ijlpr 2023; doi 10.22376/ijlpr.2023.13.6.L427-L435

International Journal of Life science and Pharma Research

ISSN 2250-0480

Case Report

Medicine for novel therapy

The Multidisciplinary Management of the Patient with Knee Endoprosthetics. A Case Report

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Abstract: The most commonly diagnosed type of arthritis is osteoarthritis (OA) of the knee joint, the incidence of which constantly increases with increasing life expectancy. The aim of this case study is the multidisciplinary management of the patient with knee endoprosthetics. The case was defined as the right knee joint's osteoarthritis operative treatment and rehabilitation. A 64-year-old -male patient complained of right-sided stage III idiopathic gonarthrosis. The patient passed the general blood analysis, biochemical blood analysis, coagulogram, and urine analysis. The patient passed the ultrasound low limbs veins examination. The total right knee endoprosthesis with the implantation was done. The prosthesis components as Journey II BCS Femoral Component Right 4, Tibial component Journey Right 4, and liner Journey II BCS XLPE Right 10 mm 3-4 were fixed to the male patient. The patient's rehabilitation period passed through three stages: III, idiopathic gonarthrosis with various deformities of the right lower limb; stage III, patellofemoral arthrosis, synovitis of the right knee joint, osteoporosis, complicated joint insufficiency, and stage III. The male patient was prescribed the non-steroidal anti-inflammatory drugs (NSAIDs). The male patient received the treatment with the hyaluronic acid. The male patient had no improvement results for four years, and the pharmacological treatment was unsuccessful. The prosthesis components are Journey II BCS Femoral Component Right 4, Tibial component Journey Right 4, and liner Journey II BCS XLPE Right 10 mm 3-4 fixed to the male patient. Physical rehabilitation after the total knee endoprosthetic was performed several stages after surgery. Stage one - immediately after surgery during the first 5 days. Stage two – the clinical stage in the early recovery period. Stage three - after the hospital during the first 3 months. After 6 months, the male patient was allowed to walk without the additional support. He was restricted from lifting weights and preventing falls. A year after the operation, the right knee joint movements' amplitude was sufficient, and there was no pain syndrome. Total knee endoprosthesis leads to high patient satisfaction and provides patients with life-quality benefits, pain relief, and function. The patient's rehabilitation period, including physical exercises and physiotherapy, is a very important stage. Effective patient rehabilitation after knee endoprosthetics is possible using multidisciplinary management.

Keywords: Total Knee Endoprosthetics, Osteoarthritis, Pain Syndrome, Physical Exercises, Physiotherapy, Rehabilitation, Multidisciplinary Management

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Received On 13 March, 2023

Revised On 30 September, 2023

Accepted On 10 October, 2023

Published On 1 November, 2023

Funding This research did not receive any specific grant from any funding agencies in the public, commercial or not for profit sectors.

Citation Zhuravleva Nadezhda Vladimirovna, Diomidova Valentina Nikolaevna ,Ukhterova Nadezhda Dmitrievna, Guryanova Evgenia Arkadievna, Smirnova Tatyana Lvovna and Vlasov Andrey Valerievich , The Multidisciplinary Management of the Patient with Knee Endoprosthetics. A Case Report.(2023).Int. J. Life Sci. Pharma Res.13(6), L427-L435 http://dx.doi.org/10.22376/ijlpr.2023.13.6.L427-L435

1. INTRODUCTION

The most commonly diagnosed type of arthritis is osteoarthritis (OA) of the knee joint, the incidence of which constantly increases with increasing life expectancy. Studies have shown that about 10% of men and 13% of women aged 60 years and older have a characteristic OA of the knee joint. In patients over 70 years of age, the incidence increases to 40%. OA of the knee joint is more common in women than in men. Depending on the etiology, there are two types of OA: primary (non-traumatic or idiopathic) and secondary (due to mechanical displacement or injury). According to the results of the Kellgren-Lawrence (KL) radiography system (1957), four radiological stages of OA are distinguished. [1]As shown by the study of Creamer et al. (1998), only 15% of patients radiologically diagnosed with knee joint OA have disease symptoms. Pain in the knee joint is the most common symptom of knee joint OA, negatively affecting the quality of life and its duration. The intensity of the pain can vary from constant to periodic, from mild to severe (by the VAS scale), which decreases the range of motion. Chronic pain disrupts physical and social functioning, emotional and mental health, energy, vitality, and general health of the patient. In addition, patients with OA suffer from an entire spectrum of symptoms that, to varying degrees, disrupt normal daily functions, including sleeping, walking, climbing stairs, cooking, or self-care. Chronic diseases of the musculoskeletal system, including OA, have proven to have a greater adverse effect on the quality of life than other chronic diseases, such as cardiovascular, respiratory, cerebrovascular, and neurological disorders, diseases of the gastrointestinal tract, and cancer.[2, 3] In the development of OA, such causes as metabolic disorders, injuries, biochemical reactions, and mechanical effects are distinguished. [4-8] The articular cartilage structure includes proteoglycans, type II collagen, water, and chondrocytes. The normal structure of an articular cartilage maintains a balance between all components, the synthesis of which corrects any cartilage disorders. In OA, the level of degrading enzymes, also known as matrix metalloproteinases (MMPs), increases, which results in a decrease in the number of proteoglycans, despite their enhanced synthesis, in a higher water content, chaotic collagen structure, as well as in a decrease in the elasticity of articular cartilage. The synovial fluid in OA has been found to contain several inflammatory mediators, such as leukotrienes (LKB4), growth factors (VEGF, TGFß, NGF, and FGFs), plasma proteins (C-reactive protein), cytokines (IL1β , IL6, IL15, IL17, IL18, IL21 and TNF), complement components, nitric oxide and prostaglandins.[9, 10] All of the components mentioned above are capable of generating MMP, as well as certain hydrolytic enzymes (including prostaglandin E and cyclooxygenases) at the local level, which causes damage to collagen and proteoglycans and results in the destruction of cartilage. The immune system cells (mast cells and macrophages) identify certain molecules (molecular models associated with damage) formed during the destruction of the extracellular matrix, which determines the action of leukocytes in the protection process.[12,13] These changes lead to cracks in the cartilage and, ultimately, damage the articular surface. Studies have shown that the cartilage is not the only affected part in OA. The cartilage cannot cause pain or inflammation due to the absence of a vascular network and innervation in the early stages of the disease. For this reason, the pain has mainly been caused by changes in non-cartilaginous components of the joint, such as ligaments, the subchondral bone, the joint capsule, periarticular muscles, and the synovial membrane. [9] As the disease progresses, these parts get damaged, weakening the periarticular muscles, bone remodeling, synovial effusion, weakening of ligaments, and formation of osteophytes.[10] Conservative treatment of knee osteoarthritis: Currently, there are many conservative methods of treating primary knee joint osteoarthritis in middle-aged patients, which contribute to improving and slowing the disease progression. At an early stage of knee joint osteoarthritis in patients who do not have obvious symptoms, work performance, personal and family life do not suffer; conservative therapy can delay the progression of osteoarthritis. Unfortunately, conservative therapy does not bring relief to several patients. It is important to inform patients promptly about the need to reduce body weight to recommend limiting such physical exercises as climbing, squatting, and long-distance running.[14, 15] Weight loss has a unique value and brings the greatest benefit to patients by reducing the load on the joints.Lack of the patients' awareness and training is often a factor causing further development of knee joint osteoarthritis. Muscle strength training can effectively relieve pain in patients and help to restore knee joint function. At the same time, it has been proven that water procedures have a good therapeutic effect, and patients have better compliance. Many modern physical treatment methods (electrotherapy, low-frequency magnetotherapy, ultrasound, laser) relax muscles, stimulate local blood circulation, and improve knee joint function.[16-18] Pharmacological treatment. Non-steroidal anti-inflammatory drugs (NSAIDs) in the treatment of OA are very effective. Still, their use is associated with a wide range of adverse reactions affecting the liver, the kidneys, the cardiovascular system, the skin, and the intestines.[19] Non-steroidal anti-inflammatory drugs' side effects in the gastrointestinal tract are the most common and cover a wide clinical spectrum. These pharmacological drugs cause dyspepsia, heartburn, and abdominal discomfort. In addition, they cause the gastric ulcer with life-threatening complications in the form of bleeding and perforation. Thus, NSAIDs have anti-inflammatory and analgesic effects while reducing or preventing their adverse effects on the body. Over the last few years, much attention has been paid to the adverse cardiovascular effects COX-2 in selective NSAIDs, which prompted a review of the global safety profile of traditional anti-inflammatory drugs. Local NSAIDs offer an alternative to reduce the risk of systemic NSAIDs. Although local NSAIDs are considered relatively safe, their side effects on the skin are visible (from 10% to 39%).[20] The efficacy and safety of oral opioid therapy raises concerns. Continuous daily intake of opioid analgesics causes tolerance and physical dependence to a certain extent. The European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) recommends an algorithm for the use of slow-acting symptomatic drugs for the treatment of osteoarthritis (SYSADOA), including glucosamine sulfate and chondroitin sulfate as first-line therapy for knee joint osteoarthritis.[21] Chondroitin sulfate and glucosamine sulfate have a beneficial effect on the metabolism of in vitro cell models derived from synovial bursae: chondrocytes, synoviocytes, and subchondral bone cells, all of which are involved in the development of osteoarthritis. They increase the synthesis of type II collagen and proteoglycans in human chondrocytes. They can reduce the production of certain pro-inflammatory mediators and proteases, reduce the process of cell death, and improve the anabolic/catabolic balance of the extracellular cartilage matrix. Surgical treatment: Intra-articular punctures and injections into the knee joint are an invasive surgical method for treating knee joint osteoarthritis. Commonly used drugs for injections include glucocorticoids, ozone, hyaluronic acid, and platelet-rich plasma. Intra-articular corticosteroid injections are a

common method of pain relief in patients with knee joint OA. The effect of intra-articular glucocorticoid administration lasts about 1-3 months. The mechanism of ozone's action is to activate cellular metabolism to reduce prostaglandin synthesis, thereby relieving pain and improving joint function and the quality of life. Intra-articular administration of ozone combined with oral NSAIDs significantly reduced pain intensity in patients with the I-II X-ray stage of knee joint OA. Hyaluronic acid (HA) is still included in the second line of treatment in patients with knee joint OA. It has been demonstrated that HA is more effective than corticosteroids. In 3-5 weeks of injections, HA had an analgesic effect lasting 5-13 weeks, while corticosteroids had an analgesic effect lasting only 3-4 weeks.[22, 23] Platelet-rich plasma (PRP) has been considered a new and promising option used to trigger regeneration of the damaged cartilage. PRP, an autologous agglomeration of human platelets in a small volume of plasma, contains several growth factors secreted by platelets that promote the healing of mesenchymal tissues. Platelet-rich plasma is a safe treatment method that benefits patients; the effect lasts up to 12 months.[24] Performing arthroscopy in OA relieves pain symptoms, eliminating loose cartilaginous flaps and destroyed meniscus parts.[25] However, the effectiveness of arthroscopy in treating knee joint OA is questionable. There is little evidence showing positive results of arthroscopy, although it is widely used. Some studies have demonstrated that arthroscopy temporarily reduces symptoms in middle-aged patients with knee joint OA.[26] Primary total knee arthroplasty (TA) has been indicated in patients who do not respond to conservative measures.[27] TA of the knee joint is a safe and highly effective method of treating the symptoms of moderate and severe osteoarthritis while reducing pain and restoring function. Elderly patients are usually at a higher risk of postoperative complications. Still, the latter has been avoided by following the enhanced Recovery after surgery protocol, a multimodal method of perioperative care intended to achieve a speedy recovery of patients who have undergone serious surgery.[28] In the postoperative period, there remains a high risk of infection in violation of the rules of aseptic and antiseptics, which requires medical specialists to introduce preventive methods. [29] The ultimate goal for patients after knee TA is to restore an active lifestyle free of pain. This result depends on the surgery and the steps taken at the pre- and postoperative stages to minimize any complications and speed up the recovery process. Patient education is an essential component of preoperative management, which includes informing patients about the benefits and risks of knee joint TA. [30] In addition, waiting for surgery can cause anxiety and fear in many patients, so teaching before anesthesia significantly reduces anxiety and emotional stress before knee replacement. Preoperative education increases trust, patient satisfaction, and a speedy recovery and discharge. At the same time, the preoperative education program needs to set achievable goals for postoperative anesthesia, physiotherapy, and mobilization.

1.1 Case study

Sixty-four aged male patient complaints with right-sided stage III idiopathic gonarthrosis were analyzed. His patient's disease history was studied. The physicians made all the procedures by the ethical standards established by the Helsinki Declaration of 1964, as amended in 2013, by the ethical standards of the Supervisory Board of the Naresuan University (IRB566/59 and Certificate of Authenticity № 573/2016). The patient's general examination has been held. The right knee joint's preoperative and postoperative X-rays in two projections have been done. The male patient passed the general blood analysis, biochemical blood analysis, coagulogram, and urine analysis. The patient passed the ultrasound low limbs veins examination. The total right knee endoprosthesis with the implantation has been done. The prosthesis components as Journey II BCS Femoral component Right 4, Tibial component Journey Right 4, and liner Journey II BCS XLPE Right 10 mm 3-4 have been fixed to the male patient. Physical rehabilitation after the total knee endoprosthetic has been carried out in several stages after surgery. The patient's rehabilitation period passed through three stages. Stage one - immediately after surgery during the first 5 days. Stage two– the clinical stage in the early recovery period. Stage three - after the hospital during the first 3 months. In the first hours after surgery, the early postoperative period includes bed activation. Then, the first verticalization with the additional support was done. The patient had been prescribed bandages, magnetic therapy, electrotherapy, physical exercises, elastic bandaging of both lower limbs, and massage. Beginning with the second day after the operation, the transition to a sitting position with lowered legs, training in getting up and walking, exercises for all joints of the limbs, sitting down in bed with the help of hands, turns to the sides have been mastered with the help of the physiotherapists. Starting from the third day, walking long distances has been prescribed. Walking on a dynamic ladder-bars simulator started on the fifth day after the operation. Starting from the sixth day, the patient has moved to the second stage of rehabilitation in the inpatient department of trauma rehabilitation at the BI "Municipal Clinical Hospital № 1" under the Health Ministry of Chuvashia. [31] The physical therapist conducted daily physical exercises - special, respiratory, and vital. Mechanotherapy on the Artromot device was prescribed - passive development of the right knee joint, 0/40-0/90 degrees daily. The patient received the psychologist's consultation. In the second stage, the anticoagulant Rivaroxaban in the dose of 0.01g is recommended, orally, one tablet x once a day, at 20:00, strictly during meals, daily. It was recommended to continue elastic bandaging of both lower extremities for up to 3 months from the moment of surgical treatment (elastic knitwear of the second compression class: elastic stockings or elastic bandages up to the upper third of the thigh). Walking with crutches, extra support, and a metered increasing load on the right lower limb for up to 6 weeks with the transition to using a cane has been recommended. Starting from the sixth-eighth week, walking with a cane and no crutches has been suggested. Stair training and physiotherapy treatment were proposed.

1.2 Preoperative education

Preoperative patient education (PPE) programs have been formed to improve patient compliance and outcomes through proper self-care education and the rehabilitation period. After the consultation, the patient accepted spinal anesthesia. The preoperative patient education program passed effectively. The study has been carried out with the help of the traumatology department's specialists of the Budgetary Institution "The City Clinical Hospital №1" of the Ministry of Health of Chuvashia. The participant clearly explained the study's purpose, and written informed consent was obtained before conducting the study. All the procedures have been performed by the ethical standards of the Helsinki Declaration of 1964 (as revised in 2008).

1.3 Radiography diagnosis

The doctors made the radiography of the right knee joint in 2 projections. The angle between the right femur's mechanical axis and the lower leg's anatomical axis is 8 degrees. The angle of the valgus deviation of the femur (between the anatomical and mechanical axes) is 8 degrees. The ratio in the joint has been violated. Genu varum, the articular cavity has significantly narrowed (more than 1/2 of the articular cavity height in the medial region). Intercondylar eminences have sharpened. Cyst-like clearances are visible against the background of subchondral sclerosis of adjacent articular surfaces. Marginal bone growths of the femoral and tibial condyles and the patellar poles have been observed. Local osteoporosis in the epiphyses of the femur and tibia is noted.

1.4 Conclusion

Right-sided deforming gonarthrosis of stage 3, patellofemoral arthrosis of stage 2, genu varum, and local osteoporosis in the epiphyses of the femur and tibia have been noted (Fig. 1).

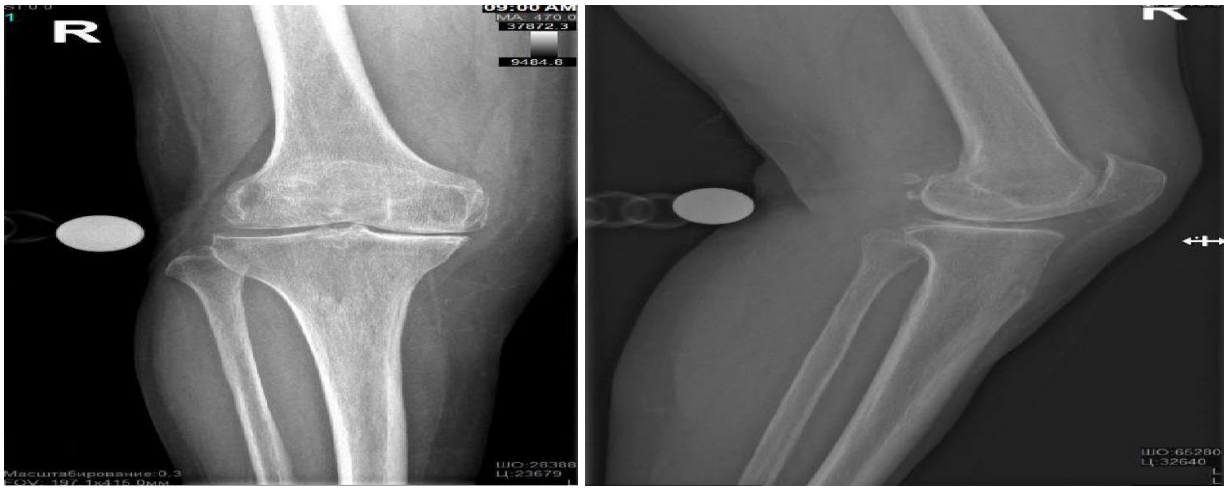

Fig.1. The right knee joint in 2 projections.

The patient was hospitalized in the traumatology center in March 2022 with complaints of constant aching pains (5-6 points by the VAS) in the area of the right knee joint during walking, physical exertion, periodic at rest, lameness, restriction of the right knee joint's movements, deformation of the right knee joint area. History: Beginning in October 2018, pain in the area of the right knee joint appeared for no apparent reason. He denied any injuries. Heredity for diseases of the musculoskeletal system has not burdened. The pain syndrome and function restriction progressed against the background of conservative treatment (chondroprotective agents, magnetotherapy, electrotherapy, situational use of NSAIDs, intra-articular steroids, and hyaluronic acid). To relieve pain, the patient took ibuprofen daily with little effect. The patient had difficulties at home and work. Due to no effect of conservative therapy and the progression of symptoms, despite his high adherence to therapy, after 4 years of conservative treatment, the patient was referred to a traumatologist in August 2022 to develop the tactics of subsequent treatment. On examination: The condition is satisfactory. There are no peripheral edemas. The nutrition is satisfactory (BMI 24.7 kg/m^2). The patient's respiration is vesicular. There is no wheezing. The respiratory rate is 18 per minute. Cardiac auscultation: the pulse is regular, the heart tones are muffled, the heart rate is 72 per minute, and the blood pressure is 135/85 mmHg. The tongue is not coated and moist. The abdomen is soft painless. The liver has not enlarged. The spleen is not palpable. Intestinal habits: regular, formed. Costovertebral angle tenderness: negative on both sides.

1.5 Patient's physical difficulties

The patient moves independently with the support of a cane. the gait is gentle, limping slightly on the right lower limb. There is hypertrophy of the anterior muscle group of the right thigh, moderate swelling, and deformation of the right knee joint area; the skin of the right knee joint area is of normal color. There is a varus deviation of the right lower leg with an angle of 8 degrees. Palpation shows soreness in the projection of the anterior surface of the right knee joint. The right knee joint movements include active - flexion 89 and extension 165. Vascular disorders are not noted. There is no neurological deficit. The doctors made the radiography of the right knee joint in 2 projections. The angle between the right femur's mechanical axis and the lower leg's anatomical axis is 8 degrees. The angle of the valgus deviation of the femur (between the anatomical and mechanical axes) is 8 degrees. The ratio in the joint has been violated. Genu varum. The articular cavity is narrow (more than 1/2 of the articular cavity height in the medial region). Intercondylar eminences have sharpened. Cyst-like clearances are visible against the background of subchondral sclerosis of adjacent articular surfaces. Marginal bone growths of the femoral and tibial condyles and the patellar poles have been observed. Local osteoporosis in the epiphyses of the femur and tibia is noted. Conclusion: right-sided deforming gonarthrosis of stage 3; patellofemoral arthrosis of stage 2; genu varum; local osteoporosis in the epiphyses of the femur and tibia has been noted. Based on complaints, anamnesis, objective, and instrumental findings, a clinical diagnosis has made right-sided stage III idiopathic gonarthrosis with varus deformity of the right lower limb. Stage III patellofemoral arthrosis. Synovitis of the right knee joint. Osteoporosis. Complicated Joint insufficiency stage III. Concomitant diseases: Hypertension of the II degree, controlled hypertension. Diastolic dysfunction of the right ventricle. GFR is 75 ml/min/1.73m^2 SKD-EPI. The target blood pressure level is less than 139/80 mmHg. The risk is high. CHF I with preserved right ventricular ejection fraction

(EF 65%), FC II. The patient was recommended for surgery for total cemental right knee joint endoprosthetics. The patient was informed about the operation. The patient has warned about possible surgical and postoperative complications (bleeding, fracture of the femoral diaphysis, early and late suppuration, instability, dislocation of the endoprosthesis, fat embolism, thromboembolism, pneumothorax, and hydrothorax). The patient's consent to the operation has been received; the operation is scheduled for September 2022. The patient received comprehensive recommendations. To the clinical recommendations, "Prevention of Thromboembolic Syndromes" of the National Standard of the Russian Federation dated 2015, for preoperative preparation, taking into account age, concomitant diseases and for the prevention of thrombus formation, a solution of enoxaparin sodium 0.4 ml has prescribed subcutaneously, once before the surgery. Under aseptic conditions, in the patient's supine position, after 4-fold treatment of the surgical field with antiseptic solutions, a median incision of the skin and superficial fascia is made under spinal anesthesia with a tourniquet on the thigh. The right knee joint has opened by medial parapatellar access. During revision, the knee joint cavity contained up to 60 ml of transparent synovial fluid. Osteophytes of the femoral bone condyles and those of the medial tibial condyle, there was degeneration of the cartilage in both femoral condyles with distal loss of the medial condyle up to 3 mm, degeneration of the tibial plateau with a bone defect-wear of the medial condyle up to 6 mm deep, medial meniscus has degeneratively altered. Cruciate ligaments were strong. Femoral-patellar joint-patella showed chondromalacia of facets and osteophytes on the periphery; tracking was not violated, and the trochlea was intact. The synovial membrane had pronounced proliferation; it was edematous, white with debris in the upper recess - it has been referred for clinical and microbiological examination together with tissue biopsies. Synovectomy, cheilectomy, modeling patelloplasty, and anterior and posterior cruciate ligament resection have been performed. The bone marrow canal of the femur has opened. Distal saw of the femur with a valgus angle of 7 degrees. By the femoral resection block, the final saws of the femur were made according to guide example 4 (external rotation of 3 degrees) with the processing of the box under the stabilizer. The lower leg was dislocated anteriorly. By the tibial resection block, the articular surface of the tibia has resected. A combined technique carries out a medial release of 1 degree. Equal flexor and extensor intervals have been obtained on a 10 mm test spacer. A trial correction was made on the templates: right hip 4, right tibia 4, insert 10 mm; BCS - the joint is stable in the position 0-30-45-60-90, flexion 140 degrees, extension 0 degrees, ligament balance is excellent, patellar tracking is correct, anterior-posterior stabilization is obtained. The biological axis of the lower limb has been reconstructed. A bed for the tibial component of the endoprosthesis was formed according to template 4. Bone arthroplasty of the bone marrow canal of the femur has been performed. Patellar denervation was not performed. The saws were thoroughly washed with a physiological solution with a pulsating jet to the "sugar content" of the saws and treated with Betadine. The following components were installed on CMW 3 cement with gentamicin: Journey II BCS Femoral Component Right 4, Tibial component Journey Right 4, liner Journey II BCS XLPE Right 10 mm 3-4. Local infiltration anesthesia with a solution of 0.2%-100.0 ml naropin was performed. After the correction, the joint was balanced, and movements were free. The wound was sutured tightly layer-by-layer; drainage was not installed. Aseptic dressing. The duration of using the tourniquet was 48 minutes. Intraoperative blood loss made 190 ml. The duration of the operation: Total cement right knee arthroplasty with Smith & Nephew Journey II BCS Oxinium Femoral component Right -4- Tibial component Journey Right-4 - insert Journey II BCS XLPE Right 10 mm 3 4 with simultaneous reconstruction of the biological axis of the lower limb was 55 minutes.

1.6 Medical support

The patient was given sufficient medical support and the rehabilitation process information. After the operation, the patient was transferred to the intensive care unit for dynamic observation. The body temperature was 36.7°C. Hemodynamics was stable. The dressing was dry. Anticoagulant therapy, antibacterial therapy/prevention, postoperative anesthesia, prevention of postoperative nausea and vomiting, and symptomatic therapy were continued. Hemodynamics, blood parameters, the balance of intravenous fluid and that consumed, and diuresis have been monitored. Status localis the day after surgery: both lower limbs in elastic bandaging. Moderate swelling of the right knee joint. The bandage was clean and dry. There was no vascular-neurological deficit; movements in the ankle joints have been restored. The movements of the operated limb have been partially restored. Early verticalization has started in the first 8 hours. Ultrasound of the veins in the lower extremities (according to the Fast protocol method) - patency of the deep and superficial veins of the lower extremities was preserved. Ultrasound data showing phlebothrombosis of both lower extremities have not been revealed at the time of examination. Radiography of the right knee joint in two projections, total right knee knee arthroplasty with cement fixation of components has been performed. The cement mantle around the femoral and tibial components of the endoprosthesis was evenly distributed (Fig. 2).

Fig. 2. The right knee joint's total endoprosthesis in 2 projections.

CBC: leukocytes (WBC) - 9.4×10⁹/l, erythrocytes (RBC) - 3.7×10¹²/l, hemoglobin (HGB) 122 g/ l, fibrinogen A 6.4 g/l, activated partial thromboplastin time 34,3 s.

Drug therapy has carried out – rivaroxaban, cefazolin, celecoxib, losartan, enoxaparin sodium, omeprazole, amlodipine. Bandages, magnetic therapy, electrotherapy, physical exercises, elastic bandaging of both lower limbs and massage.

1.7 Rehabilitation

The patient has been motivated by the specialists for the rehabilitation. From the second day after the operation, rehabilitation continued with the participation of a multidisciplinary rehabilitation team under the guidance of a physical and rehabilitation medicine doctor. With a physical therapist, the transition to a sitting position with lowered legs, training in getting up and walking, exercises for all joints of the limbs, sitting down in bed with the help of hands, and turns to the sides have been mastered. Beginning with the fifth day after the operation, walking on a dynamic ladder-bars simulator was started with the patient; walking with crutches with a metered increasing load on the right lower limb for up to 6 weeks with the transition to using a cane is recommended. The physical therapist conducted daily physical exercises - special, respiratory, restorative ones. Mechanotherapy on the Artromot device was prescribed - passive development of the right knee joint, 0/40-0/90 degrees daily. Previously, it has been found that physiotherapy interventions were clinically effective in terms of functional performance, the strength of the quadriceps muscle of the thigh, pain, and flexion angles in movements in patients after TKA. The inclusion of physiotherapy treatment in rehabilitation: exposure of a low-frequency magnetic field on the area of the postoperative wound and cryotherapy on the area of the operated joint contributed to the optimization of rehabilitation. Local status at discharge: the wound healed primarily. The sutures were consistent. Moderate swelling of the right knee joint persisted. No effusion in the cavity of the right knee joint was determined. The patient moves independently on crutches with a metered load on the right lower limb. The volume of movements (passive, active) of the right knee joint is satisfactory. Movements in the right knee joint were slightly painful in maximum flexion. There was no neurological deficit. Pain syndrome was controlled by non-narcotic analgesics (Celecoxib). There were no complications in the postoperative state, and the temperature was normal. There was no threat of thrombosis and progression of vascular pathology. Stabilization of the main clinical and laboratory parameters was done. The range of movements in the joint was 90-104 degrees. The patient could sit independently on the bed or a chair. The patient walked with additional support, descended, and ascended the stairs by 3-5 steps; passive flexion of the joint was up to 90 degrees. Rankin scale at discharge: 3 points - restriction of vital activity, moderate in severity. The patient was discharged for the second stage with recommendations for continuing taking anticoagulants (Rivaroxaban 0.01g, orally, 1 tablet x once a day, at 20:00, strictly during meals, daily, within 35 days from the start of taking the drug, the drug was to be discontinued after a control USDG of the veins in the lower extremities). It was recommended to continue elastic bandaging of both lower extremities for up to 3 months from the moment of surgical treatment (elastic knitwear of the second compression class: elastic stockings or elastic bandages up to the upper third of the thigh). The use of the local physiotherapy leads to the positive results. Then, the patient underwent the second stage of rehabilitation in the inpatient department of trauma rehabilitation at the BI "Municipal Clinical Hospital № 1" under the Health Ministry of Chuvashia. Walking with crutches with a metered load on the right lower limb was continued (up to 1.5 months from the moment of surgical treatment), followed by using a cane, stair training, and physiotherapy treatment. The psychologist did not reveal any signs of anxiety or depression. These methods motivated the patient and ensured effective rehabilitation. The patient indicated that physical therapy is important and can positively influence his motivation throughout the rehabilitation period. In 6 months, the patient could walk without additional support but with restrictions on lifting weights and preventing falls. After 12 months of surgery, the amplitude of movements in the right knee joint was full; there was no pain syndrome. The patient now leads an active lifestyle and works.

2. DISCUSSION

The scientists agree that the risk factors influence osteoarthritis.[4, 7, 8] This disease has a complex pathogenesis with the immunity system activation.[3] Osteoarthritis has various symptoms. The pain can be different, from the light to the strong pain. The other doctors who treat osteoarthritis

also stated that osteoarthritis has various symptoms, and the pain can differ.[1] The male patient had right knee joint pain. The conservative treatment did not help. The pain symptom progressed, and the right knee joint function was limited. The specialists noted that pain was caused by changes in non-cartilaginous components of the joint, such as ligaments.[9] The doctors think that the parts of the subchondral bone, the joint capsule, periarticular muscles, and the synovial membrane have been damaged as the disease progresses.[9] Da Costa B.R., during his osteoarthritis patient's clinical examination, diagnosed the weakening of the periarticular muscles, bone remodeling, synovial effusion, weakening of ligaments, and formation of osteophytes.[10] The specialists highlighted that knee osteoarthritis influences the patients' life quality.[9, 11-14] Our patient also had the same change. The patient received the conservative treatment. They suggested pharmacological drugs and physiotherapy methods [2, 5, 9, 10]. We were also treated with pharmacological drugs. Bindu S. considers the non-steroidal anti-inflammatory drugs (NSAIDs) in OA treatment very effective.[18] Non-steroidal anti-inflammatory drugs (NSAIDs) were prescribed for the patients. The European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) recommends glucosamine sulfate and chondroitin sulfate as first-line therapy for knee joint osteoarthritis. The specialists use in their clinical practice glucosamine sulfate and chondroitin sulfate.[22,23] The doctors recommend the local physiotherapy.[6,17,18,26,32] The male patient had the treatment for four years. Even though all conservative treatment methods have been tried, the disease progressed, which was the basis for referral for surgery. The other specialists also note that conservative treatment can cause ineffective results. [16,19,25-28, 31, 32] The specialists of the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) researched the algorithm for the management of knee osteoarthritis - from evidence-based medicine to real life. Preoperative patient education programs have been formed to improve patient compliance and outcomes through proper self-care education and the rehabilitation period. The preoperative patient education programs include the health care specialists' medical complex treatment. As a result, after the preoperative patient education program, the spinal anesthesia passed satisfactorily, and the operation passed successfully. Total knee endoprosthesics leads to a high degree of patient satisfaction. It provides the patients with significant medium- and long-term life quality benefits, pain relief, and functioning.[5] Total knee endoprosthetics is the world osteoarthritis treatment practice. It became possible with the help of the Federal Center for Traumatology, Orthopedics, and Endoprosthetics of the Ministry of Health of the Russian Federation (Cheboksary). Nowadays, such kind of surgery has been held for several years in our town. Endoprosthetic is the modern and complex treatment method with an effective result.[27, 31, 33] Finally, such prosthesis components as Journey II BCS Femoral component Right 4, Tibial component Journey Right 4, and liner Journey II BCS XLPE Right 10 mm 3-4 have fixed to the male patient. The operation passed successfully and had no complications. Specialists all over the world pay attention to rehabilitation importance. [15] They point out to search for the post-operative period different treatment methods.[16, 19,27, 33] The Physical rehabilitation after the total knee endoprosthetics is carried out in several stages after surgery. Stage one - immediately after surgery during the first 5 days. Stage two – the clinical stage in the early recovery period. Stage three - after the hospital during the first 3 months. The rehabilitation aim is to ensure the patient's functionality and independence maximizing. The doctors wish to minimize complications such as wound infection, deep vein thrombosis, and pulmonary embolism. The physical rehabilitation procedure consists of the following components: therapeutic exercises, shift training, training in the manner of walking, and teaching daily life. The main point in the post-operation period is the early verticalization. It was carried out that the patient's rehabilitation period is a very important stage. After 6 months, the male patient was allowed to walk without the additional support. The patient was restricted from lifting weights and preventing falls. The right knee joint movements' amplitude was sufficient a year after the operation. There was no pain syndrome.

3. CONCLUSIONS

The critical point in the post-operation period is the early verticalization. The physical rehabilitation procedure consists of the following components: therapeutic exercises, shift training, training in the manner of walking, and teaching daily life. The conservative treatment methods, including pharmacological drugs and physiotherapy, are effective for osteoarthritis treatment. Total knee endoprosthesics leads to high patient satisfaction and provides patients with life-quality benefits, pain relief, and functioning. It was analyzed that the patient's rehabilitation period, including physical exercises and physiotherapy, is a very important stage.

4. AUTHORS' CONTRIBUTION STATEMENT

Dr. Zhuravleva Nadezhda Vladimirovna and Dr. Smirnova Tatiana Lvovna conceptualized and designed the study, Dr. Smirnova Tatiana Lvovna and Dr. Diomidova Valentina Nikolaevna curated the data and prepared the original draft. Dr. Smirnova Tatiana Lvovna and Dr. Ukhterova Nadezhda Dimitrievna discussed the methodology and analyzed the data. Dr. Guryanova Evgenia Arkadievna, Dr. Zhuravleva Nadezhda Vladimirovna, and Dr. Vlasov Andrey Valerievich provided valuable inputs toward designing the manuscript. All authors read and approve the final version of the manuscript.

5. CONFLICT OF INTEREST

Conflicts of interest declared none.

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