

The influence of total hip arthroplasty on patients' disability

Wpływ alopastyki stawu biodrowego na niepełnosprawność pacjentów

- A – preparing concepts (opracowanie koncepcji i założeń)
- B – formulating methods (opracowanie metod)
- C – conducting research (przeprowadzenie badań)
- D – processing results (opracowanie wyników)
- E – interpretation and conclusions (interpretacja i wnioski)
- F – editing the final version (redakcja ostatecznej wersji)

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Abstract

Introduction: Hip osteoarthritis manifests itself with pain, limitation of the range of motion, weaker muscles and pathological gait pattern. Total hip arthroplasty is a treatment of choice which leads to pain relief and improvement in patients' functioning. The aim of the work was to assess the influence of total hip arthroplasty on the reduction in patients' disability.

Material and methods: The study group included 30 patients aged 62.53 ± 12.79 . Mean body height was 168.03 ± 8.83 cm, while mean body mass was 78.47 ± 12.86 kg. Patients were examined twice, i.e. before the surgery and three months post surgery. In order to assess disability levels, two scales were applied, i.e. Western Ontario and McMaster Universities Arthritis Index (WOMAC) and modified Harris Hip Score (HHS).

Results: Total hip arthroplasty significantly reduced the patients' disability. Prior to the surgery, the mean results of HHS were at the level of 37.07 ± 14.47 points. After the surgery, the patients scored 74.93 ± 24.12 points. In WOMAC, the study participants scored an average of 61.7 ± 20.82 points before the surgery and 19.78 ± 26.31 points after the surgery. No correlations of the respondents' BMI and the duration of pain with the level of improvement resulting from the surgical treatment were noted either in HHS or in WOMAC. A positive correlation was found between the age of the respondents and the level of improvement in HHS.

Conclusions: Total hip arthroplasty significantly reduced the patients' disability three months after the surgery. No correlations of the respondents' BMI and the duration of pain with the level of improvement in their physical fitness were noted.

Key words: surgical treatment, osteoarthritis, total hip arthroplasty, functional state

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Streszczenie

Wstęp: Zmiany zwyrodnieniowe stawu biodrowego objawiają się bólem, ograniczeniem zakresu ruchu, osłabieniem siły mięśniowej i patologicznym wzorcem chodu. Alopastyka stawu biodrowego jest leczeniem z wyboru prowadzącym do ustąpienia bólu, i poprawy funkcjonowania chorych. Celem pracy była ocena wpływu zabiegu alopastyki stawu biodrowego na zmniejszenie stopnia niepełnosprawności pacjentów.

Material i metody: Grupę badaną stanowiło 30 pacjentów w wieku $62,53 \pm 12,79$. Średnia wysokość ciała wyniosła $168,03 \pm 8,83$ cm, zaś masa ciała $78,47 \pm 12,86$ kg. Pacjenci zostali poddani badaniu dwukrotnie: przed leczeniem operacyjnym i trzy miesiące po operacji. Do oceny niepełnosprawności zastosowano dwie skale: skalę Western Ontario and McMaster Universities Arthritis Index (WOMAC), oraz zmodyfikowaną skalę Harris Hip Score (HHS).

Wyniki: Zabieg alopastyki stawu biodrowego istotnie zmniejszył niepełnosprawność pacjentów. Przed operacją wyniki w skali HHS wyniosły średnio $37,07 \pm 14,47$ punktów. Po zabiegu operacyjnym wynik skali HHS wynosił średnio $74,93 \pm 24,12$ punktów. W skali WOMAC badani ocenieni zostali przed operacją na średnim poziomie $61,7 \pm 20,82$ punktów. Po leczeniu ocena stawu biodrowego w skali WOMAC wyniosła średnio $19,78 \pm 26,31$ punktów. Nie potwierdzono zależności pomiędzy BMI badanych osób oraz okresem bólu, a wielkością poprawy, jaką uzyskali oni w wyniku leczenia operacyjnego w teście HHS i skali WOMAC. Wykazano korelację dodatnią pomiędzy wiekiem badanych osób, a stopniem poprawy uzyskanym przez nich w skali HHS.

Wnioski: Zabieg alopastyki stawu biodrowego istotnie zmniejszył niepełnosprawność pacjentów trzy miesiące po zabiegu operacyjnym. Nie stwierdzono korelacji pomiędzy BMI badanych osób, czasem trwania dolegliwości, a wielkością poprawy sprawności badanych.

Słowa kluczowe:

leczenie operacyjne, choroba zwyrodnieniowa, endoprotezoplastyka, stan funkcjonalny

Introduction

The problem of hip osteoarthritis affects a considerable percentage of the population [1]. It is estimated that a few hundred million people in the world, including approximately 2 million in Poland, suffer from osteoarthritis. The number of patients will be gradually increasing in the near future due to the fact that society is aging and the number of people over 50 years of age is increasing [1,2,3,4]. Osteoarthritis leads to pain, the shortening of an affected limb, limitation of the range of motion and weaker muscles. As a consequence, a pathological gait pattern occurs [5,6,7] and physical activity levels decrease [8,9,10]. At a further stage, the disease also limits social life of patients [11] and affects objective and subjective satisfaction with physical, social and psychological aspects of life [12].

The treatment of osteoarthritis should start from teaching a patient how to move and perform everyday activities in an appropriate manner and from applying conservative treatment. Its aim is to reduce pain, to improve or maintain the range of

motion and slow down the progress of osteoarthritis [13,14]. In case conservative treatment is not effective, it may be necessary to apply surgical treatment in further stages of the disease [15,16].

Total hip arthroplasty significantly improves patients' fitness and quality of life [17,18]. Owing to the progress in medicine, total hip arthroplasty is a treatment of choice which leads to an improvement in patients' functioning [19,20]. After the surgery, it is significant to implement appropriate rehabilitation. It increases the patients' chance to regain full health and independence [21].

The aim of the work was to assess the influence of total hip arthroplasty on the reduction in disability of patients who underwent the surgery.

Material and methods

The study was carried out at Gruca Orthopaedic and Trauma Teaching Hospital in Otwock, after receiving approval from the head of the ward and from the Senate Scientific Research Ethics Committee of the University of Physical Education

in Warsaw. The study group consisted of 30 patients, including 21 women and 9 men. The characteristics of the study group are presented in Table 1.

Tab. 1. Biometric data of the study participants

Parameter	Descriptive statistics		
	± SD	Min	Max
Age [years]	62.53±12.79	31	78
Body mass [kg]	78.47±12.86	53	105
Body height [cm]	168.03±8.83	157	186
BMI [kg/m ²]	27.79±4.16	18.56	38.1

The obtained numerical values of BMI were transferred into qualitative data according to the norms adopted for adults. The percentage of individuals with normal body mass, overweight and obesity was determined. The study group included 7 individuals (23.3%) with normal body mass, 15 (50.0%) overweight persons and 8 (26.7%) obese patients.

The study inclusion criteria were as follows: written consent to participate in the study, minimum 18 years of age, being qualified by an orthopaedist to undergo total hip arthroplasty.

The exclusion criteria were as follows: no consent to participate in the study, post-surgical complications, inadequate psycho-physical state.

All the patients were examined twice, i.e. prior to the treatment and three months after the surgery. The examination included the basis for qualifying the patient to total hip arthroplasty, pain intensity (VAS 0-10) and disability levels determined with the use of two scales, i.e. the Western Ontario and McMaster Universities Arthritis Index (WOMAC) and modified Harris Hip Score (HHS). The WOMAC is a scale commonly used to assess orthopaedic patients with knee and hip joint problems and includes questions regarding pain, stiffness and functional abilities of joints. The HHS takes into account pain intensity, the use of orthopaedic devices (walker or elbow crutches) or walking without supporting devices, gait assessment and limping, pain occurring in a sedentary position, using public transport, walking up and down the stairs, putting on socks and shoes. The HHS also includes the examination of the range of motion, joint contracture and limb length discrepancy, so these data were not analysed separately in the study. During the examination, data regarding pain occurring during movement and rest, limb stiffness in the morning and after a longer rest as well as difficulties during everyday activities were gathered.

The statistical analysis of the collected material was performed using Statistica 10.0 software from StatSoft. Non-parametric tests were applied to analyse the variables. This type of tests was selected due to the fact that basic requirements of parametric tests, i.e. the compliance of the distribution of the examined variables with normal distribution, could not be fulfilled. This compliance was verified with the use of the Shapiro-Wilk test. In order to assess intra-group variability in two populations, Wilcoxon signed rank test was applied. The correlation of two variables which did not meet the normality criterion was calculated with the use of Spearman's rank correlation coefficient. The level of significance was set at $p < 0.05$.

Results

The study participants felt hip pain for 6.28 ± 5.94 years. Mean pain intensity declared by the respondents was determined at the level of 7.8 ± 1.97 according to VAS. Patients did not feel any pain after orthopaedic treatment.

Hip osteoarthritis was the most common reason for qualifying the patients from the examined group to total hip arthroplasty.

In the case of 10 study participants (33.3%), the right hip joint was operated on, 12 patients (40.0%) had the left hip joint surgery while the remaining 8 individuals (26.7%) underwent surgeries on both hip joints (one surgery was performed earlier). Limb length discrepancy, i.e. an operated limb longer by a maximum of 1 cm, was noted in 3 cases. In all the cases, the asymmetry was eliminated with the use of orthopaedic insoles.

According to the recommendations received at the hospital, the patients were using elbow crutches for six weeks and one crutch for the next six weeks after the surgery. If a patient recovered full pelvis stability during gait, the doctor recommended putting aside the crutches.

Prior to the surgery, the patients scored an average of 37.07 ± 14.47 points in HHS, which is a poor result according to the norms. After the surgery, the HHS result increased to the mean level of 74.93 ± 24.12 points. According to the norms, it is a medium result. The improvement resulting from the treatment was at a mean level of 38.7 ± 24.93 points and was statistically significant ($p < 0.0001$).

In WOMAC, the patients scored 61.7 ± 20.82 points prior to the surgery. After the surgery, the

score in WOMAC was considerably better. It was at a mean level of 19.78 ± 26.31 points. The achieved improvement in the patients' state assessed with the use of WOMAC was at a mean level of 42.44 ± 27.95 points and was statistically significant ($p < 0.0001$).

The level of improvement resulting from the applied treatment and assessed using HHS and WOMAC was correlated with age and BMI of the respondents as well as with the duration of hip pain. It was checked whether the respondents' age, BMI and duration of pain significantly affected the results of surgical treatment. In HHS, the correlation of the respondents' BMI and duration of pain with the level of improvement achieved as a result of the surgery was not confirmed. In WOMAC, the correlation of the patients' BMI and duration of pain with the level of improvement achieved as a result of the surgery was not noted.

A positive correlation between the respondents' age and their level of improvement measured in HHS was revealed ($R = 0.48$; $p = 0.0116$). The level of improvement in the patients' state measured using HHS was higher in older patients.

Correlations of the level of improvement with age and BMI of the respondents are presented in table 2.

Tab. 2. Correlations of the level of improvement with age and BMI

Difference [pts]	Age		BMI		Duration of pain	
	R	P	R	P	R	P
HHS	0.48	0.0116	0.08	0.7031	-0.06	0.7562
WOMAC	0.35	0.0742	0.10	0.6101	-0.15	0.4639

R-Spearman's rank correlation coefficient; p-probability

Discussion

The study sought to assess the influence of total hip arthroplasty on the quality of life of patients after the surgery. It was checked whether the surgery itself reduced the level of disability of the patients. Numerous authors proved a positive influence of total hip arthroplasty on the improvement in the quality of life and on the reduction in the level of patients' disability [12,20,21]. It is the most common method of treating orthopaedic patients [10,22].

According to Derman et al. and Harris et al. [1,23], overweight was one of the factors predisposing to hip osteoarthritis. The current lifestyle, sedentary work and a low level of physical activity in the society lead to obesity. In the research by the

mentioned authors, a correlation between increasing BMI in the population in recent years and a growing number of patients undergoing hip joint surgeries was revealed. In our research, the majority of the patients were overweight or obese. It may have resulted in degenerative changes. Pain which the respondents experienced also significantly affected their mobility and distance at which they were able to walk. The majority of the study participants preferred moving only in the house or flat and declared they experienced pain after covering small distances. It led to the fact that they gave up moving at longer distances, even by public transport.

In our study, we applied functional scales, i.e. HHS and WOMAC, to assess the level of disability of the patients in the early period following total hip arthroplasty. These scales allowed us to assess the most significant aspects of the patients' functioning in everyday life and they help to assess activities which patients can or cannot perform in a functional manner [4,10].

Numerous other authors tried to assess the functional state of patients after total hip arthroplasty [2,3,5,12,20,21,24-26]. Both in our work and in the research of other authors, an improvement in the functional state of the patients in various aspects of life was indicated. Surgical treatment affected not only a physical but also a psychological aspect of the patients' life. Kotela et al. [4] assessed functional changes in the study participants with the use of HHS and WOMAC. After the surgery, the state of 73.5% of the study participants was determined as very good or good. The result according to WOMAC obtained before the surgery fell within the range of 29.7 ± 4.9 , while after the surgery it was at the level of 77.0 ± 18.2 . The most significant aspect regarded a reduction in pain and an increase in the range of motion of lower limb joints.

In their studies, Bodys-Cubak et al. [3] and Ogrodzka et al. [25] examined patients with hip osteoarthritis with the use of the Short-Form Survey (SF-36). The survey examines physical and psychological state of patients. The results obtained by Bodys-Cubak et al. [3] indicated that 38% of the respondents defined their quality of life before the surgery as average. After the surgery, 83% of the study participants were satisfied with their quality of life. Health state improved in all the respondents, regardless of gender. The authors also noted a reduction in body mass in patients after the surgery

which may have exerted a positive influence on their fitness or resulted in taking up physical activity (by the study participants). Ogrodzka et al. [25] assessed the functional state of 50 patients before and 6 weeks after the surgery. The authors noted the largest improvement in an emotional wellness and in pain reduction. Also, the range of motion in the operated limb improved.

In their work, Majda et al. [12] assessed the functional state of patients before and after the surgery with the use of the Nottingham Health Profile (NHP), which measures health state in a subjective way. They assessed, inter alia, physical fitness and pain experienced by the study participants. Physical fitness improved by 27.9 points in women and by 43.3 points in men. Pain was reduced by 22 points in women and by 21.8 points in men. The differences were statistically significant. The results indicated a significant improvement in the physical sphere of patients after total hip arthroplasty.

Stanek et al. [21] examined 120 individuals (76 women and 44 men) after total hip arthroplasty. The authors carried out their own survey which assessed the level of the patients' recovery to physical fitness and the occurrence of pain. The research results confirmed the reduction in the number of patients with limitations in their motor function and the reduction in pain. The percentage of patients with very strong and strong pain decreased and the percentage of patients who stopped feeling pain increased.

Another study on the influence of various methods of total hip arthroplasty on the functional performance of patients was carried out by Truszczyńska et al. [26]. The authors compared the results of the patients before and after the surgery with the use of HHS and WOMAC. The study group included patients after total hip arthroplasty with collum femoris preserving (CFP), while the control group included patients after classical total hip arthroplasty. Both the patients from the study group and those from the control group achieved better results 3 months after the surgery. The number of points the patients after total hip arthroplasty with CFP scored in HHS denoted a very good result (mean 88.7 ± 6.46). The patients after classical total hip arthroplasty achieved an average result (79.69 ± 15.62). Also, an assessment with WOMAC revealed an improvement in both groups. The patients who underwent the surgery with CFP obtained a mean level of 88.7 ± 6.64 points, while the study

participants after classical surgery obtained 81.92 ± 14.49 points.

In the research by Kieszkowska-Grudna et al. [20], a positive influence of total hip arthroplasty on the physical and psychological aspects of the study participants was also noted. Pain assessed four months after the surgery was significantly reduced in all the patients.

Moreover, the studies by other authors confirmed the patients' quick recovery to full fitness. A proper application of all the recommendations of the doctors and physiotherapists was the condition determining this recovery [27,28]. In the research by Pop et al. [2], a positive influence of physiotherapy on the functioning of patients after hip joint surgeries was confirmed. The aim of the work was to assess the functional ability of the patients after hip surgery who came from rural areas. The authors assessed the functioning of the patients with the use of HHS. A considerably worse result was revealed in the patients coming from rural areas, which may be related to their BMI, type of work they perform and the lack of opportunities to undergo physiotherapy after leaving the hospital. Appropriate physiotherapy and reeducation of the patients are indispensable for the recovery to full and painless functioning after the surgery.

The main aim of the rehabilitation in our study was to prevent post-surgical complications and oedema and to reduce contractures. The patients performed isometric exercises, active exercises and active resistance exercises, and worked with the use of PNF methods, soft tissue and relaxation techniques. Another key aspect was also to learn appropriate gait pattern, to eliminate pathological patterns, and to learn and practise walking on the stairs with the use of crutches and rails. All these physiotherapeutic procedures had to be performed before releasing the patient from hospital.

The authors also indicated insufficient education of patients after total hip arthroplasty. In their study, Kunikowska et al. [15] analysed the most common functional problems of patients after total hip arthroplasty. They examined 60 patients (41 women and 19 men) after total hip arthroplasty. A mean period from the surgery was 4 months. The authors used their own survey as a research tool. They paid attention to the fact that after the surgery, the patients experienced further difficulties and their level of knowledge about performing everyday activities was insufficient. Another significant problem was

constituted by the risk of post-surgical complications which may considerably hinder the patients' recovery to physical fitness [28,29,30]. In this work, no cases of endoprosthesis dislocation were noted. The complication which was experienced by several patients was trochanteric bursitis. It occurred in 3 out of 30 study participants. Moreover, after the in-patient rehabilitation, the patients were released from hospital having theoretical and practical knowledge regarding the use and care of the hip joint provided by the qualified team of physiotherapists, doctors and nurses.

An inability to define the functional state of the patients immediately after the surgery was the study limitation. The patients were released from hospital after 3-5 days and it was too short a period for tissues to heal completely. The experienced pain

and the risk of endoprosthesis dislocation made it impossible to assess the full range of motion in the hip joint. Taking painkillers also disturbed the results related to the level of pain.

Revealing the effectiveness of total hip arthroplasty in improving functional abilities of the patients is considered to be a study strength.

Conclusions

1. Total hip arthroplasty significantly reduced the patients' disability three months after the surgery.
2. No correlations of the respondents' BMI and duration of pain with the level of improvement in the patients' fitness were noted.

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