УДК: 632-938.616.72-003.71-001.514

CLINICAL CHARACTERISTICS OF HEMARRHOSIS IN INTRAARTICULAR FRACTURES OF THE LOWER EXTREMITIES

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Abstract. *Complicated hemarthrosis is significantly more common in patients with intra-articular fractures, which should be considered when choosing treatment strategies, planning rehabilitation timelines, and determining indications for antibacterial or anti-inflammatory therapy.*
Keywords: *hemarthrosis, intra-articular fractures, complications.*

Relevance. The existing gap between clinical demand for accurate outcome predictors and the insufficient development of immunological approaches to prognosis allows us to hypothesize that immunological parameters (levels of proinflammatory cytokines, lymphocyte subpopulations, immunoglobulins, phagocytic activity, and circulating immune complexes) have prognostic value in patients with hemarthrosis associated with intra-articular fractures (1, 3, 5). Their use in an early assessment system will improve prognosis accuracy, promptly identify patients at risk, and individualize therapy (2, 4, 6, 7).

Thus, the hypothesis is based on: the clinical need to improve the prognosis for hemarthrosis; the results of existing immunological studies; the lack of prognostic models based on immunological markers; and scientific research by Uzbek and international researchers confirming the importance of the immune response in post-traumatic regeneration.

Aim of the study. Analysis of the clinical features of hemarthrosis in patients with intra-articular fractures of the lower extremities.

Material and methods. The clinical characteristics of hemarthrosis (HA) in patients with intra-articular fractures differ fundamentally from similar manifestations in isolated traumatic injuries without fractures. One of the key parameters reflecting the severity of the condition is the volume of intra-articular hemorrhage. This indicator is directly relevant both for the choice of treatment (the need for puncture, arthroscopy) and for the prognosis of joint function recovery.

In this study, HA volume was analyzed taking into account two factors: the nature of the injury (presence/absence of a fracture) and the location of the lesion (KJ or AJ).

Results and discussion. Thus, in the KJ, the average volume of hemorrhage in fractures exceeds that in isolated injuries by approximately 1.5 times. A similar pattern holds true for the AJ, where the difference is over 1.4 times. These differences are statistically significant ($p<0.001$ and $p<0.01$, respectively), which confirms the systematic severity of damage in the presence of a traumatic component in the form of a bone fracture.

Pain intensity in joint injuries is an important indicator of the extent of damage and functional disorganization, reflecting both the mechanical and inflammatory effects on the receptor apparatus. In patients with intra-articular fractures, pain was significantly more severe than in injuries without fractures, regardless of the affected joint.

For example, in the knee joint, pain levels in the study group exceeded those in the comparison group by approximately 33%, while for AJ injuries, the difference was approximately 31%. Both

differences reached statistical significance, demonstrating a significant clinical difference between injury types.

An assessment of the degree of joint function limitation indicates that in the presence of intra-articular fractures, the function of the affected joint was significantly more impaired compared to injuries without bone pathology.

For example, in patients with intra-articular fractures of the knee joint, the total functional assessment score was almost 1.4 times lower than in the corresponding comparison group. In cases of AJ injury, the functional impairment was approximately 1.3-fold, which was also confirmed by high statistical significance ($p<0.001$).

Thus, the degree of functional limitation following fractures is not only a clinical reflection of the severity of the injury but also a criterion that should be considered when planning an individualized rehabilitation program.

Puncture in AJ injury has not only therapeutic but also diagnostic value. It helps reduce intra-articular pressure, alleviate pain, and exclude signs of secondary inflammation or infection. The frequency of this procedure can be considered an indirect indicator of the clinical severity of the injury. The obtained results convincingly demonstrate that puncture was required significantly more often with intra-articular fractures than with isolated injuries without fracture.

Specifically, in the study group, punctures were required in 86.1% of patients with AJ injury, while in the comparison group, only 55% did. Thus, the difference between the groups was more than 31%, indicating a significantly greater clinical severity of HA in the presence of a fracture. A similar pattern was observed with respect to localization in the articular joint: punctures were performed in 70.8% of patients in the study group versus 35% in the comparison group—that is, a difference of almost 2-fold, which also reached statistical significance ($p<0.01$).

The next indicator reflecting the severity of HA was the volume of intra-articular hemorrhage removed during a therapeutic and diagnostic puncture. Analysis of mean values revealed a statistically significant increase in the volume of blood removed in patients with intra-articular fractures compared to those with only traumatic capsular-ligamentous injury.

In patients with articular joint injuries in the study group, the volume of fluid removed was, on average, 53% greater than in patients without fractures. Similarly, in case of damage to the arterial joint, the excess rate was approximately 63%, which is also statistically significant ($p<0.001$ for both localizations).

The differences confirmed that intra-articular fractures result in more extensive hemorrhage, likely due to the involvement of bone marrow vessels, destruction of the subchondral plate, and synovial microvessels. This pathophysiological explanation is consistent with clinical observations: in patients with fractures, HA developed more rapidly, was accompanied by greater stiffness, more severe pain, and in some cases required not one but several punctures. Thus, the volume of blood evacuated during a puncture can be considered not only as a consequence of anatomical damage but also as an objective quantitative marker of the severity of the post-traumatic condition, important for determining treatment strategies and prognosis.

In cases of traumatic HA of the knee, the presence of a component associated with a bone fracture significantly increased the need for surgical intervention. In the study group, arthroscopy was performed four times more often than in the comparison group, indicating more severe intra-articular pathology requiring visual inspection and debridement of the joint cavity. The difference in the frequency of reductions and osteosynthesis was even more pronounced: in the case of fractures, these interventions were performed in more than half of the patients, while in the comparison group they were completely absent, which is entirely expected given the anatomical preservation of the bone structures. This confirms the fact that, in the case of intra-articular fractures, fragment stabilization and restoration of articular surface congruence remain key treatment goals.

Finally, repeat interventions were also significantly more frequent in the study group. They were required in cases of osteosynthesis instability, repeated osteosynthesis, or failure of the primary intervention. In the comparison group, such interventions were sporadic and typically diagnostic.

The frequency of surgical interventions was also significantly higher in the study group. Arthroscopy was performed almost six times more often than in patients without fractures, indicating the need for visual exploration in cases of suspected intra-articular fragments, chondral lesions, or instability.

The rate of reduction and osteosynthesis for AJ fractures was comparable to that of the CL, accounting for more than half of the cases. These data are consistent with the prevalence of intra-articular fractures of the fibula and tibia, which require surgical stabilization to prevent post-traumatic arthrosis. Reinterventions were also recorded exclusively in the study group, highlighting the complexity of the clinical picture and the potential for complications even with timely initial intervention.

Analysis of the length of hospital stay allows for an objective assessment of not only the severity of the clinical situation but also the complexity of the treatment. According to the data obtained, hospitalization for patients with intra-articular bone fractures was significantly longer than for patients with isolated traumatic CL fractures without a fracture.

For CL fractures, the average length of hospital stay in the study group exceeded that in the comparison group by more than 5 days, representing an increase in the length of stay of almost 67%. For AJ injuries, the difference was approximately 5 days (or approximately 72% in relative increase).

Thus, the significant increase in hospital stay confirms that the presence of an intra-articular fracture requires a more resource-intensive and lengthy approach to patient management. This parameter should be taken into account when planning patient routing, calculating clinical and economic indicators, and justifying the need for surgical treatment.

Recurrent GA was observed predominantly in the study group: with KJ injuries, it occurred in more than one in five patients, while in the comparison group, such cases were isolated. Reactive synovitis was recorded in a quarter of patients with both KJ and AJ fractures, while in the group without fractures, the complication rate was 2-3 times lower. Infectious complications (including synovitis, arthritis, and puncture site infection) were recorded exclusively in the study group.

Thus, complicated GA is significantly more common in patients with intra-articular fractures, which should be taken into account when choosing a treatment strategy, planning rehabilitation timelines, and determining indications for antibacterial or anti-inflammatory therapy.

The analysis revealed that the clinical manifestations of GA vary significantly depending on the presence of an intra-articular fracture. In patients in the study group, GA was characterized by larger effusion volumes, more severe pain, significant limitation of joint function, and the need for therapeutic and diagnostic punctures. These differences were clearly evident in both the knee and articular cartilage (ACC) injuries, indicating the systemic severity of the traumatic process involving bone structures.

Furthermore, patients with fractures significantly more often required surgical interventions, including reductions, osteosynthesis, and arthroscopies, and also experienced longer hospital stays and a high rate of early complications. These data highlight the clinical importance of timely stratification of patients by injury severity, as well as the need for an individualized approach to their treatment and outcome prediction. The results provide the basis for further study of the pathogenetic mechanisms underlying differences in clinical progression and the justification of differentiated management strategies for this patient population.

Conclusions:

1. Patients with fractures significantly more often required surgical interventions, including reduction, osteosynthesis, and arthroscopies, and also experienced longer hospital stays and a high rate of early complications. These data highlight the clinical importance of timely stratification of

patients by injury severity, as well as the need for an individualized approach to their treatment and outcome prediction.

2. It was established that the clinical manifestations of GA vary significantly depending on the presence of an intra-articular fracture. In patients in the study group, GA was characterized by larger effusion volumes, more severe pain, significant limitation of joint function, and the need for therapeutic and diagnostic punctures.

3. The significant increase in hospital stay confirms that the presence of an intra-articular fracture requires a more resource-intensive and time-consuming approach to patient management. This parameter should be taken into account when planning patient care, calculating clinical and economic indicators, and justifying the need for surgical treatment.

REFERENCES

1. Berdyugina O. V., Solomatina L. V. Clinical and laboratory evaluation of aspirate in posttraumatic hemarthrosis of the knee joint // Traumatology and Orthopedics. - 2020. - No. 3-4. - P. 187-191.

2. Labuzova N. A. PRP therapy for hemarthrosis of the knee joint in children // Youth Science Week - 2023: Materials of the All-Russian Forum, Tyumen, March 23-25, 2023. - Tyumen: RIC "Ivex", 2023. - P. 188-189.

3. Roskidaylo A. A. Differential diagnostics of non-traumatic hemarthrosis of the knee joint (case report) // Modern Rheumatology. – 2025. – Vol. 19, No. 1. – P. 110–115.

4. Eshmurzaev A. A., Marufkhanova H. M. Immunopathogenesis of posttraumatic arthritis: features of the cytokine response // Uzbekiston shifokori. – 2022. – No. 1. – P. 48–51.

5. Khamdamov B. Z., Napasov I. Z. The Role and Place of Methods for Predicting Bone Regeneration Disorders in Closed Fractures of Tubular Bones // American Journal of Medicine and Medical Sciences. - USA, 2024. - N 14(6). - P. 1588–1602.

6. Savola P., Kelkka T., Rajala H. L. M., et al. Single-cell characterization of tissue-homing $CD4^+$ and $CD8^+$ T cells in immune-mediated arthritis // Molecular Medicine. – 2024. – Vol. 30, Article 25.

7. Xu H., Yin L., Zou L., et al. Lysozyme modulates inflammatory responses to exacerbate the severity of rheumatoid arthritis // International Immunopharmacology. – 2025. – Vol. 152. – Article 114427.