$), in 12 months – 8.9 ± 3.7 points ($p < 0.01$), in 36 months – 4.0 ± 1.9 points ($p < 0.01$). In group 2 after the use of NSAIDs and kinesiotherapy positive dynamics was not observed in both short-term and long-term stages of observations: in 3 months – 48.7 ± 5.1 points, in 12 months – 56.8 ± 3.4 points and in 36 months – 72.2 ± 7.1 points. The patients of group 3 in the postoperative period after 3 months noted improvement in their functional status (21.0 ± 7.9 points). However, after 2 years in the operated patients there was deterioration and they returned to the same state as before the surgery (43.0 ± 6.4 points). After 36 months the condition of the operated patients even worsened compared to preoperative data, indicating the short-term positive result of arthroscopic partial resection (64.1 ± 5.9 points, $p < 0.05$).

Assessment of functional activity according to the KOOS data. Prior to the treatment, patients had moderate functional disorders in all groups: in group 1 the score was 69.3 ± 5.3 , in group 2 – 66.1 ± 4.4 , and in group 3 – 67.6 ± 6.4 , significant differences between the scores of the surveyed groups at the stage of primary observation were not detected ($p > 0.05$).

After the treatment, the average scores on the KOOS scale in group 1 in 3 months were 78.3 ± 4.7 points; in 12 months – 91.5 ± 4.9 and in 24 months – 94.4 ± 7.1 , i.e. on average there was a positive trend with excellent results (94.5 ± 4.8 points) in most patients in the group for 3 years. The following results were obtained in group 2: in 3 months after the treatment the score was 59.2 ± 5.7 , in 12 months – 44.6 ± 5.1 , and in 24 months – 34.9 ± 4.7 . At the end of the study in 36 months, the level of activity and ability of patients in group 2 corresponded on average to «unsatisfactory» (24.9 ± 3.9), i.e. during the use of NSAIDs and kinesiotherapy in patients there was a significant deterioration in the knee joint state compared to the primary data ($p < 0.01$).

In group 3, the average scores by KOOS scale in 3 months after the treatment were 79.6 ± 5.4 , in 12 months – 75.5 ± 5.4 , and in 24 months – 58.0 ± 6.4 points. At the end of the study in 36 months, the level of activity and ability of patients in group 3 also on average corresponded to «unsatisfactory» (47.1 ± 5.7 points), i.e. despite the improvement after surgery, a positive result remained only for 12 months, with further progression and return of symptoms, which is showed in the results of patient survey after 3 years.

Assessment of pain by VAS. A comparative analysis of the treatment results showed that a statistically significant reduction in pain at rest occurred in group 1 in 3 months – 3.8 ± 1.7 cm, and in 36 months – 1.2 ± 0.5 cm ($p < 0.01$) compared with primary data. In group 2, the dynamics were unstable, and over time, patients receiving NSAIDs and kinesiotherapy experienced an increase in joint pain during the second and third years of follow-up (in 24 months – 7.7 ± 1.8 cm and in 36 months – 7.6 ± 1.9 cm ($p > 0.05$)). In the group 3, the reduction of pain was expressed during the first year (in 3 months – 1.9 ± 1.1 cm, and in 12 months – 2.3 ± 1.5 cm, ($p < 0.01$)), with a gradual return of pain in 36 months at the level before surgery – 5.7 ± 1.9 cm.

Thus, the results show the effectiveness of intra-articular use of L-PRP/L-PCP in the treatment of traumatic meniscus tears in the short term (up to 3 months) and in the long term (up to 3 years), which is reflected in the improvement of joint function and a significant reduction in the pain level in group 1 patients (according to VAS, KOOS and WOMAC questionnaires). The use of NSAIDs and physiotherapy exercises is not effective in the short term (3-6 months), and over time the condition of patients only worsens. Performing partial resection of the meniscus

Table 2. Dynamics of scores by VAS, KOOS and WOMAC at follow-up stages

	Primary data	3 rd month	6 th month	12 st month	24 th month	36 th month	Compared to primary data, t-test
		(M ± m)	(M ± m)	(M ± m)	(M ± m)	(M ± m)	
Group #1							
KOOS, score	69.3 ± 5.3	78.3 ± 4.7	$85.7 \pm 5.9^*$	$91.5 \pm 4.9^*$	$94.4 \pm 7.1^*$	$94.5 \pm 4.8^*$	$p < 0.01$
WOMAC, score	50.6 ± 8.7	$20.8 \pm 9.4^*$	$10.6 \pm 6.7^*$	$8.9 \pm 3.7^*$	$3.5 \pm 1.7^*$	$4.0 \pm 1.9^*$	$p < 0.01$
VAS, cm	7.4 ± 1.3	$3.8 \pm 1.7^*$	$2.04 \pm 1.1^*$	$2.16 \pm 1.4^*$	$1.2 \pm 0.3^*$	$1.2 \pm 0.5^*$	$p < 0.05$
Group #2							
KOOS, score	66.1 ± 4.4	59.2 ± 5.7	$53.8 \pm 4.4^*$	$44.6 \pm 5.1^*$	$34.9 \pm 4.7^*$	$24.9 \pm 3.9^*$	$p < 0.01$
WOMAC, score	49.4 ± 7.4	48.7 ± 5.1	51.7 ± 6.4	$56.8 \pm 3.4^*$	$64 \pm 4.6^*$	$72.2 \pm 7.1^*$	$p < 0.01$
VAS, cm	6.8 ± 1.4	4.5 ± 2.1	5.6 ± 1.8	6.7 ± 1.7	7.7 ± 1.8	7.6 ± 1.9	$p > 0.05$
Group #3							
KOOS, score	67.6 ± 6.4	79.6 ± 5.4	$80.6 \pm 8.4^*$	75.5 ± 5.4	$58.0 \pm 6.4^*$	$47.1 \pm 5.7^*$	$p < 0.05$
WOMAC, score	42.2 ± 8.1	$21.0 \pm 7.9^*$	$18 \pm 6.5^*$	$22.7 \pm 5.5^*$	43.0 ± 6.4	$64.1 \pm 5.9^*$	$p < 0.05$
VAS, cm	7.3 ± 1.3	$1.9 \pm 1.1^*$	$1.7 \pm 1.9^*$	$2.3 \pm 1.5^*$	$4.2 \pm 2.0^*$	$5.7 \pm 1.9^*$	$p < 0.05$

Note: * – significant differences compared to primary data, t-test.

under arthroscopic control reduces pain and restores functional status to satisfactory within one year, with further progression of pain symptoms and functional limitations in the second and third year of the study, which is showed in treatment results of group 3.

A meta-analysis revealed that meniscus injury treatment strategies are aimed at improving function, reducing disability, relieving pain, and improving patients' quality of life. Among non-operative therapeutic interventions, intra-articular injections into the knee joint are particularly popular, including hyaluronic acid, corticosteroids, PRP therapy, non-steroidal anti-inflammatory drugs, as well as physiotherapy and immobilization [17]. The main options for surgical treatment of meniscus damage are arthroscopic partial meniscectomy or meniscus repair [9]. Complex application of mini-invasive and conservative methods of treatment for traumatic meniscus injuries is quite popular. Existing approaches to surgical treatment focus on preventing or slowing down of the progression of degenerative changes through the development of less invasive procedures or the use of interventions in the early stages of the disease.

Thus, Sochacki K. et al. conducted a systematic review of studies comparing the results of isolated arthroscopic meniscus repair supplemented with PRP in 274 patients (110 with PRP and 164 without PRP), the observation period was 29.2 ± 22.1 months. Meniscus recovery supplemented with PRP had a significantly lower failure rate than recovery without PRP (odds ratio 0.32; 95 % CI 0.12-0.90; $p = 0.03$) [18].

Belk J. et al. conducted a systematic review of 6 studies (2 studies with level of evidence 1; 4 studies with level of evidence 3), a total of 309 patients who underwent meniscus repair using PRP (mean age 31.9 years) and 445 patients without PRP augmentation (mean age

29.6 years) [19]. The mean follow-up was 32.8 months (range 12 to 72 months). Overall, 17.0 % of patients with PRP failed rehabilitation treatment compared to 22.1 % of patients without PRP. There were no differences between the groups in VAS, Lysholm, or subjective International Knee Documentation Committee (IKDC) Questionnaire scores, except for 1 study in which postoperative IKDC scores were significantly better in the PRP group ($p < 0.01$). Another study found significantly better postoperative WOMAC scores among PRP patients, and the last 2 studies found significantly better KOOS scores among PRP patients.

A systematic review by Giuffrida A. et al. [20] consisted of 10 studies (1525 patients) that focused on conservative treatment and comparison with arthroscopic recovery. In 8 studies, the effectiveness of therapeutic gymnastics was compared with surgery; in 1 study, the effectiveness of intra-articular steroid injections was compared with surgery; in other study, the effectiveness of placebo surgery was compared with partial meniscectomy. No significant intergroup differences in knee pain and knee function were observed in all studies. According to research, degenerative ruptures of the meniscus without symptoms of blockage of the knee joint and meniscus pinching can be successfully treated with proper regimen and physiotherapy. The surgical approach can be considered in case of poor response to conservative treatment.

Thus, the results of our research complement the results of the meta-analysis of Belk J. et al. on the effective use of PRP therapy to restore the functionality of patients with traumatic injuries of the menisci of the knee joints with positive results for at least 3 years [19, 21].

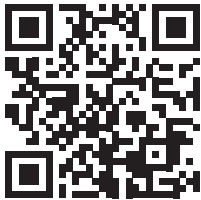
CONCLUSION

Intra-articular administration of L-PRP/L-PCP with hyaluronic acid can improve functionality and reduce pain in patients with traumatic meniscus injuries for up to 3 years. The use of NSAIDs and kinesiotherapy is not effective at all stages of the examination. The use of arthroscopic partial resection allows you to get rid of pain for up to 12 months, so surgical treatment is an option in cases of ineffectiveness of conservative methods.

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The authors declare that there is no potential conflict of interest regarding the research, authorship and/or publication of this article

УДК 616.728.3-089.819

Порівняльний аналіз застосування ін'єкцій L-PRP/L-PCP, артроскопічної парціальної резекції та нестероїдних протизапальних засобів в лікуванні розривів менісків колінного суглобу



Бондарев Г. Г., Страфун С. С., Голюк Є. Л., Сауленко К. О., Даровський О. С., Сивак А. М.

ДУ «Інститут травматології та ортопедії Національної академії медичних наук України», Київ, Україна

РЕЗЮМЕ

Сучасні дослідження показують, що у людей з активним способом життя близько 6-10 % травм припадає на гострі пошкодження колінних суглобів, а саме – на розриви менісків. Серед основних варіантів лікування травматичних розривів менісків може бути хірургічне – артроскопічна парціальна менісектомія або відновлення меніска, та консервативне – регенеративні ін'єкційні техніки. На сьогодні вибір тактики лікування серед лікарів залишається дискусійним.

МЕТА ДОСЛІДЖЕННЯ: оцінити ефективність застосування регенеративних ін'єкційних технік у порівнянні з парціальною резекцією менісків та прийомом нестероїдних протизапальних засобів (НПЗЗ) разом з систематичним застосуванням кінезотерапії при травматичних пошкодженнях менісків колінного суглоба.

МАТЕРІАЛИ ТА МЕТОДИ: Оцінено результати лікування 154 пацієнтів з травматичними пошкодженнями менісків. Група № 1 (n = 53) отримала внутрішньосуглобове введення плазми, збагаченої факторами росту з високою концентрацією тромбоцитів не менше 1 млн/мкл і високою кількістю лейкоцитів (L-PRP/L-PCP) у поєднанні з низькомолекулярною гіалуроновою кислотою; кількість ін'єкцій від 3 до 6 з інтервалом між ін'єкціями 2 тижні. Група № 2 (n = 49) отримувала терапію НПЗЗ (Ібупрофен 200 мг 2 р/день протягом тижня з перервою в 1 тиждень) протягом 2-х міс. та курс фізіотерапевтичних вправ. Пацієнтам групи № 3 була проведена парціальна резекція меніска під артроскопічним контролем з подальшим наданням рекомендацій щодо рухового режиму. Оцінювання проводили за допомогою шкали VAS, анкетування WOMAC та шкали опитування KOOS через 3, 6, 12, 24, та 36 місяців після закінчення курсу лікування.

РЕЗУЛЬТАТИ. Отримані результати продемонстрували ефективність внутрішньосуглобового застосування L-PRP/L-PCP в лікуванні травматичних розривів менісків колінних суглобів як у короткостроковій (до 3 міс.) так і у віддаленій перспективі (до 3-х років). Це відображено у покращенні функції суглоба та достовірному зменшенні рівня больового синдрому, які відзначали пацієнти групи № 1 через 36 місяців: за VAS $1,2 \pm 0,5$ см, анкетуванням KOOS $94,5 \pm 4,8$ бали, та WOMAC $4,0 \pm 1,9$ ($p < 0,05$ у порівнянні з первинними даними). Використання нестероїдних протизапальних засобів та фізіотерапевтичних вправ не є ефективним в короткостроковій перспективі (3-6 міс.), а з часом стан пацієнтів лише погіршується: через 36 місяців VAS $7,6 \pm 1,9$ см, анкетування за KOOS $24,9 \pm 3,9$ бали ($p < 0,05$) та WOMAC $72,2 \pm 7,1$ ($p < 0,01$ у порівнянні з первинними даними). Виконання парціальної резекції меніска під артроскопічним контролем дозволяє зменшити біль та відновити функціональний стан до задовільного протягом одного року, з подальшим прогресуванням симптомів болю та функціональних обмежень на другий та третій рік дослідження, що відображено в результатах через 36 місяців: за VAS $5,7 \pm 1,9$ см, анкетування за KOOS $47,1 \pm 5,7$ бали, та WOMAC $64,1 \pm 5,9$ ($p < 0,05$ у порівнянні з первинними даними).

ВИСНОВКИ. Внутрішньосуглобове введення L-PRP/L-PCP з гіалуроновою кислотою дозволяє покращити функціональні можливості та зменшити біль у пацієнтів з травматичними пошкодженнями менісків на строк до 3 років. Застосування НПЗЗ та кінезотерапії не є ефективним на всіх етапах спостережень. Щодо застосування артроскопічної парціальної резекції, то вона надає можливість позбутися болю та покращити можливості пацієнтів з травматичними розривами менісків на період до 12 міс.

КЛЮЧОВІ СЛОВА: колінний суглоб; травми меніска; регенеративні ін'єкційні техніки; збагачена тромбоцитами плазма; L-PRP