

## TOTAL HIP REPLACEMENT REHABILITATION: RESULTS AND DILEMMAS

Marija Spalević<sup>1,2</sup>, Saša Milenković<sup>2,3</sup>, Mirjana Kocić<sup>1,2</sup>,  
Ivona Stanković<sup>1,2</sup>, Lidija Dimitrijević<sup>1,2</sup>, Vesna Živković<sup>1,2</sup>,  
Hristina Čolović<sup>1,2</sup>, Miloš Spalević<sup>4</sup>

The number of candidates for total hip replacement (THR) is steadily increasing. Judging by the clinical results and implant longevity, THR is one of the most common and most successful orthopedic interventions of all times. Material, design, surgical techniques and subsequent rehabilitation continue to evolve. Choice of the prosthesis and fixation technique depends on the patients' bone structure and joint stability and their individual characteristics, such as age, weight and level of activity. Rehabilitation after THR is as important as the surgery. Rehabilitation protocols vary with the type of endoprosthesis. There is some controversial evidence about the differences in the surgical approach, the role of the preoperative education and exercises, as well as the implementation of the most efficient rehabilitation protocol. Despite many uncertainties and dilemmas, most studies have shown that majority of patients are satisfied with their arthroplasty results.

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**Key words:** total hip replacement, total hip arthroplasty, rehabilitation, exercise

<sup>1</sup>Clinic of Physical Medicine, Rehabilitation and Prosthetics, Clinical Center Niš, Serbia

<sup>2</sup>University of Niš, Faculty of Medicine, Serbia

<sup>3</sup>Clinic for Orthopedics and Traumatology, Clinical Center Niš, Serbia

<sup>4</sup>University of Niš, PhD student of Philology, Serbia

Contact: Marija Spalević  
Blvd dr Zoran Djindjić, 18000 Niš, Srbija  
E-mail: marijasp@yahoo.com

### Introduction

The hip joint is one of the most important joints in the human body. It is one of the largest, but also one of our most flexible joints that allows a greater range of motion than all other joints in the body except for the shoulder. The damage of the hip joint and its function is a complex medical problem. As a major weight-bearing joint, together with the knee joint, it is most susceptible to osteoarthritis. Chronic pain, stiffness and limited mobility are just some of the possible symptoms. In addition to severe OA, femoral neck fractures, RA, post-traumatic arthritis and avascular necrosis are the most common indications for total hip replacement (THR) surgery.

Thanks to the accomplishments of modern medicine, it is possible today to resolve a number of pathological conditions by replacing the damaged hip joint with endoprosthesis. THR surgery is a safe and effective procedure that can relieve pain, increase mobility, and help patients enjoy normal, everyday activities and regain their former quality of life. The basic goal of modern medicine is that endoprosthesis should completely replace the hip joint and restore its function. Despite technical complexity, THR is one of the most common and most successful orthopedic interventions, according to the clinical results and based on the implant duration.

Physicians first developed modern THR surgery in the early 1960s. Since 1962, improvements in joint replacement surgical techniques and technology have substantially increased the effectiveness of THR, making it one of the most successful operations. Nowadays, according to the Agency for Healthcare Research and Quality and the National Joint Registry, more than 300.000 THRs are performed in the United States annually (with 80.000 THRs in England) and the procedure has become more common in younger patients.

### Objectives

The aim of the paper is to review systematically and determine the clinical significance of diseased hip joint replacement, taking into account different types and characteristics of the hip endoprosthesis, to present the main treatment methods, pos-

sible complications, as well as evidence-based physical medicine and rehabilitation procedures and overall patient satisfaction.

### Materials and methods

A search of the PubMed database was conducted using the keywords „total hip replacement“, „total hip arthroplasty“, „rehabilitation“ and „exercise“. The study included the papers published in English in the last 30 years dealing with the etiology, treatment, surgical approaches, most common complications, exercise and rehabilitation of patients after THR.

### Results and discussion

The search identified 2,447 publications in the last 30 years, 490 of which were considered potentially relevant for the research based on the title and abstract.

It is generally known that osteoarthritis, rheumatoid and traumatic arthritis, femoral neck fractures, pathologic fractures, congenital hip diseases, avascular necrosis (commonly as the result of failure of earlier reconstructive surgery) or joint instability, could be the reason for THR.

Being a major weight-bearing joint, the hip is very prone to osteoarthritis. The incidence rates of OA increase with age. Hip OA occurs more often in the female population, especially after the age of fifty, due to obesity, hormonal imbalance, congenital and acquired deformities and trauma.

Pain, stiffness, crepitation, reduced range of motion, shorter leg, walking difficulties, limping, difficulties in performing everyday activities are just some of the possible symptoms of OA. Loss of the joint space, subchondral sclerosis and cysts, subluxation, irregularity of the joint surface are all typical radiographic signs of OA.

Conservative treatment options for OA patients involve a multimodal approach, involving patient education, medication, modification of activity and weight loss, using of cane or walkers, and physical therapy procedures, which can prevent or postpone THR. NSAIDs, COX-2 inhibitors, glucosamine and chondroitin supplements are most commonly used medications for the treatment of OA. Intra-articular injections of corticosteroids and viscosupplementation are sometimes used as well.

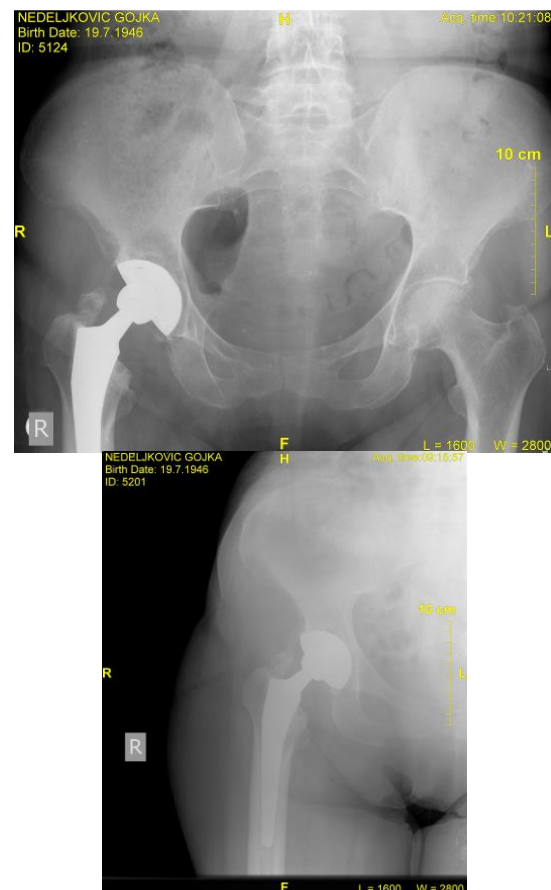
Today, lots of different types of hip endo prosthesis are available. Possible surgical methods of treatment include: hemiarthroplasty, resurfacing arthroplasty and total hip replacement. Hip replacement surgery can be performed as a resurfacing arthroplasty (a bone-preserving procedure), half (hemi) arthroplasty, where only the femoral head is replaced, or total, where both acetabulum and femoral head are replaced (Picture 1). Hemiarthroplasty is usually performed on the hip after a subcapital fracture of the neck of the femur.

Prosthetic implants have to be durable, inert and firmly fixed to the skeleton. The prostheses are



Picture 1: THR implants

of various designs and may be fixed to the remaining bone by cement, press fit or bone in-growth. The type of fixation – cemented, cementless or hybrid (Picture 2) – determines the post-operative weight bearing ability.



Picture 2: Total hip replacement, hybrid fixation. X-rays of a patient from picture 3.

As for the choice of implants, cemented endoprotheses are recommended for elderly patients (over 65 years old) because of their better early fixation, while cementless technique is now a preferred method for younger, more active patients, who are expected to walk with protected weight-bearing for the first 6 weeks after the surgery.

The results differ regarding the duration of endoprotheses. With regard to implant longevity, the advances in both femoral cementing techniques and the design of cemented stems have resulted in near perfect survivorship at 10 years (98%) and good survivorship at 25 years (93%). Comparable survival rates have been reported using cementless techniques for the femoral component. In the acetabular component, 10-year survival rates were similar as for cemented (95%) and cementless (95–100%) technique, but at 15 years cementless technology superseded cemented techniques (70–95% for cemented, versus 85–94% for cementless) (1).

Different techniques are being used for surgical approach: lateral, anterolateral, posterolateral, minimally invasive surgery and greater trochanter osteotomy. In standard THR, the incision is 8 to 10 inches long, compared to 2 to 5 inches in a minimally invasive approach. Aside from smaller incisions and blood loss, minimally invasive surgery is technically more demanding, due to a limited operative field. In comparison to traditional THR, some of the studies have shown advantages in favor of the minimally invasive approach 6 and 12 weeks postoperatively. However, up to now there have been no prospective randomized clinical studies that could definitely show the superiority of minimally invasive procedure. More evidence and better evaluation of minimally invasive hip replacement will be necessary before this technique could be recommended for more widespread clinical use. For that reason, conventional approaches to THR are still considered to be the gold standard (2). Also, a higher dislocation rate was reported in the mini-incision group.

Computer-assisted hip navigation for THR offers the potential for more accurate placement of hip components and control of leg length and offset. Although it is a brand new method without long-term data, preliminary results are encouraging regarding improved accuracy of the acetabular cup placement compared with conventional manual techniques, so it might become the technique of choice in the near future (3).

Possible complications of THR include: infection, leg length discrepancy, nerve palsy, deep vein thrombosis, improper implant fixation, joint instability, prosthetic hip dislocation, loosening of the prosthesis, osteolysis, periprosthetic fractures, etc. So far, there has been some evidence about the number of complications and lower functional gains in obese patients after THR. Functional improvements usually occurred, but the obese patients generally did not reach the same level of physical function in comparison to the patients with a lower BMI score. Also, uncontrolled obesity after THR was related to aggravated comorbidities and excessive long term healthcare costs (4).

There has been a lack of empirical data to support the type of sport activities that are safe and

feasible for patients after THR, and current recommendations are based more on clinical experience and personal preferences, than on a prospective and retrospective analysis (5). Most authors approve of low impact sporting activities such as walking, swimming, stationary biking, bowling, dancing, rowing and golf. On the other hand, contact sports, running, jogging, jumping, high impact aerobics, football, baseball, snow-boarding, weight lifting, parachuting are not allowed for THR patients. Most surgeons recommend that patients should return to the most advisable activities 3 to 6 months after their surgery (6).

The role of preoperative education remains inconclusive to a degree. Studies have generally shown shorter hospital stay, less analgesic use, less anxiety and fear in patients who attended preoperative education. Further, patients' participation in the preoperative educational programs might significantly reduce overall costs of primary THR procedures (7). In some studies, preoperative education reduced anxiety, but did not improve postoperative outcome (8).

Physical therapy procedures and rehabilitation of THR patients are as important as the surgical intervention. The main goal of rehabilitation after THR is pain reduction, restoration of the function, muscle strength and mobility, regaining a satisfactory range of motion in the hip joint necessary for everyday activities (Picture 3), thus achieving functional, economic and enduring gait and altogether better quality of life. The optimal treatment strategy following THR remains unknown.



**Picture 3:** Excellent functional recovery of a patient with the right THR.

There are many rehabilitation protocols, individually adjusted to patients based on the type of endoprosthesis. It is not known which protocol is the most effective one, whether inpatient, outpatient or home-based rehabilitation treatment produces better long-term results and provides greater patient satisfaction (1).

The role of the preoperative kinesitherapy is disputable; most studies have shown improvements in the preoperative functional status (9), but not postoperative results, considering the recovery time,

length of hospital stay and possible complications (10).

Some authors confirmed the effectiveness of treadmill training with partial body-weight support in addition to usual exercise program for THR patients (11). Certain studies have revealed that treadmill training program helps THR patients to achieve a more symmetrical gait (12). When comparing treadmill training with partial body-weight support to conventional physical therapy in ambulatory patients with THR, treadmill training proved to be more effective than conventional physical therapy at restoring symmetrical independent walking after hip replacement (13).

Ergometer cycling after THR is also an effective means of achieving significant and clinically important improvement in patient health-related quality of life and personal satisfaction (14). Some authors think that ergometer cycling should also be incorporated into the standard rehabilitation protocol.

Functional exercises (strengthening, active range of motion, balancing, stair climbing and gait training) are essential after primary THR. Exercise therapy following THR is considered to be important during initial postoperative care, but till date only a few evidence-based recommendations have been presented. There has been a substantial disagreement among rehabilitation professionals regarding exercise therapy prescriptions. Surgeons and therapists differ in their recommendations about weight-bearing and resistance training. Physiotherapists and exercise therapists prefer a more conservative approach with a delayed start of weight-bearing and resistance training, which is in contrast to the current literature evidence (15). In contrast to some evidence that preoperative kinesitherapy might be of benefit, authors agree about the absolute necessity of regular physical exercise after THR. In addition to other advantages, exercise should be able to increase bone density and prosthesis fixation and decrease the risk of falls (16).

On top of numerous uncertainties concerning THR patient rehabilitation, most studies have shown that over 86% of the operated are satisfied with arthroplasty results (17, 18), in particular the elderly

female patients (especially concerning pain relief) and those with poorer preoperative results (1).

Bearing in mind a number of dilemmas and controversy about different aspects of THR, and a lot of insufficient data to reach a firm conclusion about the most efficient rehabilitation protocol, more information is needed for better understanding of the issues these patients are faced with, so further research (with the long-term results) should be conducted, especially taking into account the rising number of younger, active patients who undergo THR. More evidence-based recommendations about beneficial exercise therapy dosages and components are needed so that reasonable guidelines and standards for postoperative treatment could be established (15).

## Conclusion

Total hip replacement has completely revolutionized the nature of treatment of arthritic hip, producing better pain relief, functional recovery, and substantial quality of life improvement. It is considered to be one of the most common and most successful orthopedic interventions of all times.

Although today implant duration is in most cases 15 years and more, the material, design, surgical techniques and postoperative rehabilitation continue to develop. Selection of the prosthesis and fixation techniques depends on patient individual characteristics, while the type of endoprosthesis determines the rehabilitation protocol. Physical therapy and rehabilitation of THR patients play a significant role in regaining the mobility and strength. It has not been established yet which rehabilitation protocol is the most efficient, whether inpatient, outpatient or home-based rehabilitation treatment provide greater patient satisfaction and best long-term results. Besides the various uncertainties concerning THR patient rehabilitation, most studies have shown that over 86% of patients are satisfied with arthroplasty results, especially the uncertainties elderly populations.

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## REZULTATI I DILEME U REHABILITACIJI BOLESNIKA SA ENDOPROTEZOM KUKA

Marija Spalević<sup>1,2</sup>, Saša Milenković<sup>2,3</sup>, Mirjana Kocić<sup>1,2</sup>,  
Ivona Stanković<sup>1,2</sup>, Lidija Dimitrijević<sup>1,2</sup>, Vesna Živković<sup>1,2</sup>,  
Hristina Čolović<sup>1,2</sup>, Miloš Spalević<sup>4</sup>

<sup>1</sup>Klinika za fizikalnu medicinu, rehabilitaciju i protetiku, Klinički centar Niš, Srbija

<sup>2</sup>Univerzitet u Nišu, Medicinski Fakultet, Niš, Srbija

<sup>3</sup>Klinika za ortopediju i traumatologiju, Klinički Centar Niš,

<sup>4</sup>Univerzitet u Nišu, student doktorskih studija filologije, Srbija

*Kontakt:* Marija Spalević

Bulevar dr Zorana Đinđića 81, 18000 Niš, Srbija

E-mail: marijasp@yahoo.com

Sudeći prema kliničkim rezultatima i vremenu trajanja implantata, zamena obolelog zgloba kuka endoprotezom jedna je od najčešćih i najuspešnijih ortopedskih intervencija. Broj kandidata za ugradnju endoproteze kuka u stalnom je porastu. Materijali, dizajn, hirurške tehnike i rehabilitacija koja sledi nastavljaju da se razvijaju. Rehabilitacija je veoma važna i ne zaostaje za samim operativnim zahvatom. Izbor endoproteze i načina fiksacije zavisi od individualnih karakteristika pacijenata; stanja lokomotornog sistema, godina, telesne težine, fizičke aktivnosti. U zavisnosti od vrste endoproteze, postoji više različitih rehabilitacionih protokola. Kontroverzni su dokazi o razlikama u hirurškom pristupu, ulozi preoperativne edukacije i vežbi, kao i o primeni najefikasnijeg rehabilitacionog protokola. Uprkos brojnim nedoumicama, različite studije pokazuju da je najveći broj pacijenata zadovoljan rezultatima aloartroplastike kuka.

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**Ključne reči:** totalna endoproteza kuka, aloartroplastika kuka, rehabilitacija, vežbe