TOTAL HIP AND KNEE ARTHROPLASTY:
ON THE ISSUE OF INDICATIONS FOR SURGERY

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Background. Both in Russia and across the world, the annual frequency of total hip and knee replacement has increased, which has inevitably led to an increase in the number of patients with unsatisfactory treatment outcomes. This failure can primarily be attributed to the complications that arise, some of which arise due to the wrong choice of treatment approach.

Aim. To analyze the publications on the results of treatment of patients with hip osteoarthritis and knee osteoarthritis by total hip and knee replacements.

Materials and methods. The literature data were searched in open electronic databases of scientific literature PubMed and eLibrary using the following keywords and phrases: total hip/knee replacement, complications, patient satisfaction, age, obesity. The search depth was 20 years.

Results. The data indicated a rise in the total number of such patients recorded annually. A significant number of publications, both in Russian and foreign literature, are devoted to the analysis of complications that mainly determine the patient's satisfaction with an operation. In addition, these articles analyze the issues of determining the indications and contraindications in applying these methods of treatment. However, it is not uncommon for orthopedists to form a decision for performing an operation based on their subjective experience. At the same time, one of the circumstances that influences the decision-making is the lack of a stable system in the conservative treatment of degenerative joint diseases. According to the data from health care organizations, hip and knee replacements are the only available method for treating osteoarthritis. This circumstance may lead to an unjustified expansion of indications for arthroplasty, which would definitely affect the outcomes of treatment. In this situation, it is critical to search for precise criteria to identify the indication for total hip and knee arthroplasty.

Conclusion. Unjustified expansion of indications for endoprosthesis leads to an increase in the number of complications, which in turn leads to an increase in the number of patients who remain unsatisfied with the outcomes of hip and knee arthroplasty in the long term. This circumstance encourages special scientific research to clarify the indications and contraindications for hip and knee replacements, especially in young and middle-aged people.

Keywords: total hip replacement; total knee replacement; complications; indications/contraindications for surgery.

ЭНДОПРОТЕЗИРОВАНИЕ ТАЗОБЕДРЕННОГО
И КОЛЕННОГО СУСТАВОВ: ПОКАЗАНИЯ К ОПЕРАЦИИ

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Endoprosthetics of large joints has been used in clinical practice since the 1950s and has become widespread already in the early 2000s due to its high-tech nature. In the Russian Federation (RF), these surgeries are funded by the federal budget within the framework of the national project “Public Health.”

Diseases of various joints are noted in 33% of the adult population in Russia, 10% to 15% of whom require surgical treatment [1]. Most often, surgeries are performed to replace the hip and knee joints (HJ and KJ). In the RF in 2017, 113,220 such surgeries were performed [2], whereas in 2013, 54,000 replacements of HJ and KJ with implants were performed, and in 1994, 20 times less surgeries (about 3000 interventions) were noted [3, 4].

Many developed countries have an increased number of HJ and KJ arthroplasty surgeries. More than 1 million such surgeries are performed worldwide yearly [4, 5]. According to S. Kurtz, in the USA alone, by 2030, 572,000 surgeries on primary total HJ arthroplasty will be performed, which is 174% more than in 2005. The same author reports an even higher demand for primary total KJ arthroplasty. According to the researchers, by 2030, the number of total KJ arthroplasty surgeries in the USA will increase by 673% (compared to 2005), amounting to 3.48 million. The frequency of revision arthroplasty is also predicted, and the demand for KJ revision is expected to surpass that for the HJ revision. In general, the total volume of HJ and KJ revisions is projected to increase by 137% and 601%, respectively, in the period from 2005 to 2030 [6].

As a rule, HJ and KJ arthroplasty is performed in elderly and senile patients. About 2/3 of all operated patients are over 60 years old [7, 8]. However, every year, the proportion of young patients with a history of hip arthroplasty increases [9, 10]. Most pediatric orthopedists believe that HJ arthroplasty in children with a terminal stage of osteoarthritis should be performed only according to strict indications and when the possibilities of conservative treatment are completely exhausted and reconstructive plastic surgery will not provide the desired effect [11].

A number of researchers believe that the results of arthroplasty of both HJ and KJ in young patients are much worse than in older patients [12]; others, on the contrary, report good short- and medium-

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Заключение. Как в России, так и во всем мире частота выполнения эндопротезирования тазобедренного и коленного суставов ежегодно повышается, что неизбежно ведет к увеличению количества пациентов с неудовлетворительными результатами лечения. В первую очередь это связано с осложнениями, одна из причин которых заключается в неправильном выборе метода лечения.

Цель — проанализировать публикации, в которых представлены результаты лечения пациентов с остеоартрием коленного и тазобедренного суставов методом тотального эндопротезирования.


Результаты. Значительное количество как отечественных, так и зарубежных публикаций посвящено анализу осложнений, в основном определяющих неудовлетворенность пациента операцией. Кроме того, отдельно рассмотрены показания и противопоказания к эндопротезированию тазобедренного и коленного суставов. Вместе с тем нередко травматолог-ортопед принимает решение о выполнении операции на основании субъективного опыта. При этом на ситуацию влияет отсутствие устойчивой системы консервативного лечения дегенеративно-дистрофических заболеваний суставов. С учетом такой особенности организации здравоохранения эндопротезирование тазобедренного и коленного суставов является практически единственным доступным способом лечения остеоартрита. Все это приводит к неоправданному расширению показаний к артропластике, что не может не сказываться на результатах лечения. Таким образом, необходимо определить критерии для формулирования показаний к эндопротезированию тазобедренного и коленного суставов.

Заключение. Необоснованное расширение показаний к эндопротезированию приводит к увеличению количества осложнений и, следовательно, к увеличению количества пациентов, не удовлетворенных результатами артропластики тазобедренного и коленного суставов в долгосрочной перспективе. Это обстоятельство побуждает к проведению специальных научных исследований по уточнению показаний и противопоказаний к эндопротезированию тазобедренного и коленного суставов, особенно у пациентов молодого и среднего возраста.

Ключевые слова: эндопротезирование тазобедренного сустава; эндопротезирование коленного сустава; осложнения; показания/противопоказания к операции.
term results in young patients, which depend directly on the principal diagnosis and the duration of the degenerative-dystrophic process [13, 14].

With the increase in the number of patients with a history of HJ and KJ arthroplasty, the number of patients who are unsatisfied with the intervention results, including those who need re-endoprosthetics, also increases.

One of the reasons for their dissatisfaction is the wrong choice of surgery as a treatment method. The issues of indications and contraindications for joint arthroplasty have been discussed in scientific medical forums and the literature for many decades, since the beginning of these interventions to the present day [15]. The national guideline “Orthopedics” (2008), in addition to listing the indications and contraindications for replacing a joint with an implant, states that indications may vary depending on the severity of the pain syndrome, nature, severity of concomitant pathology, etc.

The work aimed to analyze publications that present the results of the treatment of HJ and KJ osteoarthritis patients using total arthroplasty.

Materials and methods

The literature data were searched in the open electronic databases of scientific literature PubMed and eLIBRARY using the following keywords and phrases: total hip replacement/arthroplasty, total knee replacement/arthroplasty, complications, patient satisfaction, and indications/contraindications for surgery.

The search depth was 20 years.

Inclusion criteria were full-text articles with specific quantitative data.

Exclusion criteria were clinical examples and abstracts of reports.

Results and discussion

In 2007, the Lancet magazine published a review article by I.D. Learmonth, who called total hip arthroplasty the “surgery of the century” [16], since it has indeed led to a significant improvement in the quality of life of older HJ osteoarthritis patients. Most researchers note an improvement in the physical function and relief of pain after total arthroplasty for the terminal stage of HJ osteoarthritis [17]. At the same time, the results of arthroplasty depend directly on several factors, for example, the presence of complications, body mass index (BMI), patient age, severity of concomitant pathology, duration of stay in the waiting list, the type of endoprosthesis and the method of its fixation, etc. [3, 18, 19].

The accumulated data on HJ and KJ arthroplasty are constantly analyzed and rethought: not only the technique of joint implantation but also the materials for the production of the artificial joint components are being improved. The service life of implants increases, reaching, according to some authors, ≥20 years [20, 21]. However, as with any method of treatment, when replacing large joints, a number of complications arise, which can be conditionally divided into intraoperative, postoperative (both early and late), and natural wear of the implant components long after the surgery [22]. In the vast majority of cases, the complications primarily determine the patient's dissatisfaction with the surgery results [23-25].

Fractures of the acetabulum or diaphysis of the femur during surgery are reported in 0.4%–5% of cases [26], which is more often registered with uncemented implant fixation, that is, with surgical treatment of <60-year-old patients [27]. In addition, with revision arthroplasty of the HJ, femoral fractures with cement fixation occur in 3%–6.3% of cases and, with uncemented joint replacement, in 17.6%–46% of cases [28, 29].

Surgical site infection is the most common unfavorable outcome of HJ and KJ arthroplasty [28, 30, 31]; the ones during HJ arthroplasty were recorded in 1%–8% of cases [32, 33].

According to a number of researchers, local pyoinflammatory complications in KJ arthroplasty are noted in 0.25%–7.6% of cases [6, 34]. With revision endoprosthetics of the KJ, this indicator increases to 15% [4, 20].

Among other arthroplasty complications, thromboembolic disease holds a special place. Vein thrombosis of varying severities of the lower extremities occurs in 40%–60% of patients after HJ and KJ arthroplasty [35]. Some authors report a high risk of pulmonary embolism, as it is registered in 2%–20% of cases with a mortality rate of 0.7%–4% [18, 36, 37].

Complications of HJ arthroplasty with a noninfectious nature are represented by neurological disorders in 0.7%–3% of cases, which include muscle contractures, weakness of the abductor muscle of
the thigh, damage to the sciatic nerve, etc. [38]. The number of complications of this type during re-endoprosthetics doubles [39]. The dislocation of the endoprosthesis head is a common complication, which is registered in 0.2%–11% of cases, with 77% of dislocations occurring within the first year after surgery [40].

Lethal outcomes during HJ and KJ arthroplasty are analyzed separately. The mortality rate in HJ arthroplasty is within 0.2%–4.5% [33, 41]. Fatal outcomes after KJ arthroplasty are verified in 0.1%–0.8% of cases [42, 43], which are most commonly due to pulmonary embolism, acute coronary insufficiency, and sepsis. According to J.A. Singh et al., who studied the results of 17,994 primary arthroplasty of the KJ, 46 lethal outcomes (0.26%) were registered within 30 days after the surgery, and 220 lethal outcomes (1.2%) were recorded within a year after KJ arthroplasty [42].

In cases of revision surgery for periprosthetic infection after KJ arthroplasty, the mortality rate increases from 3.7% (deaths due to various causes within 90 days after surgery) to 25.9% (within 5 years after revision surgery), and the causes of death were different and were not always dependent on arthroplasty [44]. The mortality rate was significantly higher (p < 0.001) in patients with periprosthetic joint infection than in patients who underwent aseptic revision arthroplasty 90 days (3.7% versus 0.8%), 1 year (10.6% versus 2.0%), 2 years (13.6% versus 3.9%), and 5 years (25.9% versus 12.9%) later. Such mortality rates are quite high, which must be taken into account when determining the indications for arthroplasty.

Throughout the history of HJ and KJ arthroplasty, special attention has been paid to obese patients. When planning HJ and KJ arthroplasty, the maximum permissible BMI values are taken into account. Most authors report both unsatisfactory results of endoprosthetics in terms of the implant functioning and a high risk of postoperative complications, including infectious ones, with a >40 kg/m² BMI [45, 46].

The instability of the implant components, which causes a high probability of re-endoprosthetics and patient dissatisfaction with the treatment result, is noted in 1.3%–7.5% of cases [37].

At the same time, even in the absence of complications, the patient may be dissatisfied with the outcome of the HJ endoprosthetics due to persisting pain syndrome, physical dysfunction, overestimated expectations of results, etc. [47, 48].

When deciding on HJ and KJ arthroplasty for osteoarthritis, the orthopedic traumatologist proceeds from a variety of data, namely, the stage of the pathological process, the pain syndrome intensity, the degree of physical dysfunction, the presence and severity of concomitant pathology, the patient's desire, the experience of the surgeon and his preferences, etc., many of which are subjective [34, 46].

Some researchers attach significance to the study of the patient's immunological background and do not recommend surgery in cases of immunodeficiency or immune system imbalance. So, for example, L.B. Gaykovaya (2018) reports that a prognostically unfavorable criterion for the development of infection in the area of surgical interventions during orthopedic surgeries is the decrease in the number of B-lymphocytes [49].

J.A. Singh recommends limiting the use of HJ and KJ arthroplasty in rheumatoid arthritis patients while expanding the indications for HJ osteoarthritis patients [42]. Other researchers hold the same opinion [50]. At the same time, a number of authors, having studied the economic efficiency of surgeries to replace the hip joint with a prosthesis, conclude that HJ arthroplasty is economically effective only for the management of end-stage osteoarthritis patients [51].

To date, the methods that assess the results of joint replacement with an implant are ambiguous, which is due to different approaches to surgical interventions, different types of implants, and the lack of a generally accepted universal assessment of treatment results [19, 52]. In addition, nowadays, national registries of endoprosthetics of joints do not exist in all countries, complicating major studies that assess the results of total HJ and KJ arthroplasty [37, 53].

Within the national project “Public Health,” the state funding in the Russian Federation provides replacement of the hip joint to patients who need it. At the same time, the problem of meeting the needs of the population for hip arthroplasty has not yet been fully resolved. On the one hand, there are patients with indications to this surgery, and on the other hand, there are cases of unjustified hip arthroplasty [3].

Great Britain researchers A. Moorhouse and G. Giddins (2018) draw attention to the absence...
of objective criteria for indications for arthroplasty in osteoarthritis [54], which is the same problem reported by authors from New Zealand [55]. In recent years, similar works have appeared in Russia. A.V. Lychagin et al. (2019), having studied the reasonability of total KJ arthroplasty among elderly patients, concluded that in 40% of them, the surgery was not justified, that is, the surgical approach was excessively active [56]. These authors proposed their own method to determine the KJ arthroplasty indications, based on the degree of dislocation syndrome of the KJ in points from 0 to 20. Based on the number of points scored, indications for arthroplasty were determined. If, according to the examination results, the patient had ≥ 13 points, total KJ replacement was recommended, and in the case of patients with ≤ 12 points, conservative treatment was recommended (intra-articular injections with platelet-rich autoplasm, PRP therapy; intra-articular injections of hyaluronic acid; systemic pharmacotherapy using chondroprotectors and nonsteroidal anti-inflammatory drugs). Intra-articular therapy was used as an alternative method of treatment in such patients. International authors provide similar data. In the USA, one-third of patients unreasonably undergo KJ replacement [57]. Other researchers refer to similar statistics, noting that HJ and KJ arthroplasty is groundless in 7%–34% of cases [58, 59]. In addition, a number of authors have proved that in 82% of patients who underwent HJ and KJ arthroplasty, their physical activity is not restored, and they lead a sedentary life, as before the surgery [60]. In general, in recent years, many authors have formed the position that total HJ and KJ arthroplasty, especially in young and middle-aged patients, should be delayed as much as possible. The possibilities of contemporary methods of conservative treatment are advisable to use, and organ-preserving surgical interventions should be performed [56, 61, 62].

Some authors argue that 1 year after arthroplasty, 12%–30% of patients are dissatisfied with its result, usually due to overestimated expectations. Later, this indicator only increases [48].

Most researchers studying the diseases of large joints believe that the conservative methods of treatment are not used sufficiently [61, 63, 64]. In addition, the UK currently maintains a national register of patients who underwent hip joint surgery without arthroplasty (NAHR, Non-Arthroplasty Hip Registry). The authors report that organ-preserving surgeries are effective in reducing pain intensity and improving quality of life in the short term [65]. In the long term, organ-preserving hip joint surgeries can slow down osteoarthritis development and significantly delay replacement arthroplasty [66].

**Conclusion**

The number of patients with HJ and KJ is increasing both in Russia and in other developed countries due to an increase in life expectancy. Arthroplasty is the main type of treatment for degenerative-dystrophic diseases of the joints. Nowadays, modern implants and technologies used to treat patients in need of arthroplasty have been created. The increase in funding within the framework of the national project “Public Health” (a significant improvement in the material and technical resources of medical institutions) and the widespread introduction of arthroplasty create the preconditions to improve the quality and availability of medical care in the RF. At the same time, the data of many researchers indicate an increase in the number of patients who are unsatisfied with the results of HJ and KJ arthroplasty in the long term. First of all, this is due to the unreasonable expansion of indications for this type of surgical treatment, which also entails an increase in the number of complications, some of which do not depend on the patient’s age, inevitably leading to an increase in the number of revision interventions, characterized by an obviously worse long-term result and a higher complication rate. Thus, a vicious circle is formed, which results in the deterioration of the patient’s quality of life, necessitating special studies to clarify the indications and contraindications for HJ and KJ arthroplasty, especially in young and middle-aged patients.

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**Author contributions**

A.A. Vorokov performed the search and analysis of literature sources.
P.I. Bortulev discussed the indications and contraindications for hip and knee arthroplasty.

V.M. Khaidarov took part in the search for literature sources and prepared the manuscript for publication.

S.A. Linnik conducted the analysis of effectiveness of methods for purulent complication prevention and treatment after knee and hip joint arthroplasty.

A.N. Tkachenko formulated the ideological concept of this work, analyzed the literature sources, generalized the data, and presented the material.

All authors made significant contributions to the research and preparation of the article and also read and approved the final version before its publication.

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