

The effect of the changes of co-morbidities and movement abilities on the long-term quality of life after total hip replacement

PhD thesis

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INTRODUCTION

The rise in living standards, the urbanization, the heavy physical works, and lifestyles which involve insufficient movement, all contribute to the rapid increase in rheumatologic illnesses all over the world. The frequent consequences of these diseases are a decrease in the capacity for work, disability, or a change in the quality of life. A complete recovery in terms of the health-related quality of life (HRQoL) is claimed to be increasing not only in the younger population but in elderly patients too.

In severe osteoarthritis the best solution is the total joint replacement which significantly improves the different health related quality of life (HRQoL) parameters. The main weakness of the different HRQoL methods that are applied for total hip replacement (THR) analysis is the lack of information regarding the influencing role of co-morbidities. This is especially true for cardiovascular diseases (CVDs) in an aging population. It has been well documented that heart failure, stroke, atherosclerosis and ischemic heart diseases are independent risk factors for severe osteoporosis and the subsequent hip fractures that stem from it. Despite the inverse relationship in bone mass between osteoporosis and osteoarthritis., we may assume that there are several common pathophysiological factors that have a similar influence on both the THR outcome and the HRQoL.

OBJECTIVES

I. To evaluate to what degree the THR operation itself or the co-morbidities or their progression influence the HRQoL and the patients' subjective feelings of health or otherwise after THR.

II. We looked for an objective method using simple parameters to reflect the severity of the CVD of the patient and to better characterize the HRQoL of patients with THR.

III. To analyze in detail the relationship between the movement and generic quality of life indicators and the subjective feeling of health of the patients, as well as the objective movement parameters measured by the surgeon and the patient's opinion about the success of the total hip replacement.

IV: To give guidance to the nursing staff who are responsible for the patients recovery after THR that which fields are the most important in the patient's care years after the operation.

METHODS

This cohort, retrospective longitudinal study involved 109 consecutive patients who had had THR in the orthopedic department of our hospital between 1998 and 2005, and who had been operated on by the same surgeon. 178 questionnaires were posted, and the response rate was 61%. Besides the questionnaires, the patients' health status (occurrence of and

changes in co-morbidities plus objective and subjective functional performance at the time of operation and 5 years later) was evaluated using the electronic database of the hospital and the case-history sheets of the patients. The questionnaires included demographic and personal health data, the EuroQol System HRQoL scores (EQ-5D and the short version of the Western Ontario and McMaster Universities' Osteoarthritis Index (WOMAC) scores.

With regard to the EQ-5D questions, the patients scored from 1 to 3 for mobility, self-care, daily activity, existence of pain/discomfort and anxiety/depression proportionally to the decrease of well being. On evaluation the single summary index was considered.

In the short version of the WOMAC questionnaire, patients scored from 0 to 10 for pain (0 means the best and 10 the worst assessment) when ascending stairs, rising from the sitting position, walking on a flat surface, getting in/out of the car, putting on socks, rising from bed, and sitting. The analysis was performed using the percentage ratio.

In the questionnaires, the patients were asked about co-morbidities that included the presence of hypertension (HT), ischemic heart diseases (IHD), chronic heart failure (CHF), stroke, diabetes mellitus and chronic pulmonary and hepatic diseases. The severity of each illness was classified by the clinical symptoms and the pharmacological treatment applied.

The severity stage of HT ranged from 0 to 3 in respect of the type and combination of the antihypertensive treatment. Stage 0 indicated no HT at all, while Stages 1, 2 and 3 included patients receiving single, double and triple or more antihypertensive drug treatment. For patients with IHD, the classification was as follows: Stage 0 – no IHD, Stage 1 – previous history of angina, Stage 2 – patients with ischemic

signs on ECG and/or applying anti-ischemic and cholesterol decreasing treatment, Stage 3 – patients who had previously had a myocardial infarction. In patients with CHF, the grouping was based on the NYHA criterion for heart failure.

We performed an Objective Cardiovascular Classification (OCVC) evaluating the deterioration of CVDs in respect of HT, IHD, and CHD over the period of 5 years. OCVC Stage 0 included patients who had no CVD; OCVC Stage 1 patients whose CVD status did not change or showed mild deterioration in one co-morbidity (one stage worse); OCVC Stage 2 patients who experienced moderate deterioration in one (two stages worse), or mild deterioration in two CVDs; and OCVC Stage 3 patients who experienced severe deterioration in a minimum of one co-morbidity (three stages worse), or moderate deterioration in two illnesses or who died during the examination.

For the subjective assessment of the health status (SAHS) the patients were asked to evaluate their global HRQoL in year 5 after surgery. The patients who felt no or minimal sickness were categorized as SAHS Group 0, while those who designated themselves as moderately or severely sick or who died during the examination period were classified as SAHS Group 1.

The movement status of the hip evaluated by the surgeon was considered to be an objective parameter. The surgeon who had performed the THR operation measured the flexion and the in- and out-rotation of the hip before surgery and in the 5th year after surgery.

During the same interval, the use of walking aids was also examined (does not use, or uses either walking stick or crutches or cane).

The patients also rated the success of the operation. They could choose from the following options: complete recovery regarding mobility, moderate improvement or no substantial changes movement ability; and deterioration in mobility status in spite of surgery.

Microsoft Windows Excel 2002 was used for data collection and SPSS 15.0 for Windows program for statistical analysis. Descriptive and comparative statistical methods were used: mean \pm SD for normally distributed continuous data, median and 1st and 3rd quartiles for skewed data, two-sided t-test for comparison of two means arising from unpaired normally distributed data, Mann-Whitney U-test for comparison of two means arising from unpaired skewed data, χ^2 test for analysis of the qualitative categorical variables. For the analysis of the correlations between the changes of EQ-5D and WOMAC as well as the hip movements Sperman's regression analysis was performed.

Logistic regression analysis was performed (forward, stepwise, conditional) to determine the influencing factors of the patients' SAHS and the success feeling of the operation.

Receiver Operating Curve (ROC) analysis was performed to compare the predicting role of OCVC and EQ-5D at year 5 for the SAHS. 'Truly healthy' patients were those who belonged to OCVC Groups 0 and 1 and/or had an EQ-5D score <1.5 , while 'truly sick' patients belonged to OCVC Groups 2 and 3 and/or had an EQ-5D scores ≥ 1.5 points.

A p value <0.05 was considered to indicate statistical significance.

RESULTS

Considering the demographic and morbidity data of the patients at the time of operation we found no significant differences among the variables examined in respect of gender, therefore in the following analyses the data were drawn up together. The occurrence of CVDs was significantly higher compared with the other co-morbidities. There were no substantial changes during the five years of the study where stroke, diabetes mellitus and chronic pulmonary and liver diseases. The severity of CVDs (HT, IHD) significantly worsened during the examined 5 years, while the progression of CHF was not statistically significant. Apart from those patients suffering from ischemic heart diseases, the severity of existing CVD at the time of operation did not greatly influence the self evaluation of the health status in Year 5.

The severity and especially the changes in CVD over 5 years, together with hospital admittance and length of stay, differed highly significantly between the two SAHS groups. The WOMAC and the EQ-5D scores improved significantly within both SAHS groups, though the severity of HT and IHD became significantly worse in SAHS Group 1 compared to the baseline level. In Year 5 the EQ-5D scores were significantly worse in SAHS Group 1 compared to SAHS Group 0, though the WOMAC scores showed a similar distribution in both groups. The WOMAC values improved in all but 4 cases (deteriorated in 3 cases, stagnant in 1 case).

The severity and frequency of co-morbidities related to the different OCVC groups (OCVC Group 0 n=26, Group 1 n=30, Group 2 n=27, Group 3 n=26) did not differ significantly in respect of CVD at the time of operation. The severity and frequency of co-morbidities related to the

different OCVC groups (OCVC Group 0 n=26, Group 1 n=30, Group 2 n=27, Group 3 n=26) did not differ significantly in respect of CVD at the time of operation.

The median value of EQ-5D scores increased proportionally in the OCVC groups (Group 0 1.1 (1, 1.6), Group 1 1.3 (1, 1.7), Group 2 1.5 (1.4, 1.7), Group 3 1.7 (1.3, 2)). However, the differences were not significant due to the high scatter. In turn, highly significant differences occurred in the self evaluation of health status. In the SAHS Group 0 the median OCVC group value was 1 (0, 2), but in the SAHS Group 1 the median value was 2.5 (2, 3) ($p < 0.000$).

The ROC analysis, to determine the sensitivity and specificity of the OCVC groupings and EQ-5D scores at Year 5 for overall awareness of health, revealed the advantage of the OCVC groupings. This variable characterized as highly significant the self evaluation of health status (AUROC=0.73, $p < 0.000$). At the optimum threshold value (borderline between OCVC Groups 1 and 2) the sensitivity was 66% and the specificity was 85%. The EQ-5D scores at Year 5 showed worse results (AUROC=0.56, sensitivity 52%, specificity 71% at the optimum threshold value 1.18 points).

Using logistic regression analysis, among the independent variables characterizing the general health status, only the female gender, the HT in Year 5, and the hospital admittance number showed significant correlation with the subjective feeling of the patient's well-being and health.

When the patients evaluated the success of the operation themselves 42 of them felt a complete recovery, 55 of them felt a substantial improvement in movement ability, and 2 of them experienced no change in their hip mobility (due to the low case number these patients were excluded from the

further analysis). Deterioration of hip movement was not mentioned at all, and there was no revision surgery in any case.

There were no significant differences between the components of EQ-5D and WOMAC at Year 0 as regards the patients' evaluation of the effectiveness of the operation. However, in Year 5 highly significant differences between the two groups were experienced as regards movement ability, anxiety/depression, health status evaluation, in all components of the WOMAC, as well as in the summarized values of EQ-5D and WOMAC. Comparing Year 0 and 5 significant improvements were found in all components of EQ-5D and WOMAC in those patients who felt completely recovered after the operation. In patients, who felt an improvement only in mobility functions, there were no significant differences in the mobility-and pain-dimensions of EQ-5D between Year 0 and 5. However, the other components of EQ-5D and WOMAC showed significant improvements in these cases.

There were no significant differences in Year 0 between SAHS Group 0 (n=77) and SAHS Group 1 (n=32) regarding the components of EQ-5D and WOMAC. In Year 5 the improvement in all components of EQ-5D (except self-care) and WOMAC was highly significant in SAHS Group 0.

However, in Year 5 highly significant differences between the two groups were experienced as regards movement ability, anxiety/depression, health status evaluation, in all components of the WOMAC, as well as in the summarized values of EQ-5D and WOMAC. Comparing Year 0 and 5 significant improvements were found in all components of EQ-5D and WOMAC in those patients who felt completely recovered after the operation. In patients, who felt an improvement only in mobility functions, there were no significant differences in the mobility-and pain-dimensions of

EQ-5D between Year 0 and 5. However, the other components of EQ-5D and WOMAC showed significant improvements in these cases.

In respect of the feeling of overall health of the patients in Year 5, the surgeon-assessed mobility function of the hip was examined. There were no significant differences in the mobility of the hip either before surgery or in Year 5 in respect of SAHS Group 0 or 1. The objective mobility functions improved significantly at Year 5 in both groups.

The mobility of the hip was evaluated also on the basis of the patients' feeling about the success of the operation. At the time of operation significantly better results occurred only in the degree of flexion in patients who felt a complete recovery from the THR compared to those patients who felt only slight improvement in movement ability. In Year 5 all of the examined mobility functions showed a significant improvement and the values were similar in both groups.

Comparing patients who used or did not use movement helping devices before surgery, significant differences occurred in self-care, daily activity, pain/discomfort, anxiety/depression and in the summarized EQ-5D score, but not in the components of WOMAC. As it was expected, for patients using a walking aid at Year 5 after THR, significantly worse values were found in movement ability, self-care, daily activity, anxiety/depression, in all components of WOMAC and in the summarized EQ-5D and WOMAC scores. The number of the patients using walking aids at the time of operation (n=48) significantly decreased at Year 5 (n=13, $p<0.001$), and the number of new users was only 6 (5 patients used stick, and 1 patient crutch).

We did not find significant relationships between the 0 – 5 year changes of the WOMAC values and the surgeon-evaluated hip movements. Using logistic regression analysis to evaluate the patients' feeling about the success of the operation considering general and movement variables, only the female gender was an influencing factor. When the WOMAC values were also involved into the analysis than besides the female gender, the Year 5 WOMAC values had a highly significant influencing role.

CONCLUSIONS

The conclusions are overviewed according to the Objectives:

I. As a summary we can state that the operation, according to the international data, was a successful intervention. We found only limited number of studies which has examined the importance of co-morbidities to the HRQoL years after THR. Comparing to the whole population we can prove an outstandingly high occurrence rate of CVDs in our patients. We can explain this situation by the fact that this population may use much higher amount of non-steroidal anti-inflammatory drugs because of their pain that may worsen the cardiovascular status of the patients. We found that after successful THR, patients' postoperative awareness of health is influenced mainly by existing and developing CVDs. It seems to be the case that for patients with significant HT, IHD or CHF even a successful operation will not improve the patients' general feeling of health.

II. We have performed an Objective Cardiovascular Classification evaluating the deterioration of CVDs in respect of HT, IHD, and CHD over the period of 5 years. Higher was

the OCVC grouping worse was the patients' global feeling of sickness. The OCVC seems to be more effective than the widely used EQ-5D HRQoL method in respect of either sensitivity or specificity to determine the patients' overall feeling of health. We could confirm these results also by logistic regression analysis. However, the application of the OCVC grouping, which we have developed, needs further prospective validation.

III. It was found that THR significantly improved both the objective and subjective movement values at Year 5. However, there were no significant differences in respect of the surgeon measured movement parameters between patients who felt completely recovered or experienced only a slight improvement in mobility. We have not found significant correlations also among the movement parameters and the WOMAC values. We can conclude from these results that in the late phase after successful THR there is no significant importance of the particular degree of the hip movement, however, using movement helping device in Year 5 characterizes better the improvement of general HRQoL and the global movement function.

IV: Our study reinforced that several years after the successful operation and rehabilitation the awareness of health is influenced mainly by existing and developing CVDs but not by movement parameters. When the mobility function does not improve properly, of course, the pain and the restricted movement will influence the HRQoL. We suggest that 5 years after successful THR the nursing care has to focus not only on the further improvement of mobility but to strengthen the subjective feeling of health of the patients. Nurses and doctors have to pay more attention to the adequate treatment of cardiovascular co-morbidities whose prevalence is much higher than it is in the normal population, and has more

influence on the later post-THR HRQoL than mobility function alone. Nurses have to call the patients' attention to the importance of the regular medicine intake to keep their CVDs in steady state. We may conclude from the results of our study that there is an increased demand to inform patients in a similar way, who are on waiting list. We have to try to decrease the non-steroidal anti-inflammation drugs intake and shorten the waiting time among the patients who have significant CVDs to get a more favorable long term HRQoL.

LIST OF PUBLICATIONS

1. Király E., Gondos T.: Cardiovascularis betegségek szerepe csípőízületi endoprotézis beültetése utáni betegségérzet kialakulásában. *Orv. Hetil.* 152: 532–536 (2011)
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3. Király E., Gondos T.: Cardiovascular diseases and the health-related quality of life after total hip replacement. *Journal of Clinical Nursing*, 21:2843-2850 (2012)
4. Király E, Gondos T.: The effect of functional movement ability on the quality of life after total hip replacement. *Journal of Clinical Nursing*, doi: 10.1111/jocn.12135 (2012)