KNEE OSTEOARTHRITIS AND ARTHROPLASTY OF THE KNEE JOINT

OSTEOARTRITIS KOLENA I ARTROPLASTIKA KOLENA

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Summary
According to the Public Health Institute of Vojvodina one of the main causes of morbidity, invalidity and absence from work in Vojvodina are musculoskeletal diseases. Osteoarthritis is a multifactorial joint disease, with catabolism and inflammation in its background. For radiological classification of knee osteoarthritis stage Kellgren-Lawrence scale is used. It consists of five levels, from stage “0” to stage “4”. The goal of osteoarthritis treatment is to reduce pain and muscle spasms, improve limb function, prevent joint contractures and train patients to function in everyday life and professional activities. The therapy is divided into conservative (medical and physical) and surgical. Arthroplasty is a surgical procedure that involves destruction of articular surfaces and replacement of degenerative joints with endoprosthesis, which result in increased general and working ability. Modern endoprostheses enable a high success rate of the procedure. At the Department of Orthopedics and Traumatology, Clinical Center of Vojvodina in Novi Sad, the first knee arthroplasty was performed in 1989. Since then, more than 3000 knee arthroplasties have been done. Clinical patient evaluation was obtained through subjective status, functional evaluation and use of scoring systems. More than 80% of patients had a good or a great score.

Key words: Osteoarthritis, Knee; Knee Joint; Arthroplasty, Replacement, Knee; Treatment Outcome; Disability Evaluation; Recovery of Function

Introduction
According to the data taken from the report “Analysis of the health status of the population of Vojvodina” of the Public Health Institute of Vojvodina, one of the major causes of morbidity, disability and absence from work in Vojvodina are musculoskeletal system diseases (10.1%), primarily degenerative diseases.

Degenerative joint disease, osteoarthritis, belongs to a group of chronic processes, which are characterized by progressive deterioration of cartilage and supportive tissues and are accompanied by proliferative processes in the bone tissue of joints. Degradation process in the articular cartilage often leads to the occurrence of chronic inflammatory process of the synovial membrane.

These changes are most common in large joints, such as the hip joint and the knee joint. Due to its high incidence, osteoarthritis takes the third place in the world [1].

The real cause of degenerative changes is not fully understood. They can be divided into primary and secondary ones depending on the etiological factors.

The cause of primary arthrosis is called essential arthritis, which practically represents physiological process of aging. The impact of genetic factors, body composition and sex on more frequent occurrence of degenerative changes is considerable.

Secondary arthritis results from different static disorders, post-traumatic conditions, inflammatory processes and many other factors. Cartilage damage happens due to a change in the static-dynamic relationship between articular surfaces.
Inflammation of the joints also contributes to the development of later osteoarthritic changes. Non-specific arthritis is relatively rare today, due to effective antibiotic therapy, but it may occur in certain immunodeficiency states. In recent years, there has been an increase in specific inflammation of the joints, which is explained by the deterioration of living conditions, nutrition and stress.

Besides, rheumatoid arthritis can often lead to serious osteoarthritic changes, which require long-term treatment. Untreated cases of gout, some hematological and other internal diseases may also be a cause of osteoarthritis.

Osteoarthritis is a disease of the joints whose occurrence is not related to a single factor but a combination of several causes associated with the cascade of catabolic and inflammatory processes due to the injury of articular cartilage. The changes are due to increased activity of lysosomal proteolytic enzymes, and/or reduction of the synthetic activity of chondrocytes. As the process progresses, the articular cartilage degenerates which results in fissures, erosion and loss of articular cartilage. Cysts are formed, there is destruction of the subchondral bone and the formation of new bone in the form of osteocysts. In addition, there is a release of inflammatory mediators resulting in the destruction of the joint, which is most often irreversible [2].

The main symptom in degenerative joint disease is pain. It usually occurs after a certain amount of physical exertion and can be intensified by weather changes and after exposure to cold and moisture.

The diagnosis of osteoarthritis is made based on medical history and physical examination, which is dominated by pain, joint stiffness, and difficulty in movement, in the absence of general symptoms.

Laboratory findings of patients are normal, apart from a possible increase in the number of cells in the synovial fluid. Radiological diagnostic procedures are performed in order to visualize joint changes and are not directly correlated with subjective complaints. Computed tomography and magnetic resonance imaging of the diseased joint is of great significance [3, 4].

The goal of osteoarthritis treatment is to reduce pain and muscle spasms, improve limb function, prevent joint contractures and train patients to function in everyday life and professional activities.

The therapy is divided into conservative (medical and physical) and surgical. Primarily, the patients are recommended to change their behavior and lifestyle.

One of the priorities in the prevention of osteoarthritis is to reduce body weight thus reducing burden on the affected joint. The risk of osteoarthritis in the obese people is 4 to 7 times higher compared to the population with normal body weight.

Obesity is a major epidemiological problem of population of Vojvodina, as shown by the results of the research of the Institute of Public Health of Vojvodina.

Medical treatment involves the use of antirheumatic, antiinflammatory and myolytic drugs, administered parenterally, orally, intra-articularly and locally. Preparations of hyaluronic acid and corticosteroids can also be applied intra-articularly, but their application is not recommended in younger patients, because they can accelerate the process of destruction of articular cartilage [5, 6].

Physical therapy is carried out simultaneously with medication and includes kinesiotherapy, hydrotherapy, and a range of electrical and electromagnetic therapeutic procedures.

Surgical treatment is conducted if conservative treatment does not result in alleviation of subjective symptoms and improvement of functional ability of the affected limb.

Arthroplasty is a surgical procedure that involves destruction of articular surfaces and replacement of degenerative joints with endoprosthesis. Total joint replacement contributes to analgesia and improvement of joint functionality, which results in an improvement of working ability of patients [7, 8].

Since the beginning of the 21st century, there has been an increasing number of hip and knee arthroplasty carried out every year. According to estimates, the number of hip replacement procedures will be significantly higher in the coming decades [9].

There is almost no country in the world that does not have long waiting lists when it comes to solving advanced osteoarthritis of the joints. The goal of each joint replacement procedure is to achieve mechanical stability of the prosthetic components, biomechanical reconstruction of the joint and its functions [10].

The knee joint (articulatio genu) is the biggest joint in the human body with a complex structure. The stability of the knee joint is the result of the geometry of articular surfaces, menisci, ligaments, joint capsules, muscles and gravity, which allow complex movements of this joint.

Knee osteoarthritis causes the working and living disability in the elderly population, as much as heart and lung diseases combined [1]. Kellgren-Lawrence (KL) scale is used to work out radiological classification of knee osteoarthritis stage. It consists of five levels, from stage “0” to stage “4” [1].

Indications for arthroplasty of the knee include over a hundred different conditions which disrupt the normal function of a joint, because of pain, movement limitation or contractures, when all conservative methods are exhausted. Total knee joint arthroplasty is indicated in all cases of painful joints with altered function, where non-surgical treatment has not given a satisfactory result. Arthroplasty procedures should relieve pain in the knee, correct deformity, resume normal joint function and restore patient’s daily activities.
An increasing number of knee arthroplasty is performed every year. The increase in the number of these procedures is far greater than in the number of hip arthroplasty. The number of knee arthroplasty procedures is expected to increase 2.5 times in the next twenty years. It is significant that the patients are female in 60% of cases of knee arthroplasty [12, 13].

There are certain differences in the structure and shape of the bone elements of the knee joint in relation to sex, which are recognized by implant manufacturers. Knee prostheses intended for female population are specially designed to adapt better to the structure and shape of the bone in order to achieve better functional results.

Contemporary endoprostheses, with proper installation, provide an extremely high success rate of the procedure, both in short-term and long-term studies. The components of total prosthesis must endure years of cyclic loading, which is at least three to five times increased in relation to the weight of the body and can occasionally be increased 10 to 12 times [14, 15].

The aim of arthroplasty is to achieve normal value of mechanical leg axis and to equalize tensions of medial and lateral joint structures. The position and orientation of the elements of the prosthesis should enable the smooth performance of the movements of flexion and extension of the knee [16].

The biomechanics of the knee joint can be reconstructed by restoring the anatomical axis, by achieving functional stability and good fixation of the implant, as well as by reconstructing the joint line. The appropriate clinical and functional result is obtained by achieving stability of the knee in flexion and extension [17].

The challenge of knee arthroplasty is a functional outcome, when a great range of motion is achieved, while preserving the kinematics of the joint, with appropriate radiographic findings. Preoperative planning results in a lower perioperative morbidity and complication rate [18].

Over time, the standards of the profession in relation to the functional results of aroarthroplasty have become increasingly higher, and the expectations of patients in later stages of knee osteoarthritis are getting bigger [19].

There are constant requirements for more and more efficient operating procedures in knee arthroplasty [20]. Thanks to the Internet access and availability of information, patients are better informed about the possibilities of modern arthroplasty.

There are more patients with degenerative changes who require knee arthroplasty at younger age, as well as patients in the ninth decade of life. Therefore, surgical techniques must be adapted to each patient [9].

Material and Methods

There are numerous scoring systems for clinical and radiological evaluation of the results after implantation of total knee prostheses, including HSS (Hospital for Special Surgery) and KSS (Knee Society Score) scoring system or scoring system of the Knee Association of American Academy of Orthopedic Surgeons based on radiographic evaluation of the results after implantation of total knee prosthesis [21, 22].

All systems for the evaluation of the clinical results are scored on the basis of subjective and clinical status as well as functional findings by the protocol [23].

At the Department of Orthopedics and Traumatology, Clinical Center of Vojvodina (KCV) in Novi Sad, the first modern type total condylar knee prosthesis was implanted in 1989. Since then until 2016 more than 3,000 knee arthroplasty procedures were performed, including very complicated and demanding revision procedures with a complex revision endoprosthesis implantation and tumor endoprosthesis used in case of ligamentous deficit and massive bone defects. The average age of patients was 68 years and more than 60% of the patients were females.

Results

Clinical evaluation of the patients was done by the means of HSS (Hospital for Special Surgery) scoring system, based on a subjective status and functional findings with the average HSS score. Preoperative and postoperative points, being 43/100 (43 of 100) and 90/100 respectively indicate a high success rate of operative treatment of knee osteoarthritis. According to the obtained data, over 80% of patients had a good or a great score.

Discussion

The concept of accelerated treatment (Fast Track, Rapid Recovery) has been increasingly implemented at the Department of Orthopedic Surgery and Traumatology of KCV in recent years in order to satisfy the requirements of the modern age for even more efficient operating procedures in knee arthroplasty. Such a concept has been used at numerous well-known orthopedic departments for about two decades [24].

A multidisciplinary approach, which also includes preoperative education and motivation of patients, while recognizing the individual characteristics of patients, enables optimal treatment and prevention of complications [20].

The role of the anesthesiologist is very important in the preoperative selection of the optimal protocol and premedication of the patients in accordance with their general condition and comorbidities [25].

The preconditions that would enable mobilization and verticalization of patients within several hours of surgery, thus reducing the length of hospital stay can be created by applying adequate, minimally invasive surgical technique, prevention of perioperative discomfort, adequate hydration of
patients, with a reduction in blood transfusion, adequate multimodal analgesia, early enteral nutrition and activation of patients, as well as prevention of thromboembolic complications [19, 26, 27].

The patient is instructed to continue treatment at home within three postoperative days. Prior to discharge, the patient is further advised regarding recovery at home to prevent readmission [25].

Such a treatment results in higher patient’s satisfaction, better functional results and a lower percentage of perioperative complications. All the above mentioned reduces the overall cost of treatment and represents the best option for most patients. In addition, it contributes to reducing waiting lists for total knee replacement surgery [28].

This rapid recovery treatment has been implemented in approximately 400 patients who underwent knee arthroplasty thus far. The average age of patients was 64.5 years, 70% of the patients were women, and 69.9% were given regional (spinal) anesthesia. During surgery tranexamic acid (an antifibrinolytic) was used, consequently only 10.45% of patients received allogenic blood transfusion [27].

Postoperative analgesia was carried out by a combination of nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen and opioid analgesics. Adequate hydration and anti-emetics have also been provided. The intensity of postoperative pain was determined by means of the NRS (Numeric Ratio Scale). The patients had their first postoperative meal about 6 hours after surgery, they were active (sitting, standing beside their bed and walking) 6 to 8 hours after surgery and the average length of hospital stay was 2.20 days.

**Conclusion**

The conclusion is based on the evaluation of subjective status and functional findings that over 80% of patients had a good and a great result, which suggests that knee arthroplasty as a method of operative treatment of knee osteoarthritis has a high success rate.

The concept of accelerated treatment (Fast Track or Rapid Recovery) is the best treatment option for most patients owing to a multidisciplinary approach, especially cooperation between the anesthesiologist and orthopedic surgeon, along with tailor-made treatment for each patient.

There is ample evidence about the benefits of accelerated treatment (Fast Track or Rapid Recovery).

**References**


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