

# AN ASSESSMENT OF THE RETURN TO PROFESSIONAL ACTIVITY OF PATIENTS AGED $\leq 30$ YEARS AFTER HIP REPLACEMENT SURGERY

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## Abstract

**Objectives:** The study evaluated the professional activity of patients after a total cementless hip replacement surgery performed at the age of  $\leq 30$  years. **Material and Methods:** The study group comprised 87 patients, with 95 total cementless hip replacements. The mean age was 25.7 years. The youngest patient was 17 years old, and the oldest 30 years old. The mean length of observation was 20.1 years, ranging 5–33 years. All patients underwent clinical and radiological evaluations before the surgery, and again in the third, sixth and twelfth months after the surgery. Further follow-up visits were performed every year. The tests were scored according to the Merle d’Aubigné and Postel (MAP) classification, as recommended by the Polish Society of Orthopaedics and Traumatology. Postoperative radiographs were used to assess the position of the endoprosthesis, and the degree of implant healing in the bone tissue. The data was subjected to statistical analysis. **Results:** Of the surveyed group, 67 patients were professionally active before the surgery: 34 were white-collar workers, 29 manual workers, and 4 students or school pupils. The remaining 20 had not worked for many years, and were receiving sickness or disability benefits. An excellent result, according to the Kellgren-Lawrence classification, was noted in 22 cases, a good result in 42 cases, and a satisfactory result in 6 cases. In 25 cases, a poor result was observed. All of the patients professionally active before the surgery returned to work following the procedure. A further analysis found that 15 previously-unemployed patients commenced employment following the procedure. The mean length of the sick leave was 196.2 days, and rehabilitation payments were granted in 5 cases. **Conclusions:** Total cementless hip replacement is a valuable method of treating osteoarthritis in young patients. All of the patients who worked before the surgery returned to work in the same position and on the same employment conditions. Most of the previously-unemployed patients commenced employment following the procedure. *Int J Occup Med Environ Health.* 2021;34(6):747–54

## Key words:

return to work, arthroplasty, total hip replacement, hip arthritis, clinical and radiological outcome, endoprosthesis

## INTRODUCTION

Total hip replacement is now a widely-recognized method of treating advanced hip arthritis, allowing the treatment of even severe forms of post-inflammatory or subdysplastic degenerative changes in the hip joint. Hence, endoprostheses are becoming increasingly used in difficult

cases of secondary coxarthrosis and in younger patients. It is not without significance that the vast majority of patients with secondary coxarthrosis are very young people, who can demonstrate significant disease symptoms even in the second or third decade of life. Due to the complicated nature of the anatomical and intraoperative conditions,

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and the high expectations of the patient, alloplastic procedures in young patients present a unique challenge for orthopaedists dealing with hip replacement surgery [1,2].

### Aim

The study evaluated the professional activity of patients after total cementless hip replacement surgery performed at the age of  $\leq 30$  years.

### MATERIAL AND METHODS

The study group comprised 87 patients, 53 women and 34 men, in whom a total of 95 total cementless hip replacement surgery procedures were performed in 1985–2014. The left side of the hip joint was operated on in 49 cases and the right side in 46. The mean age of the patients undergoing the procedure was 25.7 years (SD = 3.757, Me = 27). The youngest was 17 years old, and the oldest 30 years old. The mean length of observation was 20.1 years (SD = 9.74, Me = 20.86), ranging 5–33 years. The mean BMI was 24.785 (SD = 4.603, Me = 24.38), ranging 16.94–33.22.

The indication for surgical treatment was secondary, advanced degenerative disease of the hip joint. The group included 60 cases (63.2%) of dysplastic coxarthrosis, 8 cases (8.4%) of post-inflammatory coxarthrosis, and 4 cases (4.2%) of traumatic coxarthrosis. In addition, 3 cases (4.2%) of secondary coxarthrosis co-occurring with Perthes disease were observed, and 7 (7.2%) of degenerative changes in the course of rheumatoid joint inflammation. In 13 cases (13.7%), the alloplastic procedure was performed due to aseptic necrosis of the femoral head. More detailed characteristics of the study group, divided according to sex, are presented in Table 1.

The study was performed retrospectively. All patients underwent clinical and radiological evaluation before the surgery, and again in the third, sixth and twelfth months after the surgery. Further follow-up visits were performed every year. The last patient follow-up was conducted in 2019.

The tests were scored according to the Merle d'Aubigné and Postel (MAP) classification, as modified by Charnley, as recommended by the Polish Society of Orthopaedics and Traumatology. In this system, points are assigned for pain, gait and the sum of the ranges of passive movements within the operated hip joint [3]. The level of pain was evaluated according to a 10-point *Visual Analogue Scale* (VAS) [4].

The level of advancement of hip osteoarthritis was assessed according to the Kellgren-Lawrence classification based on the radiological image taken before the procedure [5]. In all cases, X-ray images were taken of the operated hip joint from the anterior-posterior and axial projections. Postoperative radiographs were used to assess the position of the endoprosthesis, the degree of implant healing in the bone tissue, and the presence and degree of extra-skeletal ossification [6,7]. In addition, the extent of migration was determined, i.e., the vertical, horizontal and angular displacement of the acetabular component. The healing of the acetabular component was evaluated according to the 3-level DeLee and Charnley classification, and that of the endoprosthesis stem according to Gruen and Moreland. The following features were also assessed: the axial seat of the stem in the femoral shaft, the features of vertical migration, atrophy, hypertrophy and saturation of bone tissue, and the presence of ossification in 7 zones [8,9]. The radiological evaluation was performed by an independent researcher.

Of the group, 67 (77%) patients were professionally active before the surgery: 34 (50.7%) were white-collar workers, 29 (43.3%) manual workers, and 4 students or school pupils. The remaining 20 patients had not worked for many years, and were receiving sickness or disability benefits. The vast majority presented with dysplastic coxarthrosis. Finally, 10 patients had never engaged in professional activity, and had been receiving disability benefit before the operation due to not being able to perform professional work.

**Table 1.** Characteristics of the study group of patients after a total cementless hip replacement surgery performed in 1985–2014 in Łódź, Poland

Variable	Participants (N = 87)		
	women (N = 53, 60.9%)	men (N = 34, 39.1%)	total
Procedures [n (%)]	60 (63.2)	35 (36.8)	95
right hip	32 (69.6)	14 (30.4)	46
left hip	28 (57.1)	21 (42.9)	49
2-stage left and right hip	7 (87.5)	1 (12.5)	8
BMI			
M	24.812	24.781	24.785
min.–max	16.94–33.22	19.25–30.03	
Age at operation [years]			
M	24.9	26.8	25.7
min.–max	17–30	17–30	
Observation period [years]			
M	22.8	15.1	20.2
min.–max	6.8–34.6	5.3–33.2	

The data was subjected to statistical analysis. The Kaplan-Meier survival rate of the prosthesis was calculated using the Statistica v. 10.0 PL software [10]. The relationship between the preoperative and postoperative VAS values was determined using Student's t-test.

The study was approved by the Bioethics Commission (RNN/178/14/KE). All procedures involved in the study were performed in accordance with the standards given in the 2013 Declaration of Helsinki.

## RESULTS

In all cases, as expected, the preoperative clinical and radiological results were poor. All hip joints were qualified as grade IV according to the Kellgren-Lawrence classification. The mean length of stay in the clinic was 8.4 days (SD = 2.836; Me = 8). A significant relationship was observed between the duration of hospitalization and the etiology of the degenerative illness: while the shortest stays

were recorded in cases of sterile femoral head necrosis, the longest stays were associated with cases of severe degenerative changes occurring together with developmental hip dysplasia, with significant movement limitations and limb length asymmetry before the surgery.

After a mean postoperative period of >20 years, an excellent result according to the Kellgren-Lawrence classification was noted in 22 cases (23.16%), a good result in 42 cases (44.21%), and a satisfactory result in 6 cases (6.32%). In 25 cases (26.31%), a poor result was observed. On the basis of this classification, a mean improvement of 6.9 pts was observed at the final clinical evaluation (SD = 1.314; Me = 7). This result is statistically significant. All poor outcomes were associated with aseptic loosening of the endoprosthesis, with 1 case being associated with septic loosening; these patients underwent a 2-stage revision procedure, resulting in a good final outcome. The clinical findings are presented in Table 2.

**Table 2.** Clinical results of the study group of patients after a total cementless hip replacement surgery performed in 1985–2014 in Łódź, Poland, according to the modified Merle d’Aubigné and Postel (MAP) classification, according to the etiology of degenerative changes

Etiology of degenerative changes	Hip results according to MAP classification			
	excellent	good	satisfactory	poor
DDH (60 hips) [n]	6	31	3	20
AVN (13 hips) [n]	10	3	0	0
Coxarthrosis (8 hips) [n]	0	3	2	3
RA (7 hips) [n]	4	2	0	1
Injury (4 hips) [n]	1	2	1	0
Perthes disease (3 hips) [n]	1	1	0	1
Total [n (%)]	22 (23.16%)	42 (44.21%)	6 (6.32%)	25 (26.31%)

AVN – avascular necrosis of the femoral head; DDH – developmental dysplasia of the hip; RA – rheumatoid arthritis.

Radiological evaluation revealed no other abnormal symptoms, apart from the previously discussed cases of loosening and revision, and confirmed that the prosthesis components were properly seated. In 8 cases (8.2%), extra-skeletal ossification was observed.

The mean VAS score was 6.3 pts (SD = 1.42; Me = 7) before the surgery, and 1.6 pts (SD = 0.843; Me = 1) after the surgery ( $p < 0.001$ ). This difference is statistically significant.

The subjective evaluation performed after the procedure was much better than the final results. The greatest improvements were observed in terms of significant reductions or resolution of pain, increases in the range of motion of the operated joint, and greater gait efficiency. Such improvements contributed to a more favorable overall assessment of the operated hip function and greater patient satisfaction with the obtained result. As predicted, relatively worse final results were recorded among patients treated for coxarthrosis after childhood developmental hip dysplasia. However, when analyzing these results, it should be remembered that an excellent grade following arthroplasty corresponds to the parameters observed in a healthy hip joint.

On the basis of these findings, using the Kaplan-Meier estimator, it was possible to determine the likelihood of

“survival” of the implants. Over an observation period of 10 years, the biofunctionality, i.e., the Kaplan-Meier coefficient, was found to be 85.18% for the entire prosthesis, 93.83% for the stem, and 86.42% for the acetabular component (81 cases). During a 15-year period, this value was 69.84% for the entire prosthesis, 85.71% for the stem, and 71.43% for the acetabular component (63 cases). In turn, over 20 years, the survival rate was found to be 54.54% for the entire endoprosthesis, 81.81% for the stem, and 56.36% for the acetabular component (55 cases).

All of the 67 patients who were in professional employment before the operation returned to work following the procedure. A further analysis found that 15 previously-unemployed patients entered employment following the procedure. The mean length of sick leave was 196.2 days, and rehabilitation payments were granted in 5 cases.

## DISCUSSION

The first total hip replacement procedure was performed in 1938 by the English orthopaedist Philip Wiles [11]. Since then, tremendous progress has been made in this field of orthopaedic surgery, and modern hip joint prostheses have evolved through steady advancements in the design

of materials, technical solutions, modern articulations and surgical techniques. Currently, total hip replacement surgery is the method of choice for the treatment of extensive and advanced degenerative changes of various etiologies in the hip joint.

However, the effect of arthroplasty on the professional activity of younger patients, i.e., those of the age examined in the present paper, remains unclear. Nevertheless, some studies have examined the problem in a slightly broader scope.

It has been reported that the majority of people employed prior to hip replacement return to work following the surgery [12,13]. The present findings suggest that the etiology of degenerative changes appears to be of key importance in determining the return to professional activity by young patients following hip replacement. The prognosis is very good in the case of hip replacement surgery performed due to aseptic necrosis of the femoral head: these patients quickly regained their full physical fitness, and typically returned to work in their previous position after a mean period of 3 months. All patients with aseptic necrosis of the femoral head returned to their previous work after the surgery. These findings indicate that the key factors in this regard are a relatively short disease course, a quick decision to perform endoprosthesis and the motivation of patients to resume professional activity. Young doctors, lawyers and farmers return to their previous work particularly quickly.

Patients treated surgically for post-traumatic lesions and those suffering from rheumatoid diseases (rheumatoid arthritis, ankylosing spondylitis) have a slightly worse prognosis. In these cases, degenerative changes develop much more slowly, and the patients gradually adapt to them. The only motivation to undergo arthroplasty was a significant limitation of the hip joint function. The fact that some of these patients had previously been receiving a disability allowance did not favor the decision to return to work. This was reflected in the results obtained by the authors.

The worst prognosis was observed in young patients treated surgically due to degenerative changes resulting from hip joint disease in childhood. In this group, the worst professional situation is observed among patients treated for dysplastic coxarthrosis: a degenerative disease characterized by extremely severe distortions of the anatomical structure of the hip joint. The picture of these distortions is often additionally complicated by the effects of previous surgical interventions in this area; however, although early results were promising, these were not confirmed in long-term observations. In these patients, the first symptoms of the disease appear very early, even in the second or third decade of life. Their expectations regarding the proposed treatment and the expected end result are exceptionally high. Being at the peak of biological, professional and social activity, these patients expect a quick return to full fitness in all aspects of their daily life. It is also important to note that some of these patients have never taken up a job due to significant limitations in their mobility.

The literature clearly confirms the effectiveness of hip replacement surgery and that it has a beneficial effect on the possibility of returning to professional activity. However, it is difficult to compare the results presented in this article with these findings. This issue is influenced by many factors. Generally, the procedure was associated with a significant improvement in the quality of life, including an improved range of motion, locomotion and reduction or even elimination of pain; these provided excellent conditions for returning to work. This was particularly apparent in the patients with aseptic necrosis of the femoral head, who returned to professional activity relatively early.

A completely different situation occurred in patients with a different etiology of degenerative changes. These patients had experienced a significantly reduced quality of life for a long period before the procedure, mainly due to the significant limitation of movement in the hip joint and muscle insufficiency, and were frequently subject to asymmetry of the limbs and faulty, inefficient gait. It was not the case that

these patients tended to avoid work for reasons related to the performed procedure. Rather, earlier dissatisfaction with the work performed, low earnings and a lengthy period of inability to work before the procedure had a stronger influence, as did an acquired habit of remaining unemployed while on sickness benefit or disability allowance.

In addition, a long waiting time for scheduled surgery has a significant negative impact on return to work. However, to the dissatisfaction of doctors and patients, hip replacement surgery has limited funding and availability, and suffers from long waiting times. Surgery can also be postponed by the patient due to a fear of losing a job, and of the outcome of the surgery itself. As such, it is difficult to compare these results with literature data.

Limitations to work were reported prior to the surgery irrespective of hip joint being replaced like standing, lifting, carrying moving objects, crouching, bending or kneeling [14]. Sankar et al. [14], in his study, noticed that about one-third of people returning to work within 1 month post-surgery tended to report more pain, function and work limitation than those who returned later post-surgery. Bohm [12] found that people with total hip replacement had an improved ability in meeting job demands at 1-year follow-up. Patients who returned to work were younger and with a better general physical function. Cowie et al. [16] reported that the majority of patients undergoing total hip replacement can expect to return to work and sporting activities within 4–6 months. They found no differences in working or doing sports with postoperative Grimby and Frandin [15] activity level, and physical level of occupational activity. In that study, low impact exercises such as walking or swimming were the most popular after hip surgery. Placing restriction on the patient's weight bearing and range of movement was also found to slow down the return to work with little additional benefit [17].

Whether the patient should return to work or high impact activities is still open to debate.

The patient can expect rapid improvement for the first 3 months after the surgery. According to clinical evi-

dence, it is thought that starting physical therapy right after the surgery can help speed up the recovery process and improve outcomes [18]. After a 6-week post-surgery period, most patient will be able to return to most of their daily activities including driving. Most patients are likely to begin their sporting and recreational activities within 6 months after the surgery [19]. However, it may take several days to several weeks before the patients will be able to return to work. While maintaining total hip precautions for 90 days post-surgery [20], it is recommended not to flex the hip by  $>90^\circ$ , cross the operated leg over the non-operated leg, or walk pigeon-toed (internal rotation of the hip). Most people experience rapid recovery in the first 3–4 months following hip replacement, after which improvements continue at a slower rate for up to a year [21]. The type of work will determine the length of time before return to work. The patients return to desk jobs and administrative work at about 6 weeks, while returning to manual labor is significantly prolonged, with average return to a job that requires [22] heavy lifting or excessive activity taking of 3–6 months [23,24].

The authors' observations and discussions with patients clearly suggest that an increasing number of patients want and expect a quick return to work after hip replacement surgery. This is supported by the gradual shortening of the waiting time for the procedure itself, improvements in the surgical technique, fast rehabilitation procedures, and a growing general awareness of the patients.

## CONCLUSIONS

Based on the present findings and those of previous studies, the following conclusions can be drawn: total cementless hip replacement is a valuable method of treating osteoarthritis in young patients, all of the patients who worked before the surgery return to work in the same position and on the same employment conditions, and most of the previously-unemployed patients enter employment following the procedure.

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