



METHODS OF COMPLEX REHABILITATION OF PATIENTS WITH OSTEOARTHRITIS (REVIEW OF LITERATURE)

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Article history:	Abstract:
Received: October 20 th 2022 Accepted: November 20 th 2022 Published: December 28 th 2022	The article provides a review of the literature on the methods of complex treatment of osteoarthritis. Medicinal and rehabilitation measures for osteoarthritis are considered. According to the literature, despite the complex treatment of arthrosis with non-steroidal anti-inflammatory drugs and chondroprotectors, it is not effective enough. Therefore, depending on the pathogenetic link of arthrosis, it is necessary to study complex restorative methods of treating this disease.
Keywords: osteoarthritis, synovial membrane, knee joint, rehabilitation, osteophyte, chondroprotectors	

RELEVANCE. Today there are a large number of different methods of treatment of osteoarthritis. But, despite the variety of techniques, they can conditionally be divided into conservative and operational. At the same time, some conservative methods are partly minimally invasive, since they require a puncture of the joint cavity. As part of conservative therapy, the following are used:

- 1) chondroprotectors (drugs of glucosamine and chondroitin);
- 2) physiotherapy;
- 3) intra-articular administration of hormonal preparations;
- 4) viscosupplementary therapy, including intra-articular injection of hyaluronic acid or platelet-rich plasma (plasmolifting);
- 5) non-steroidal anti-inflammatory drugs (NSAIDs).

Estimates of the possibilities of therapeutic influence on the course of osteoarthritis are presented in the work of the authors [7, 12, 15]. The fundamental role in the course of OA belongs to such CKs as interleukin (IL) - 1 β , -4, -6, -10, -17, -18, as well as tumor necrosis factor - α (TNF- α). Directly in chondrocytes, the action of these CKs is accompanied by an increase in the synthesis of proteases, a decrease in the synthesis of proteoglycans, a tissue inhibitor of metalloproteases, the progression of catabolism processes in cartilage tissue, and an increase in the destruction of cartilage matrix components.

Conservative treatment has a lasting positive effect only in the initial stages of the disease. In the late stages, conservative treatment of gonarthrosis gives a low effect and does not stop the progression of the disease.

Analysis of the information presented in Russian and foreign sources, we can confidently speak about the importance of the cytokine link in the pathogenesis of OA. The analysis of the composition of cytokine networks, the dynamics of changes in their structure, the analysis of relationships between changes in the levels of individual CKs relative to each other, the development, improvement and introduction into clinical practice of drugs that can pointwise influence certain representatives of the cytokine spectrum will radically change the approach to treatment of OA, since by effectively influencing the main link of pathogenesis, it is possible to change the course of the disease and thereby increase the patient's chances of recovery, as well as significantly reduce or completely abandon the use of cyclooxygenase inhibitors, thereby avoiding the occurrence of a number of complications characteristic of the use of non-steroidal anti-inflammatory drugs. Separately, in this context, it is worth noting the prospects of such non-invasive methods as TES-therapy, which, like pharmacotherapy, can affect the quantitative parameters of the cytokine profile. Undoubtedly, the complete recovery of patients in this category, accompanied by the restoration of cartilage tissue, regression of inflammation and, accordingly, a decrease in the severity of the pain syndrome, requires an integrated approach, namely the use of chondroprotectors, monitoring of cytokine levels, and physiotherapy.

In recent years, a number of works have been published on evaluating the effectiveness of the use of platelet autoplasm in comparison with viscosupplementary therapy, with injections of glucocorticosteroids. Despite the growing popularity of these techniques and a large



number of positive reviews, there is currently no single approach and developed methodology for the treatment of osteoarthritis of the knee joint. The results of treatment of patients with this pathology after a course of intra-articular injection of ozonated platelet auto plasma in the work of scientists [3, 12, 19, 24]. In the complex sanatorium treatment course intra-articular injection of ozonized platelet autoplasm was performed in 350 patients. In the vast majority of cases (85.5%), patients after a course of treatment with intra-articular injection of ozonized platelet autoplasm showed a decrease in pain, an increase in mobility in the knee joint, and an improvement in walking function. Depending on the severity of deforming osteoarthritis, 5 ml of ozonized platelet autoplasm was injected into each knee joint every 7 days, from three to five injections in total. The use of ozonated platelet autoplasm in the treatment of knee osteoarthritis using this technology is simple, affordable, and does not require sophisticated equipment.

In recent years, in orthopedic practice for the treatment of patients with osteoarthritis (OA), along with operations for total joint replacement, joint-preserving treatment methods are increasingly being used. These methods traditionally include conservative therapy with platelet-rich plasma (PRP-therapy), and surgical - corrective osteotomy, chondroplasty, etc. The use of joint-preserving treatment methods can significantly improve the quality of life of patients and for a long time, sometimes for years, delay the need for joint arthroplasty. However, in the orthopedic environment, there is a strong opinion about the inapplicability of joint-preserving methods in geriatric practice. The analysis carried out by the authors showed that there are no reliable data on the low effectiveness of joint-preserving methods in elderly patients, and all arguments about this are speculative. In the practice of the orthopedic department of GVV No. 3, joint-preserving methods of treating patients with OA have been used for a long time, and the accumulated experience allows us to draw conclusions about their effectiveness in patients of older age groups. Under supervision there is a significant number of patients for whom arthroplasty is impossible or extremely risky due to the presence of concomitant diseases. For these patients, the use of joint-preserving therapies is the only way to maintain mobility. Over the past two years, the department performed 1456 PRP-therapy procedures

for 479 patients. Within a year, a stable therapeutic effect in the form of a reduction in pain symptoms and an improvement in the quality of life was observed in 76% of patients. At the same time, there were practically no complications typical for the treatment of OA with corticosteroids. Among joint-preserving operations, preference is given to various options for chondroplasty, both arthroscopic and open, due to the low trauma and sufficient effectiveness of these methods. In the early stages of work, chondroautoplasty was actively used, but recently we have been increasingly using synthetic membrane materials. Thus, over the past two years, 56 open chondroplasties with synthetic materials have been performed in patients of older age groups. A good result was noted in 72% of cases. This experience shows that joint-preserving approaches to the treatment of OA can be used in patients of older age groups as additional methods in cases where, for a number of reasons, arthroplasty is impossible or extremely risky [17, 27, 29].

Share their experience of using osteochondral mosaic plasty in 25 patients with deforming osteoarthritis of the knee who had articular cartilage defects, which was about 16% among this group of patients. Long-term results were studied in 15 patients over a period of 1 to 5 years. In 93.4% of them, a pronounced clinical improvement was noted in the form of a decrease in the level of pain syndrome, assessed using the Lequesne index. In two patients, treatment outcomes were tracked for 16 years. A stable remission of the disease was recorded for 10 years. But in the future, a gradual development and intensification of the pain syndrome followed, which eventually became resistant to conservative therapy, which required knee arthroplasty. Thus, the active use of osteochondral mosaic plasty in patients with osteoarthrosis of the knee, who have articular cartilage defects, has a positive effect in terms of improving the functional results of treatment and the prognosis of the course of the disease, and allows you to delay knee arthroplasty, subject to careful selection patients [4, 5, 21].

The problem of choosing tactics for the treatment of osteoarthritis of the knee is still the subject of discussion in modern orthopedics. A large database of clinical studies and meta-analyses of the results of many years of use of surgical methods of treatment, such as therapeutic and diagnostic arthroscopy,



corrective periarticular osteotomy of the femur and tibia, unicondylar arthroplasty of the medial and lateral parts, total knee arthroplasty, show their high efficiency in terms of recovery limb function, reducing pain intensity. Currently, the operation of corrective periarticular osteotomy is again becoming in demand, since the technique of total knee arthroplasty is more expensive and requires revision interventions, especially in young patients. The authors of this study analyzed the results of treatment of patients with deforming osteoarthritis of the knee joint II-III stage. methods of corrective osteotomies performed based on the Department of Traumatology No. 3 of the Elizabethan Hospital, St. Petersburg.

The appearance of new symptoms, together with radiological signs of OA progression, was defined as an indication for a new surgical intervention, since it is the improvement of the patient's quality of life that is the goal of treatment. To clearly determine the severity of damage to the knee joint (2-3 stages of arthrosis), the authors recommend conducting a preliminary diagnostic arthroscopy. In case of valsiing external osteotomies of the tibia with varus deformity of more than 15 degrees, a shortening osteotomy of the fibula is required. Oblique shortening osteotomy is recommended to be performed at the border of the middle and lower thirds, in the direction from the outside inwards, from top to bottom, with access along the anterior surface, which helps prevent pathological deformity of the lower third of the leg and minimize vascular and neurological disorders. The main factors in relation to a favorable outcome of treatment are good technical equipment, the availability of metal structures suitable for the chosen method of treatment, as well as the possession of the necessary surgical skills by the attending physician. The choice of osteotomy method directly depends on the listed factors [11, 13, 24, 27].

Aim of the study: to improve the clinical effectiveness of the treatment of gonarthrosis using an individualized therapy regimen. Examination and treatment of 63 patients diagnosed with stage II-III gonarthrosis was performed. Patients of group I received standard treatment (StT), patients of group II received injections of AutoBoTP to StT, and injections of PHA and AutoBoTP were added to StT of group III. The condition of patients before and after treatment was assessed using generally accepted scales and questionnaires and the electrolyte composition of the

synovial fluid (SF). Results. The best result of therapy in patients of group III. There was a decrease in the severity of pain with a long period of remission, an increase in the range of motion and normalization of mineral metabolism in the SF, due to a decrease in the Ca²⁺/PO₄³⁻ ratio. Conclusion. The use of the proposed system of treatment of gonarthrosis according to the scheme StT with PHA and AutoBoTP allows to improve the results of treatment and improve the quality of life of patients [14, 23].

Osteoarthritis causes joint pain and functional disorders, of which osteoarthritis of the knee is the most common. Currently, clinically effective treatments mainly include conservative treatment, arthroplasty and osteotomy. However, conservative treatment offers only symptomatic relief, and arthroplasty is limited to patients with moderate to severe osteoarthritis. For relatively young patients who require greater preservation of the knee joint, surgical treatment with a small surgical trauma and a frequency of revisions is necessary. Osteotomy around the knee, based on the concept of "knee sparing", was chosen as an alternative surgical treatment. Cutting and realigning the bones corrects the mechanical line of force loading on the lower extremities. As such, an osteotomy around the knee maintains a normal anatomical structure and provides good functional recovery of the knee joint. Methods of osteotomy around the knee include osteotomy against varus deformity and osteotomy against valgus deformity, aimed at redistributing the force load in the compartment of the knee joint. By choosing the surgical site of the lower extremities, osteotomy around the knee allows for mechanical axis correction such as high tibial osteotomy (HTO), proximal peroneal osteotomy (PFO), and distal femoral osteotomy (DFO). Numerous modified methods based on traditional methods have been developed to meet the needs of patients. These modified osteotomies have their own advantages and indications Peng H., Huang X., (2021).

Osteoarthritis of the knee with varus displacement and medial space stenosis is a common degenerative disease in the elderly. To redistribute the force load from the medial to the lateral section, an antivarus osteotomy is performed, including high tibial osteotomy (HTO) and proximal fibula osteotomy (PFO), using surgical methods to correct the mechanical lines of the lower extremities, which reduces abrasion of the



medial cartilage and relieves pain. PFO is based on the theory of "non-uniform calculation". It consists in cutting a small section of the proximal fibula, i.e., below the head of the fibula, which breaks the fibula and weakens its support for the lateral side of the tibial plateau, and finally reduces the gap on the lateral side of the knee joint and displaces the knee. PFO and WTO have the same short-term efficacy in the treatment of OA, but PFO reduces the time of surgery, intraoperative bleeding, hospital stay and postoperative complications, which has certain advantages. Clinically, for patients with many complications and poor tolerance to surgery (PFO is preferred Wu ZX, Ren WX, Wang ZQ. (2022)). With some advances in the clinical management of OA, the quality of life of patients with OA has improved. However, there is still a clinical need for more effective treatments for OA. Increasing evidence shows that macrophages are an important breakthrough in the treatment of OA. Macrophages stimulated by various factors differentiate into two phenotypes: the pro-inflammatory type M1 and the anti-inflammatory type M2. This study summarizes various therapeutic agents for the treatment of macrophage-dependent OA, including physical stimuli, chemical compounds, and biological molecules. Subsequently, the mechanisms of action of various approaches to macrophage modulation are discussed and the signaling pathways underlying these treatments are interpreted. NF- κ B signaling plays a vital role in the onset and progression of macrophage-mediated OA, as NF- κ B signaling agonists promote OA, while NF- κ B inhibitors improve OA. In addition, several signaling pathways are also involved in OA, including the JNK, Akt, MAPK, STAT6, Wnt/ β -catenin, and mTOR pathways. Thus, macrophage polarization is a critical node in the regulation of the inflammatory response in OA. Reagents targeting macrophage polarization can effectively inhibit joint inflammation, ultimately alleviating OA symptoms (Sun Y, Zuo Z, Kuang Y. 2020) Scientists of the Novosibirsk Institute Research Institute of Traumatology and Orthopedics. Ya.L., Sivyan developed a method for the surgical treatment of deforming osteoarthritis of the knee joint of the II degree. An autograft is taken, a canal is formed in the tibia and the autograft is installed in the formed canal. At the same time, two canals are formed in the tibia by cutting out cylindrical In addition, two canals are formed by cutting out cylindrical elements in the subchondral zone of the medial condyle of the femur, and the

channels in the femur and tibia are cut parallel to each other and relative to the joint space of the knee joint, the autograft is taken by isolating from crest of the iliac crest of four cylindrical elements corresponding to the dimensions of the cylindrical channels in the femur and tibia, the corresponding elements are installed in the channels of the femur and tibia of the transplant, and cylindrical elements obtained by forming channels in the femur and tibia are installed at the site of the autograft in the iliac wing. EFFECT: method makes it possible to preserve the integrity of all anatomical structures of the knee joint and the iliac wing, providing high efficiency of treatment.

The cornerstone in the treatment of osteoarthritis in young patients is the assessment and correction of the leg axis. The combination of joint injury (meniscus, cartilage, ligament) and axis deviation inevitably, depending on its degree and the patient's comorbidities, such as obesity, leads to progressive osteoarthritis of the knee after a few years. In addition to accurate deformity analysis for osteotomy planning, it is important to know the normal ranges of the respective angles and determine the target value for axis correction. Reflecting the repertoire of different osteotomies around the knee (open vs. closed, tibial vs. femoral, medial vs. lateral), side effects should then be assessed in terms of patellofemoral displacement, ligament balancing, and leg length (Imhoff FB, Fucentese SF. 2021)

Approximately 10% of patients undergoing total knee arthroplasty develop hallux valgus. When performing total knee arthroplasty in severe valgus deformity of the knee joint, it is necessary to know the technical aspects of surgical exposure, bone incisions of the distal femur and proximal tibia, balancing the medial and lateral ligaments, balancing the flexion and extension interval, creating an appropriate line more than the tibia hip joint. balancing the patellofemoral joint, preserving the function of the peroneal nerve, and choosing an implant, taking into account the limitations. The restoration of a neutral mechanical axis and the correct balance of the ligaments are important factors in the stability and durability of the prosthesis, as well as a good functional result. Prior to any total knee arthroplasty, preoperative planning is strongly recommended, and the surgeon should inform treated patients of potential fibular paralysis in cases of severe hallux valgus. Surgical treatment depends on the



degree of deformity (Alesi D, Meena A, Fratini S, (2022)).

A group of German scientists (Beckmann J, Barrett D. 2022) evaluates approaches to arthroplasty: before, during and after surgery. Personalized medicine has been introduced into endoprosthetics a long time ago with the goal of respecting each individual for their unique personal characteristics to further improve outcomes. Compared to the early days of arthroplasty, the range of implant types, implant sizes, geometries, and implant techniques has expanded significantly over the past decades to better match patient needs and anatomy. Some of these technical enhancements have been hailed as the new holy grail, but most of them have disappeared again or been repackaged into existing vehicles as minor updates. Changes in hip arthroplasty seem to be less radical and more conservative due to the durability of the implants and the high level of patient satisfaction. In knee arthroplasty, 20% to 30% remain dissatisfied, urging surgeons, designers, and implant manufacturers to find solutions to their problems. Over the past two decades, sizing problems such as overhang and pain or reduced size and flexion instability have been resolved. This has led to the development of many different sizes with more representative anatomical aspect ratios and better surface matching in almost all modern implants and has resulted in truly customized implants made for each patient. There is also a resurgence in partial knee replacement, where resurfacing only the affected side of the knee can lead to better results. This can be done in perhaps 50% of patients instead of using general data. The opposite of the three times higher revision rate of partial knees compared to full knees can be clearly disarmed by surgical experience, and more recently also for the first time by registry data. The German Endoprosthesis Registry (EPRD) shows a similar frequency of revisions in those clinics where a large volume of a partial knee joint is performed. The latest debate regarding individuality in knee arthroplasty is the debate and the trend towards individual alignment. Each person has their own unique type of coronal alignment. The idea is to get closer to this natural alignment with the tilted position of the implant. To be able to achieve these more complex goals in surgery, new technologies are needed, with precision robots being the newest trend, of course. Paradoxically, all these high-precision methods, such as

robots, computer navigation, or special patient instruments, have been used for a decade to avoid surgical deviations outside of the neutral mechanical axis. Now they help to implant the same prostheses in different abnormal positions. This new trend clearly shows that the goal of coronal alignment has changed. It remains only to prove that this improves the subjective outcome of the patient and does not lead to a decrease in survival. The new generation of robots combines the advantages and precision of navigation and robotics. Undeniably, the accuracy with these technologies is higher than with conventional fixtures and eyeballs, even when compared to experienced surgeons. However, careful planning is a must to avoid the possible "garbage in, garbage out" effect.

A difficulty with knee replacements remains that all implants are made of metal and plastic and that they must replace cartilage, menisci, and soft tissue structures such as ligaments. In addition, their shapes and radii of curvature were determined over 40 years ago, mainly to avoid premature failure of materials. Today, these symmetrical implants require advanced technological tools for their asymmetric implantation in the native knee joint. The development of asymmetric implants that take into account the individual displacement of each part of the human knee may be the best evolution. Today, this remains difficult due to the logistics associated with this type of treatment and the high cost. However, if the cost of goods can be reduced with economies of scale and higher volumes of use, this may be a more attractive concept for future arthroplasty. If this is combined with robotic type of surgery, reducing the need for instrument kits, and the patient-specific knee eliminates inventory, the orthopedics value chain will experience its first new economic revolution in decades.

Literature data indicate that the physiotherapeutic treatment of osteoarthritis in complex treatment is an important method. The structure of physical and rehabilitation medicine technologies for patients with OA, in addition to physical exercises, includes acupuncture in various forms (normal, laser puncture, electropuncture, cauterizing needles), low-frequency electrotherapy, high-frequency therapy, laser therapy and ultrasound therapy (using non-steroidal anti-inflammatory gels). Also in the structure technologies include pulsed magnetic field, orthotics using brace and tape, massage, manual therapy,



pelotherapy, hydrotherapy, balneotherapy [Abuseva G. R., Kovlen D. V., Ponomarenko G. N. et al. 2013].

In case of pain syndrome, local electrophoresis of iodine and novocaine is carried out on the area of the joints. In reactive synovitis, electrophoresis of analgin, novocaine, salicyl has an analgesic, anti-inflammatory and hyposensitizing effect [Tursunova A. M., Abdurahimova L. A. 2015].

In OA, laser therapy is used as the main method of treatment, which has anti-inflammatory, analgesic, stimulating effects. The recovery time is reduced, swelling and pain are removed, microcirculation is restored. The recovery period is significantly reduced, swelling disappears, pain is relieved, microcirculation is normalized. [Zimin V.P. 2019].

In recent years, high-tone therapy has been widely used in the West for the treatment of OA. High-tone therapy is distinguished by a periodic change in frequency in a wide range of electrical variables from 4 kHz to 32 kHz. It has vasodilating, neuromyostimulating, decongestant, anti-inflammatory, resorptive, trophic, antispasmodic, sympatholytic, gangliolytic, lipolytic effects [Maksimov A. V., Shibanov E. N., Yamaldinova E. A. 2018].

A fairly popular physiotherapeutic method is neuromuscular electrical stimulation (NMES), which is also used for osteoarthritis. Due to the stimulation of nerve fibers, this method is able to have an analgesic effect [Mengelbaeva Z. Ya. 2020]

Zeng C. et al. (2015) conducted a systematic review and meta-analysis of a randomized controlled trial using low-frequency and high-frequency transcutaneous electrical neurostimulation (H-TENS and I-TENS), interference currents (IFC), neuromuscular electrical stimulation (NMES), non-invasive neurostimulation (NIN), pulsed electrical stimulation (PES) in patients with OA. As a result of this study, it was found that interference currents have an analgesic effect. And h-TENS differs with the least analgesic effect.

Concluded that bromine-iodine baths (in combination with other procedures) are the most effective treatment for elderly patients with knee OA. In addition to iodine-bromine baths (10 procedures every other day, with a water temperature of 36-37 °C, lasting 10 minutes), the basic medical complex included: physiotherapy exercises daily No. 10-12 procedures,

magnetotherapy and manual massage of the joints (daily, No. 8).

Also, Lepshokova A. B. (2017) in her studies revealed high efficiency (88.9%) of the complex use of therapeutic exercises in the pool, radon baths and magnetotherapy with a low-intensity dynamically changing magnetic field, which was manifested by a significant improvement in metabolic, inflammatory and biochemical reactions, improvement quality of life. One of the new methods of physiotherapy, which allows to obtain an analgesic effect without side effects, is high-intensity pulsed magnetic therapy (HIMT) with a magnetic induction value of up to 1.5-3 T. International studies demonstrate the high efficiency of SIS therapy (BTL-6000 Super Inductive System) in the treatment of diseases of the musculoskeletal system.

After analyzing the literature data on the use of physiotherapeutic methods of treatment in patients with OA, we can conclude that physiotherapy in this disease is essential. There are a huge number of physiotherapy treatments for patients with OA that have a high therapeutic efficacy. It is important to select the correct dosage, the duration of the effect of the method, the course of therapy, the selection of the correct combination with other methods of treatment and take into account the contraindications of each method. It is also necessary to know that risk factors such as age, gender also play an important role in the treatment of patients. It is also worth paying attention to the conditions of the musculoskeletal system, to the presence of concomitant diseases, which are most often found in the elderly. Considering all the subtleties of the application of physiotherapy methods, it is possible to help slow down the progression of the disease, increase the working capacity of patients, and significantly improve the condition and quality of life of patients.

To date, most of what is known about osteoarthritis prevention and risk factors for osteoarthritis is related to the disease (underlying biology and pathophysiology) of osteoarthritis, with several studies addressing risk factors for osteoarthritis, force driving personal, financial, and social stress.

Thus, this descriptive review discusses what is known about the prevention of osteoarthritis, proposes actionable prevention strategies related to obesity and joint injury that have become important modifiable risk factors, identifies where evidence is lacking, and provides insight into what might be perhaps from a



prevention perspective, focusing on a lifelong approach to osteoarthritis as opposed to structural disease in the elderly.

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