

## ***Evaluation of clinical and functional status of patients following total hip replacement***

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**Introduction** Total hip replacement and total knee replacement are one of the most commonly performed orthopaedic procedures and available assessment tools designed to measure functional outcomes are widely discussed in the literature. Organization and assessment of results of restorative treatment are important issues of total joint arthroplasty. **The objective** of the study was to evaluate functional status of patients after THR and non-operated subjects with coxarthrosis using scales and tests accepted as quality of life measures. **Material and methods** Clinical and functional status (pain intensity, impairment of limb function) was evaluated in 151 THR patients and non-operated coxarthrosis patients using WOMAC, VAS, Harris Hip Score, the Lequesne Index and McGill Pain Questionnaire. **Result** THR patients showed less pain intensity and stiffness as compared to controls ( $p < 0.05$ ) with no significant differences in severity of functional disorders before and after THR ( $p > 0.05$ ). **Conclusion** The findings suggested that deficits in function in THR patients required rehabilitation interventions at different postoperative time points.

**Keywords:** total hip replacement, coxarthrosis, functional deficit, scales, tests

### INTRODUCTION

Coxarthrosis is a very common disease with increasing incidence and the high impact worldwide. It is an age-related disorder and thought to be an inevitable consequence of growing old [1]. Non-operative treatment is indicated at early stages of coxarthrosis [2], and total hip replacement (THR) is the definitive treatment for advanced osteoarthritis of the hip joint [3, 4] to allow clinically significant improvement for the patients. Nevertheless, postoperative rehabilitation is of the utmost importance following total joint replacement [5]. Despite new joint replacement

technologies improving outcomes of THR some patients can develop hip pain at the side of surgery at a late and long-term follow-up (with stable implant and absent infection) or a pain of a different localization due to insufficient functional recovery of the limb that interferes with human kinematic chain of locomotor system.

The objective of the study was to evaluate an extent of impaired clinical and functional status of patients following THR at a late and long-term follow-up using assessment scales and tests.

### MATERIAL AND METHODS

Patients were examined and treated by qualified personnel. The investigation was performed in accordance with the ethical standards as laid down in the Declaration of Helsinki "Ethical principles for medical research involving human subjects" and the amendments. The patients and legally authorized representatives gave informed consent for surgical procedure and publication of the findings without identification.

The sample included results of examinations of 151 patients who were referred to rehabilitation unit of the RISC "RTO" and subdivided into two groups.

The two groups of patients were matched for sex ratio, length of disease with equal number of males and females in both groups.

An index group consisted of 77 patients (24 males and 53 females) aged 29 to 78 years ( $58.1 \pm 1.4$  years) who underwent THR and presented with pain in the operated limb at a late and long-term follow-up. Pain in the operated limb was associated with myofascial disorders at the hip area and soft tissue scars at the site of surgery in 70.5 % ( $n = 54$ ) of the cases and pain localized in the contralateral hip joint or other joints of the limbs

in 29.5 % ( $n = 23$ ). Duration of the disease prior to surgery averaged to  $11.9 \pm 1.3$  years. Postoperative follow-up was 0.3 to 2.1 years and averaged to  $1.1 \pm 0.2$  years. Bilateral THR was performed for 65 patients, among them 34 right-sided and 31 left-sided cases. THR was cementless ( $n = 41$ ), cemented ( $n = 21$ ) and hybrid ( $n = 15$ ).

Control group was comprised of 74 patients (23 males and 51 females) aged 38 to 78 years ( $55.9 \pm 1.1$  years) and diagnosed with grade III coxarthrosis including primary disease ( $n = 49$ ), dysplastic ( $n = 15$ ), posttraumatic ( $n = 7$ ) and associated with avascular necrosis of the femoral head ( $n = 3$ ). The controls included bilaterally ( $n = 35$ ) and unilaterally ( $n = 39$ )

involved hip. Duration of the disease averaged to  $10.0 \pm 1.0$  years.

Clinical and functional status was evaluated with VAS, the Lequesne Index, McGill Pain Questionnaire modified by V.V. Kuzmenko, WOMAC pain scale and Harris Hip Score. Application of several scales, tests and questionnaires allowed comprehensive characteristics of major clinical and functional manifestations and greater reliability of the findings. Statistical data analysis was performed using the tools of Microsoft Excel 2010 and Attestat computer program. The Student's t-test was used to determine significant differences between the samples. For calculations, a significance level of  $p < 0.05$  was adopted.

## RESULTS

Pain intensity scores and an extent of deficit in function of THR patients at a late and long-term follow-up (index group) and controls with grade III coxarthrosis measured with various scales and tests are presented in Table 1. Visual analogue scale pain score showed less pain intensity in Group I than in Group II ( $p < 0.05$ ). The scores indicated to moderate pain in patients of index group and evident pain in controls. Similar pain ratings were observed with WOMAC survey. THR patients exhibited less pain intensity as compared to subjects with grade III coxarthrosis. Total pain intensity score measured  $201.6 \pm 12.0$  mm in index group and  $232.5 \pm 9.9$  mm in controls. The differences identified with evaluation of pain intensity were significant ( $p < 0.05$ ).

Algo-functional assessment of pain intensity with Lequesne index and Harris Hip Score showed statistically significant differences between the groups ( $p < 0.05$ ). Total Lequesne index scored  $14.4 \pm 0.5$  in patients of index group and  $15.3 \pm 0.4$  in controls, and total Harris Hip Score was  $45.2 \pm 1.6$  and  $41.2 \pm 1.5$  points in patients of index and control groups, correspondingly. The findings indicated to evident pain, evident deficit in function of operated limb and absence of statistically significant differences between the groups ( $p > 0.05$ ).

The total number of applicable descriptors (NAD) of the McGill Pain Questionnaire was

$10.2 \pm 0.5$  words and the total pain rating index (PRI) measured  $22.5 \pm 1.5$  points in patients of index group; controls showed total NAD of  $12.7 \pm 0.5$  words and PRI of  $29.6 \pm 1.5$  points. The findings indicated to much lower values in THR patients as compared to controls. The differences were statistically significant ( $p < 0.05$ ).

Pain stiffness was measured in patients of both groups during the day time using WOMAC scoring system. Total WOMAC score was  $86.1 \pm 5.0$  mm in THR patients and  $103.1 \pm 4.8$  mm in coxarthrosis patients. Patients of Group II reported greater stiffness as compared to Group I. Differences between the groups were statistically significant ( $p < 0.05$ ).

Evaluation of functional deficit in index and control groups was of prime importance. WOMAC function score was  $722.4 \pm 35.8$  mm in THR patients and  $798.9 \pm 31.8$  mm in coxarthrosis patients with statistically significant differences between the groups ( $p < 0.05$ ). Functional deficit was also measured with Lequesne index and Harris Hip Score. Harris Hip Score of index and control groups was  $29.0 \pm 1.0$  and  $28.8 \pm 1.3$ , respectively, and Lequesne index measured  $9.4 \pm 0.3$  in both groups. No statistically significant differences were observed in functional deficit measures of index and control groups ( $p > 0.05$ ).

Table 1

Pain and function in THR and grade III coxarthrosis patients

Indices, scales, tests, questionnaire		Index group	Control group
Visual analogue scale (cm)		5.3 ± 0.2	6.2 ± 0.2
Lequesne index (points)	pain	5.0 ± 0.2	5.8 ± 0.2
	function	9.4 ± 0.3	9.4 ± 0.3
WOMAC pain questionnaire (mm)	pain	40.3 ± 2.4	46.0 ± 2.0
	stiffness	43.1 ± 2.5	51.6 ± 2.4
	function	43.0 ± 2.1	47.6 ± 1.9
Harris Hip Score (points)	pain	16.4 ± 0.8	13.1 ± 0.8
	function	29.0 ± 1.0	28.8 ± 1.3
McGill Pain Questionnaire (points)	NAD sens.°	5.2 ± 0.4	7.6 ± 0.4
	NAD aff.°	3.3 ± 0.2	4.1 ± 0.1
	NAD eval.°	2.7 ± 0.1	3.2 ± 0.1
	PRI sens.°	13.2 ± 1.1	17.5 ± 1.1
	PRI aff.°	6.6 ± 0.5	9.0 ± 0.5
	PRI eval.°	2.7 ± 0.1	3.2 ± 0.1

Note: sens.°, aff.° and eval.° – sensory, affective and evaluative categories, correspondingly.

## DISCUSSION

Outcome assessment following THR and TKR is relevant to monitoring standards of orthopaedic practice. The majority of publications focus on outcomes of surgical treatment or complications [6, 7, 8]. Other authors assess quality of life (QoL) using WOMAC, Oxford Hip Score, EQ-5D and SF-12 [9–13]. Good results after THR are reported in most publications [11, 14]. There are reserved opinions regarding outcomes of THR. While THRs are successful in decreasing pain and improving quality of life, it is unclear whether individuals who undergo TJA become more physically active after surgery. It is possible that THR, by itself, is not sufficient to affect the behavior of patients toward physical activity participation. To increase physical activity participation, individuals with THR may need to be exposed to exercise, behavioral interventions specifically aimed to promote physical activity [15]. We have the same point of view because not all the patients report pain relief and good function of the joint at a long-term follow-up. Seeber G.H. et al. [14] explored effectiveness of rehabilitation following THR in the Netherlands and Germany. In the Netherlands patients are discharged from the

hospital within a few days and only some of them can receive rehabilitation. The authors hypothesize that an intensive physical therapy is needed after THR to regain muscle strength and function as arranged in Germany where patient are transferred to rehabilitation centers for the period of 3 weeks. The German procedure is seen as more effective in terms of functional outcomes and patient satisfaction than the Dutch procedure of Seeber GH et al. [14]. However, our findings indicate to the rehabilitation needed at a long-term follow-up and the differences are reported in several values between totally replaced hip after improvement and the intact joint [16, 17]. Researches indicate to the problems THR patients are encountered postsurgery including pain, limited range of motion and impaired functioning of different joints [6, 18]. Padovan A.M. et al. reported optimization of postoperative pain management as one of the most important problems after surgery. It was shown that pain was intimately linked to the fear of movement, the so-called kinesiophobia, which could affect the entire postoperative period and quality of life in people undergoing THR [19]. The reported decrease in the range of motion at a short-

term follow-up [20, 21] that persisted through a ten-year period postsurgery [22] support our hypothesis that rehabilitation is required for an extended period of time. Abnormal kinematics of the knee and ankle joints was also reported before and after THR [16, 17, 21–23]. M. Wesseling et al. showed that joint loading was not normalized at 12 months of THR, with both hip and knee loading decreased in the patients compared to controls [23]. Persistent postsurgical pain is seen as a prevalent condition

following THR. Despite marked improvements in surgical methods and quality of implants during the last two decades, 27 % of THR patients reported experiencing persistent postsurgical pain at six months, with 4% of THR patients reporting severe-extreme persistent pain [24, 25]. Therefore, it is important for clinicians to comprehensively assess patients undergoing THR in order to identify the underlying pathology of a painful hip or impaired function and then offer timely treatment [26].

## CONCLUSION

Clinical and functional evaluation of THR patients at a long term and patients with grade III coxarthrosis showed statistically significant differences ( $p < 0.05$ ) in pain outcomes between the groups. THR patients reported less stiffness with WOMAC scoring system as compared to coxarthrosis group ( $p < 0.05$ ). No statistically significant differences ( $p > 0.05$ ) were identified between the groups in the assessment of deficit in function. The Lequesne Index, McGill Pain Questionnaire and Harris Hip Score appeared to be more sensitive in exhibiting limitations in functional activities of THR patients with less responsiveness

from WOMAC. The findings demonstrated that the absence of significant differences in functional deficit in both groups suggested the applicability of periodical courses of rehabilitation to be performed for THR patients [27, 28] due to regression of coxarthrosis related pathobiomechanical impairment [29] that can be continuous and failure in spontaneous sanogenesis. Deficit in function of the operated limb is strongly associated with biomechanics of lower limbs that can affect performance of implant components, the survival rate and finally, quality of life of the patients.

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