

## Comment to the Article “Pain in Anterior Knee after Locked Nailing of Diaphyseal Tibia Fractures”

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### The current state of the issue

The tibial fractures are one of the most frequent tubular bones fractures, making up, according to some reports, a quarter of their total number [1]. The AO efforts to popularize the minimally invasive “biological” osteosynthesis, the reproducibility of the intramedullary nail implantation technique, the possibility of early axial load after surgery, good bone fragment stability — all these and a number of other factors made blocked intramedullary osteosynthesis the “gold standard” in the treatment of diaphyseal tibia fractures [1, 2]. Nevertheless, despite the improvement of the surgical technique and the potential benefits associated with this type of osteosynthesis, the fracture consolidation often does not coincide with the final recovery of the patient, who in ideal


conditions should have “forgotten” about the surgical intervention and returned to the previous level of physical and social activity.

In the study under discussion, the author draws attention to an interesting phenomenon associated with intramedullary osteosynthesis of the tibia due to its diaphyseal fractures — the chronic pain in the anterior knee. Of course, this complication is not so catastrophic for the patient as a deep infection of the surgical area or nonunion, but the intense chronic pain syndrome itself reduces the patient’s quality of life, his/her social adaptation, significantly reduces the satisfaction with the surgical treatment.

The rate of chronic pain development in the anterior knee after the blocked intramedullary osteosynthesis varies in different studies in a very wide interval, reaching 86% (!) [3], but on average it is detected in half of the operated patients [4]. This complication is multifactorial. There are many reasons for its development. In addition to the proximal end of the nail protrusion and the small size of the tibial plateau, mentioned by the author of the article, it is necessary to note the effect of intraoperative trauma to the patellar ligament and infrapatellar fat pad during the nail implantation, damage to the menisci

### • Comment on the Article

Pisarev V.V. [Pain in Anterior Knee after Locked Nailing of Diaphyseal Tibia Fractures]. *Travmatologiya i ortopediya Rossii* [Traumatology and Orthopedics of Russia]. 2020;26(1): 85-93. doi: 10.21823/2311-2905-2020-26-1-85-93. (In Russian).

 **Cite as:** Chugaev D.V. [Comment to the Article “Pain in Anterior Knee after Locked Nailing of Diaphyseal Tibia Fractures”]. *Travmatologiya i ortopediya Rossii* [Traumatology and Orthopedics of Russia]. 2020;26(1): 94-97. doi: 10.21823/2311-2905-2020-26-1-94-97. (In Russian).

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and the transverse ligament of knee which is extremely rich in mechanoreceptors, cartilage of the articular surfaces of the knee, infrapatellar branch of the saphenous nerve, cortical layer of the tibia in the area of nailing. The abundance of foreign publications, including meta-analyses covering this topic, is discordant with the lack of interest to this problem in the Russian scientific literature, which makes the article under discussion especially valuable.

### What does this publication give us?

Analyzing the study under discussion, I would like to make several criticisms regarding its design. Summarizing the results obtained by the author, we can say that he identified two main subgroups of patients with pain in the anterior knee.

1. The patients whose nail protruded above the surface of the tibia and chronically injured soft tissues.

2. The patients with multifragmentary diaphyseal fractures of type C according to the AO classification, who did not have any obvious causes for the pain syndrome, but the pain developed more often than in other patients.

As a solution to the problem of the subgroup of the patients with protrusion of the proximal end of the nail beyond the metaphysis, the author proposed to pay attention during surgery to its maximum immersion in the tibial metaphysis. But at the same time, the study mentioned a part of the patients in which the proximal end of the nail was situated in the so-called 3rd zone and in no way could come into the contact with the soft tissues of the joint. Can the proposed solution help this group of the patients, or is the reason different? According to Zhang et al., the distance from the proximal end of the nail to the cortical tibia did not directly correlate with the pain syndrome intensity [5]. The analysis of the treatment results of the patients with the anterior knee pain allowed foreign researchers more than 20 years ago

to find a solution, if not solving this problem completely, then, in any case, significantly reducing the rate of this complication. If we allow the existence of a causal relationship between the events of “excessive intraoperative trauma of the patella and its ligament” and “chronic pain in the postoperative period”, then it is necessary to reduce the injury during the nail placing into the central fragment of the tibia. For this, a suprapatellar approach was proposed, which allowed the nail intramedullary implantation without excessive knee bending, without trauma to the patellar ligament, without the need for a skin incision in the zone of the infrapatellar branch of the saphenous nerve distribution [1, 4, 6]. Modern studies on this issue, including systematic reviews, note that the use of such a surgical approach can reduce the rate of chronic pain in the anterior knee in patients after intramedullary osteosynthesis of the tibia [4, 6, 7, 8, 9, 10].

Yes, it is obvious that trauma to the patellar ligament and infrapatellar fat pad by the protruding nail is a serious cause of chronic pain development, which must be prevented by intraoperative monitoring the depth of the nail immersion. This will eliminate the influence of one of the components in the multifactorial problem of pain in the anterior knee [3].

More interesting is the cause of the chronic pain in the anterior knee in patients included in the study with a tibia fracture type C according to the AO classification. The article notes that in none of the cases of pain, the proximal end of the intramedullary nail did not extend beyond the metaphysical zone, while 90% of patients with this type of fracture were diagnosed with anterior knee pain. As possible reasons, the authors of the study considered the excessive mobility of the intramedullary nail in the medullary canal of the tibia. In this case, a number of questions arise, the answers to which would greatly “strengthen” the discussing study and ultimately bring it closer to solving the raised issue:

- If intramedullary osteosynthesis was performed without preliminary rimming of the bone marrow canal, relying only on X-rays, was the nail diameter optimal for this clinical case?

- What intramedullary nail blocking schemes were used for stable fractures (static, dynamic)? Were the fragments dynamized on the intramedullary nail in case of delayed fracture consolidation, and did this affect the intensity of the pain syndrome?

- Given the fact that in the intramedullary osteosynthesis of the multifragmentary fractures, the anatomical reposition is difficult to achieve and the surgeons are primarily focused on restoring the correct length and axis of the injured segment, whether restoration of the limb axis was evaluated to native in the studied patients? Had the extremities been evaluated by tele X-ray to analyze a possible residual frontal deformation?

- After the fracture consolidation, was the rotational profile of the injured limb evaluated compared with the contralateral (using the computed tomography)?

- Had the patients with chronic pain syndrome some trials of minimally invasive treatment without removing the intramedullary nail, such as drug blockade or radiofrequency ablation of the infrapatellar branch of the saphenous nerve? Was the effect obtained?

Also, I would like to draw attention to the choice of questionnaires in the study to assess the nature and intensity of the pain syndrome. The SF-36 scale is not specific for the knee damage, and in any patient with chronic pain, the quality of life is reduced. The question “Does the pain in the anterior knee of the operated limb bother you?”, of course, is not a valid test. A patient with a hypertrophic scar in the area of skin access to the patellar ligament and a patient with anteromedial gonarthrosis will complain of pain in the anterior knee, but this is associated with completely different problems. Reliable scales have been developed to evaluate the

anterior knee, the use of which allows one to accurately evaluate its functional state, including for chronic pain after intramedullary osteosynthesis. The Lysholm Knee Scoring Scale [6] and Kujala Scale [11] were validated for Russian-speaking patients. The Aberdeen Weight-Bearing Test (Knee) is original, reproducible, and adapted specifically for the patients of the discussing study [12].

The use of specific and standardized questionnaires makes it possible to level out the likelihood of a misunderstanding of the issue by the patient, to objectify the data obtained during the patient examination, and ultimately “speak the same language” with other researchers.

In conclusion, I would like to emphasize that, despite a number of comments on the study, this study is extremely important, because the author was the first in the Russian-language literature who paid attention to this problem, analyzed the results of his patients treatment, trying to find a solution to an important clinical issue.

### Further research prospects

The more specific subsequent investigations of an anatomical and (or) physiological substrate of the chronic pain syndrome in patients with anterior knee pain, the introduction of suprapatellar access into practice and monitoring the treatment results, will allow the blocking intramedullary osteosynthesis for the diaphyseal tibia fractures to be an even more effective and safe type of surgery.

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