## Original article

# Daily step counts and health-related quality of life before and after bilateral and unilateral total hip arthroplasty

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## Abstract

**Purpose:** We examined and compared the daily step counts and health-related quality of life of patients before undergoing either bilateral or unilateral (with or without arthritis in the opposite joint) total hip arthroplasty (THA), and for 6 months afterwards.

**Participants and Methods:** Participants were patients who were living at home and were requested to wear accelerometers and log their daily step count preoperatively and again 6 months postoperatively. Additionally, they completed the Oxford Hip Score and EuroQol 5-Dimension questionnaires at both time points.

**Results:** Data from 40 patients were analyzed. Patients underwent bilateral total hip arthroplasty (n=13), unilateral total hip arthroplasty with arthritis in the opposite joint (n=13), and unilateral total hip arthroplasty without arthritis in the opposite joint (n=14). The Oxford Hip Score and EuroQol 5-Dimension score showed that the daily step counts of patients who underwent bilateral or unilateral total hip arthroplasty without arthritis in the opposite joint significantly increased postoperatively, but that of patients who received unilateral THA with arthritis in the opposite joint did not change significantly. The Oxford Hip Score indicated an improvement in hip joint function after surgery, but the EuroQol 5-Dimension score did not show a significant change postoperatively in patients who received bilateral total hip arthroplasty.

**Conclusion:** The pre- and postoperative comparisons of the participant's daily step count after bilateral and unilateral operations without arthritis on the other side showed improvements in their amount of daily life activities. In all surgeries, Oxford Hip Score improvements were confirmed. The EuroQol 5-Dimension score of bilateral operations did not change. Bilateral operations and an understanding of unilateral postoperative qualitative support will be necessary in the future.

**Key words:** bilateral total hip arthroplasty, unilateral total hip arthroplasty, degenerative arthritis, step count, health-related quality of life

## Introduction

Total hip replacement or arthroplasty (THA) as well as partial hip replacement are performed in cases of terminal osteoarthritis or articular rheumatism. Typical symptoms cause a decrease in the activities of daily living (ADL) due to pain when walking and are often associated with a decreased quality of life (QOL).

Among the various types of artificial joint replacement operations performed in Japan, THA was performed in as many as 50,000 cases during 2015, an increase of approximately 30,000 cases compared to 2005[1]. THA is performed at the end stages of joint disease, and successful operations can eliminate pain and are considered extremely effective for improving the patient's QOL. THA has been described as a type of surgery offering superior reconstructive potential and high patient satisfaction[2]. The number of such surgeries is expected to continue to rise in the future to treat an increasing number of age-related conditions appearing in conjunction with the rapidly aging Japanese society.

Various studies investigating the changes in muscle strength and range of motion after surgery for arthritis

have been conducted[3–5] in addition to studies assessing the changes in patients' QOL[6, 7].

According to the results of a study[8] using a pedometer to evaluate daily step count as a measure of physical activity before and after THA, no significant differences were observed in the number of steps taken before surgery and one month postoperatively. In addition,[9] on artificial lower limb joint replacement,

"It is difficult to compare a patient's activities of daily living between the time before undergoing surgery and after postoperative discharge, the latter of which can be reflective of the patient's hospital experience. As such, surveying patients as to their daily activities after discharge is needed."

However, few studies conducted to date have examined the relationship between step count and health-related QOL. Furthermore, although osteoarthritis may involve lesions in both hip joints, there has been no study comparing bilateral and unilateral THA (with or without arthritis in the opposite joint). Degenerative hip arthropathy can present as lesions in both hip joints and adversely impact the capacity for physical activity and QOL.

Therefore, in this study, we investigated the changes in health-related QOL, a subjective measure of health and wellness, in patients who underwent either bilateral or unilateral THA (with or without arthritis in the opposite joint) at six months postoperatively. To compare the patients' ADL, this study was conducted on patients who resided at home before and after the surgery. In addition, we investigated the relationship between the daily step count and health-related QOL in order to support surgery patients.

## Patients and Methods

The purpose of this study was to identify changes in the daily step count and health-related QOL before and after surgery among patients who underwent either bilateral or unilateral THA, and further investigate the relationship between the daily step count and health-related QOL.

In this study, daily step count refers to the number of steps taken during the period from waking up until going to sleep, and reflects a patient's ADL during their waking hours, such as exercise, housework, and occupation. The daily average value for data representing a 7-day period was used.

### Study population

Participants were 45 patients undergoing either bilateral or unilateral THA (with or without arthritis in the opposite joint) at University Hospital A between September 2010 and June 2011. All patients resided in their homes before and after discharge from the hospital.

### Research procedure

We conducted the investigation request 1–2 times/week. Patients were briefed both verbally and in writing regarding the purpose of this study during the examination conducted one month prior to the surgery. Patients also received instructions on the use of the accelerometer, and consenting patients were interviewed. In addition, an accelerometer and a survey form were sent by postal mail to patients who did not undergo the 1-month preoperative examination after obtaining their consent via telephone. These materials were collected by return mail following the completion of measurements.

Postoperative surveys were conducted following the same procedure as the preoperative survey and after reconfirming the patient's intentions to participate in the study via telephone. According to the results of a previous study,[10] significant improvements in pain and physical function, measured using the Western Ontario and McMaster Universities Osteoarthritis Index and EuroQol 5-Dimension (EQ-5D), were confirmed six months after THA surgery; thus, our postoperative survey period was also defined as six months in this study.

### Ethics

This study received approval from the University Study Ethics Committee, and all patients participated voluntarily. Individuals were asked to provide informed consent for the investigation, with the understanding that they would not be at a disadvantage if they refused to participate. All information was anonymously coded to maintain the participants' privacy, and the data were not used for any purpose other than for the given study, which was carried out via postal mail.

### Outcome measures

Steps

The number of steps was measured using a Lifecorder EX accelerometer (Suzuken Corporation). Patients wore it as a shoulder harness from the time they woke up until they went to bed for 10 days before and after the operation. We asked patients to remove the accelerator during bathing. Three pre- and postoperative days of step count data were excluded, leaving the total data of 7 days for analysis. We read the data using the 02 Life Riser software (Suzuken Corporation), which analyzed steps automatically.

Health-related QOL

We assessed subjective health before and after the operation with the EQ-5D questionnaire and Oxford Hip Score (OHS).

The OHS[11] is the standard for evaluating health-related QOL in people with arthritis. It has 12 items to assess hip pain and function in everyday life using a 5-point Likert

scale (a score of 1 indicates a problem and 5 indicates no problem), with scores ranging from 12 to 60 points. A total rating of 12 points indicated the lowest QOL while 60 indicated the highest possible QOL. For this study, we developed a Japanese version of the OHS, tested its reliability and validity, and estimated the internal consistency reliability using Cronbach's α coefficient (0.91)[12]. We collected data about the age, sex, diagnosis, operative method, and comorbidities through medical records. We asked participants about their height and weight in an investigation request and calculated their body mass index (BMI) and examined their living conditions, such as occupation and cohabitants.

The EQ-5D is a self-reported questionnaire to evaluate health-related QOL. There are three kinds of answers for the five items (movement, ADL, everyday activity, pain/dysphoria, and uneasy/moping). A score of three indicates a problem, two denotes a mild problem, and one represents no problem. We digitized the health status from the results and calculated the health-related QOL score[13]. The answers from the five items were then converted into an effect level. The effect level shows if we are in poor health (score of 1) or in perfect health (score of 0). When the scores on all five items were 3, the effect level was −0.111; when all five items were scored at 1, the effect level was 1.000. This study used the effect level conversion table of the Japanese edition of EQ-5D[14].

### Surgical procedures

Information concerning the patients' age, sex, diagnosis, operation type, and comorbidities was collected from the medical records. In the survey form, patients were asked about aspects of their living situation, such as their employment status and whether they lived alone or with others, and their BMI was calculated based on their height and weight at the time of invitation to participate in the survey. We gathered information on the presence or absence of contralateral arthritis with the clinical records.

### Statistics

A Wilcoxon signed-rank test was performed to evaluate the changes in daily step count, OHS, and EQ-5D scores, both pre- and postoperatively. We examined the association between the postoperative steps of patients who underwent bilateral and unilateral THA with the OHS and EQ-5D score using a Spearman's rank order correlation coefficient.

Statistical analyses were performed using SPSS version 24.0. The level of significance in all tests was p<.05.

## Results

### Baseline characteristics

Of the 45 participants who underwent THA, 40 were included in the analysis. A total of five patients were excluded from the analysis: two patients who did not provide consent to participate, one patient lost the accelerometer and tools of the Lifecorder, one withdrew in the middle of the study, and the Lifecorder did not provide complete data for one patient (Figure 1). All patients who underwent THA had degenerative arthritis. The age of the 13 patients who received bilateral THA was 65.0 ± 6.1 (range, 54–75) years, and 11 of them were females (84.6%). The age of the 13 patients who received unilateral THA (with arthritis in the opposite joint) was 69.7 ± 5.9 (range, 56–76) years, and 11 of them were females (84.6%). The age of the 14 patients who received unilateral THA (without arthritis in the opposite joint) was 72.1 ± 6.7 (range, 55–79) years, and 10 of them were females (71.4%). There were no significant differences between the patients who underwent different types of THA (Table 1).

### Outcome measures

Daily step count and health-related QOL were calculated before and after surgery. The number of steps taken by patients who underwent bilateral THA before and after surgery increased significantly from 2,841 steps/day preoperatively to 5,173 steps/day postoperatively (P=0.019) (Figure 2). No significant difference was observed with respect to the number of steps taken by patients who underwent unilateral THA (arthritis also presents in the opposite joint) before and after surgery, which increased from 2,530 steps/day preoperatively to 3,725 steps/day postoperatively (P=0.055) (Figure 3). However, the number of steps taken by patients who underwent unilateral THA (no arthritis in the opposite joint) before and after surgery increased significantly from 3,455 steps/day preoperatively to 5,014 steps/day postoperatively (P=0.008) (Figure 4).
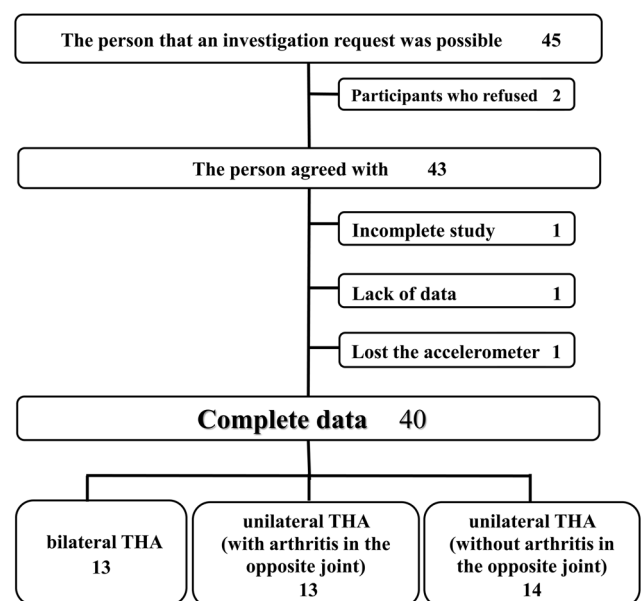


**Figure 1**  Study enrollment and follow-up.

**Table 1** Patient attributes

| | | Bilateral THA | | Unilateral THA (with arthritis in the opposite joint) | | Unilateral THA (without arthritis in the opposite joint) | |
|---|---|---|---|---|---|---|---|
| | | n=13 | % | n=13 | % | n=14 | % |
| Age (years) | Mean ± SD (Range) | 65.0 ± 6.1 (54–75) | | 69.7 ± 5.9 (56–76) | | 72.1 ± 6.7 (55–79) | |
| Sex | Male | 2 | 15.4 | 2 | 15.4 | 4 | 28.6 |
| | Female | 11 | 84.6 | 11 | 84.6 | 10 | 71.4 |
| Comorbidities (Yes) | Hypertension | 2 | 15.4 | 4 | 30.8 | 5 | 35.7 |
| | Diabetes | 2 | 15.4 | 2 | 15.4 | 1 | 7.1 |
| BMI | Mean ± SD (Range) | 22.8 ± 2.7 (18.1–28.4) | | 23.7 ± 3.7 (17.9–29.9) | | 23.1 ± 3.4 (16.8–27.6) | |
| Working (Yes) | | 5 | 35.7 | 3 | 25.0 | 3 | 21.4 |
| Living alone (Yes) | | 0 | 0.0 | 4 | 33.3 | 3 | 21.4 |



**Figure 2** Improvement in the number of steps of bilateral THA patients from pre- to 6 months post-operation.



**Figure 3** Improvement in the number of steps of unilateral THA (with arthritis in the opposite joint) patients from pre- to 6 months post-operation.

**Figure 4** Improvement in the number of steps of unilateral THA (without arthritis in the opposite joint) patients from pre- to 6 months post-operation.

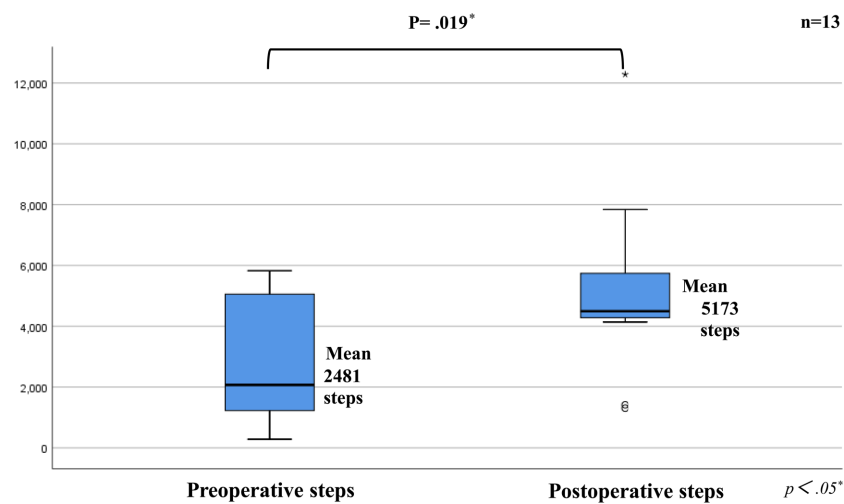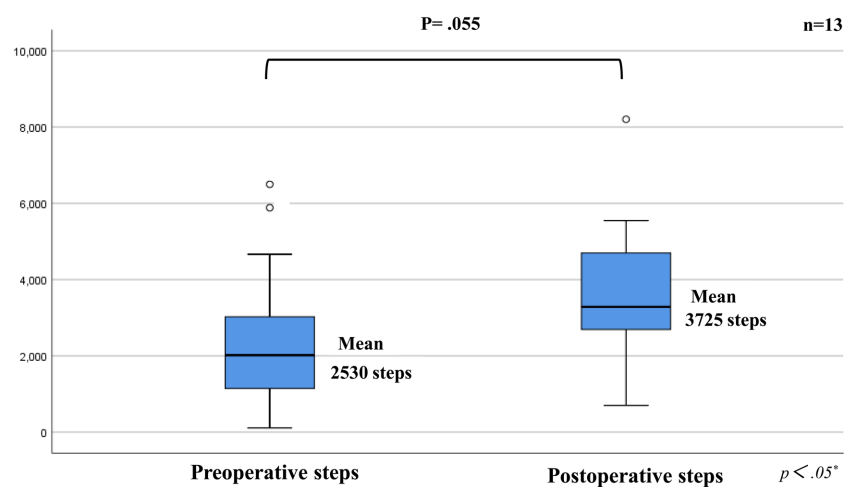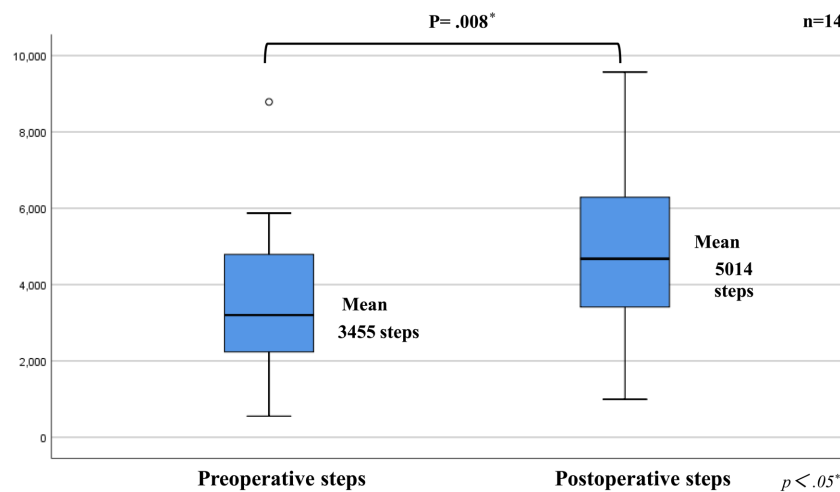The OHS pre- and postoperatively were 33.9 ± 10.5 and 21.3 ± 7.1 (*P*=0.003) and 34.9 ± 9.1 and 19.4 ± 5.8 (*P*=0.001), respectively; and for unilateral THA (no arthritis in the opposite joint), was between 25.2 ± 7.9 and 16.0 ± 1.2 (*P*=0.005) (Table 2). Improvement in hip joint function was observed in all joints. The EQ-5D values (effect values) for each type of surgery were 0.63 preoperatively and 0.74 postoperatively (*P*=0.255), 0.57 preoperatively and 0.77 postoperatively (*P*=0.003), and 0.70 preoperatively and 0.84 postoperatively (*P*=0.015), respectively (Table 3).

Relationship between daily step count and health-related QOL

A significant correlation was observed between the daily step count after surgery and the OHS (r=0.614, *P*=0.025) and EQ-5D score (r=0.583, *P*=0.036) (Table 4).

## Discussion

Considering the baseline characteristics, there was no significant difference found between the patients who underwent bilateral or unilateral THA (i.e., patients with and without arthritis in the opposite joint, respectively). For the patients who underwent bilateral or unilateral THA (without arthritis in the opposite joint), a significant difference was found in their daily step counts before and after the procedure; on the other hand, for patients who underwent unilateral THA (with arthritis in the opposite joint), there was no significant difference found in their daily step counts before and after the procedure. This demonstrates that the condition of patients who underwent bilateral or unilateral THA (without arthritis in the opposite joint) improved after the operation; however, for patients who underwent unilateral THA (with arthritis in the opposite joint), walking ability

involving the contralateral hip joint was impacted by the effect of arthritis.

A previous study found that patients with pain on both sides who underwent unilateral THA did not show significant improvements in QOL[7]. The mean daily step counts of patients aged 70 years or older was 4,569 steps/day. Using numbers from a report of the Ministry of Health, Labour, and Welfare, we found that the daily step count of patients who underwent bilateral or unilateral THA (without arthritis in the opposite joint) were restored to a value similar to the nationwide average. Objective data improvement was confirmed with the use of the Lifecorder regarding daily life[15], which showed how patients consciously move during their free time after an operation for maintaining their health is important; we thus matched individuals according to their habits after the THA.

In all operative methods, a significant difference was confirmed for OHS and hip joint function was improved by undergoing surgery. It is important to consider dislocation prevention in the daily lives of patients as they need reasonable support in performing activities after THA.

As for unilateral THA (with or without arthritis in the opposite joint), a significant difference was found in the results of the EQ-5D. In contrast, patients who underwent bilateral THA did not demonstrate a significant difference. Only mild improvement was observed, and this may affect the six-month postoperative pain and self-care scores. A study about health-related QOL reported low Short Form Health Survey (SF-36) scores in the subscales of body function and daily life role function for both groups[16]. SF-36 consists of 36 questions (items) that measure physical and mental health in relation to eight health aspects.

Furthermore, a correlation was found in this study between the step counts of patients who underwent bilateral

**Table 2** Changes in the six-month postoperative OHS results in patients that underwent THA

| OHS (Oxford Hip Score) | Bilateral THA | | | | | Unilateral THA (with arthritis in the opposite joint) | | | | | Unilateral THA (without arthritis in the opposite joint) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n=13 | | | | | n=13 | | | | | n=14 | | | | |
| | Preoperative | | Postoperative | | P | Preoperative | | Postoperative | | P | Preoperative | | Postoperative | | P |
| | Mean ± SD | | Mean ± SD | | | Mean ± SD | | Mean ± SD | | | Mean ± SD | | Mean ± SD | | |
| Scores | 33.9 | 10.5 | 21.3 | 7.1 | 0.003 | 34.9 | 9.1 | 19.4 | 5.8 | 0.001 | 25.2 | 7.9 | 16 | 3.5 | 0.005 |
| Items | n | % | n | % | | n | % | n | % | | n | % | n | % | |
| **1 How would you describe the pain you <u>usually</u> have from your hip?** | | | | | | | | | | | | | | | |
| None | 1 | 7.7 | 6 | 46.2 | | 0 | 0.0 | 8 | 61.5 | | 3 | 21.4 | 8 | 57.1 | |
| Very mild | 2 | 15.4 | 3 | 23.1 | | 8 | 61.5 | 4 | 30.8 | | 4 | 28.6 | 5 | 50.0 | |
| Mild | 4 | 30.8 | 4 | 30.8 | | 3 | 23.1 | 1 | 7.7 | | 1 | 7.1 | 1 | 7.1 | |
| Moderate | 5 | 38.5 | 0 | 0.0 | | 7 | 53.8 | 0 | 0.0 | | 6 | 42.9 | 0 | 0.0 | |
| Severe | 1 | 7.7 | 0 | 0.0 | | 2 | 15.4 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| **2 Have you had any trouble with washing and drying yourself (all over) <u>because of your hip</u>?** | | | | | | | | | | | | | | | |
| No trouble at all | 4 | 30.8 | 6 | 46.2 | | 2 | 15.4 | 6 | 46.2 | | 10 | 71.4 | 11 | 78.6 | |
| Very little trouble | 3 | 23.1 | 4 | 30.8 | | 6 | 46.2 | 5 | 38.5 | | 3 | 21.4 | 3 | 21.4 | |
| Moderate trouble | 2 | 15.4 | 3 | 23.1 | | 4 | 30.8 | 2 | 15.4 | | 1 | 7.1 | 0 | 0.0 | |
| Extreme difficulty | 4 | 30.8 | 0 | 0.0 | | 1 | 7.7 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| Impossible to do | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| **3 Have you had any trouble getting in and out of a car or using public transport <u>because of your hip</u>? (whichever you tend to use)** | | | | | | | | | | | | | | | |
| No trouble at all | 2 | 15.4 | 5 | 38.5 | | 0 | 0.0 | 8 | 61.5 | | 6 | 42.9 | 9 | 64.3 | |
| Very little trouble | 4 | 28.6 | 6 | 46.2 | | 6 | 46.2 | 4 | 30.8 | | 6 | 42.9 | 5 | 35.7 | |
| Moderate trouble | 2 | 15.4 | 1 | 7.7 | | 4 | 30.8 | 1 | 7.7 | | 2 | 14.3 | 0 | 0.0 | |
| Extreme difficulty | 3 | 23.1 | 0 | 0.0 | | 2 | 15.4 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| Impossible to do | 2 | 15.4 | 1 | 7.7 | | 1 | 7.7 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| **4 Have you been able to put on a pair of socks, stockings or tights?** | | | | | | | | | | | | | | | |
| Yes, easily | 0 | 0.0 | 1 | 7.7 | | 1 | 7.7 | 9 | 69.2 | | 5 | 35.7 | 7 | 50.0 | |
| With little difficulty | 4 | 30.8 | 7 | 53.8 | | 3 | 23.1 | 1 | 7.7 | | 7 | 50.0 | 7 | 50.0 | |
| With moderate difficulty | 2 | 15.4 | 2 | 15.4 | | 5 | 38.5 | 2 | 15.4 | | 2 | 14.3 | 0 | 0.0 | |
| With extreme difficulty | 5 | 38.5 | 1 | 7.7 | | 2 | 15.4 | 1 | 7.1 | | 0 | 0 | 0 | 0.0 | |
| No, impossible | 2 | 15.4 | 2 | 15.4 | | 2 | 15.4 | 0 | 0.0 | | 0 | 0 | 0 | 0.0 | |
| **5 Could you do the household shopping <u>on your own</u>?** | | | | | | | | | | | | | | | |
| Yes, easily | 4 | 30.8 | 7 | 53.8 | | 3 | 23.1 | 7 | 53.8 | | 7 | 50.0 | 10 | 71.4 | |
| With little difficulty | 2 | 15.4 | 3 | 23.1 | | 4 | 30.8 | 4 | 30.8 | | 4 | 28.6 | 4 | 28.6 | |
| With moderate difficulty | 2 | 15.4 | 2 | 15.4 | | 6 | 46.2 | 1 | 7.7 | | 2 | 14.3 | 0 | 0.0 | |
| With extreme difficulty | 3 | 23.1 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | | 1 | 7.1 | 0 | 0.0 | |
| No, impossible | 2 | 15.4 | 1 | 7.7 | | 0 | 0.0 | 1 | 7.7 | | 0 | 0.0 | 0 | 0.0 | |
| **6 For how long have you been able to walk before <u>pain from your hip</u> becomes severe? (with or without a cane)** | | | | | | | | | | | | | | | |
| No pain/More than 30 minutes | 1 | 7.7 | 10 | 76.9 | | 1 | 7.7 | 8 | 61.5 | | 4 | 28.6 | 10 | 71.4 | |
| 16 to 30 minutes | 3 | 23.1 | 1 | 7.7 | | 3 | 23.1 | 3 | 23.1 | | 2 | 14.3 | 2 | 14.3 | |
| 5 to 15 minutes | 5 | 38.5 | 2 | 15.4 | | 3 | 23.1 | 1 | 7.7 | | 7 | 50.0 | 1 | 7.1 | |
| Around the house only | 3 | 23.1 | 0 | 0.0 | | 4 | 30.8 | 1 | 7.7 | | 1 | 7.1 | 0 | 0.0 | |
| Not at all – severe pain from walking | 1 | 7.7 | 0 | 0.0 | | 2 | 15.4 | 0 | 0.0 | | 0 | 0.0 | 1 | 7.1 | |
| **7 Have you been able to climb a flight of stairs?** | | | | | | | | | | | | | | | |
| Yes, easily | 0 | 0.0 | 3 | 23.1 | | 0 | 0.0 | 3 | 23.1 | | 0 | 0.0 | 6 | 42.9 | |
| With little difficulty | 2 | 15.4 | 6 | 46.2 | | 4 | 30.8 | 5 | 38.5 | | 9 | 64.3 | 7 | 50.0 | |
| With moderate difficulty | 3 | 21.4 | 2 | 15.4 | | 3 | 23.1 | 2 | 15.4 | | 4 | 28.6 | 1 | 7.1 | |
| With extreme difficulty | 8 | 57.1 | 1 | 7.7 | | 4 | 30.8 | 2 | 15.4 | | 1 | 7.1 | 0 | 0.0 | |
| No, impossible | 0 | 0.0 | 1 | 7.7 | | 2 | 15.4 | 1 | 7.7 | | 0 | 0.0 | 0 | 0.0 | |

**Table 2**  (Continuation of Table 2)

| OHS (Oxford Hip Score) | Bilateral THA n=13 | | | | | Unilateral THA (with arthritis in the opposite joint) n=13 | | | | | Unilateral THA (without arthritis in the opposite joint) n=14 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Preoperative Mean ± SD | | Postoperative Mean ± SD | | P | Preoperative Mean ± SD | | Postoperative Mean ± SD | | P | Preoperative Mean ± SD | | Postoperative Mean ± SD | | P |
| **8  After a meal (sitting at a table), how painful has it been for you to stand up from a chair <u>because of your hip</u>?** | | | | | | | | | | | | | | | |
| Not at all painful | 2 | 15.4 | 9 | 69.2 | | 1 | 7.7 | 10 | 76.9 | | 4 | 28.6 | 12 | 85.7 | |
| Slightly painful | 5 | 35.7 | 4 | 30.8 | | 4 | 30.8 | 2 | 15.4 | | 6 | 42.9 | 2 | 14.3 | |
| Moderately painful | 5 | 35.7 | 0 | 0.0 | | 4 | 30.8 | 1 | 7.7 | | 1 | 7.1 | 0 | 0.0 | |
| Very painful | 1 | 7.7 | 0 | 0.0 | | 4 | 30.8 | 0 | 0.0 | | 3 | 21.4 | 0 | 0.0 | |
| Unbearable | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| **9  Have you been limping when walking, <u>because of your hip</u>?** | | | | | | | | | | | | | | | |
| Rarely/never | 0 | 0.0 | 4 | 30.8 | | 2 | 15.4 | 7 | 53.8 | | 3 | 21.4 | 10 | 71.4 | |
| Sometimes, or just at first | 5 | 38.5 | 6 | 46.2 | | 4 | 30.8 | 3 | 23.1 | | 6 | 42.9 | 4 | 28.6 | |
| Often, not just at first | 5 | 38.5 | 1 | 7.7 | | 1 | 7.7 | 3 | 23.1 | | 3 | 21.4 | 0 | 0.0 | |
| Most of the time | 2 | 15.4 | 0 | 0.0 | | 4 | 30.8 | 0 | 0.0 | | 1 | 7.1 | 0 | 0.0 | |
| All of the time | 1 | 7.7 | 2 | 15.4 | | 2 | 14.3 | 0 | 0.0 | | 1 | 7.1 | 0 | 0.0 | |
| **10  Have you had any sudden, <u>severe</u> pain – "shooting," "stabbing," or "spasms" – <u>from the affected hip</u>?** | | | | | | | | | | | | | | | |
| No days | 5 | 38.5 | 11 | 84.6 | | 4 | 30.8 | 13 | 100.0 | | 5 | 35.7 | 13 | 92.9 | |
| Only 1 or 2 days | 3 | 23.1 | 3 | 23.1 | | 2 | 15.4 | 0 | 0.0 | | 4 | 28.6 | 0 | 0.0 | |
| Some days | 3 | 23.1 | 0 | 0.0 | | 4 | 30.8 | 0 | 0.0 | | 5 | 35.7 | 0 | 0.0 | |
| Most days | 1 | 7.7 | 0 | 0.0 | | 3 | 23.1 | 0 | 0.0 | | 0 | 0 | 1 | 7.1 | |
| Every day | 1 | 7.7 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | | 0 | 0 | 0 | 0.0 | |
| **11  How much has <u>pain from your hip</u> interfered with your usual work (including housework)?** | | | | | | | | | | | | | | | |
| Not at all | 2 | 15.4 | 7 | 53.8 | | 0 | 0.0 | 8 | 61.5 | | 5 | 35.7 | 12 | 85.7 | |
| A little bit | 5 | 38.5 | 6 | 46.2 | | 3 | 23.1 | 3 | 23.1 | | 5 | 35.7 | 2 | 14.3 | |
| Moderately | 2 | 15.4 | 0 | 0.0 | | 4 | 30.8 | 2 | 15.4 | | 0 | 0.0 | 0 | 0.0 | |
| Greatly | 3 | 23.1 | 0 | 0.0 | | 5 | 38.5 | 0 | 0.0 | | 3 | 21.4 | 0 | 0.0 | |
| Totally | 1 | 7.7 | 0 | 0.0 | | 1 | 7.7 | 0 | 0.0 | | 1 | 7.1 | 0 | 0.0 | |
| **12  Have you been troubled by <u>pain from your hip</u> in bed at night?** | | | | | | | | | | | | | | | |
| No nights | 5 | 38.5 | 10 | 76.9 | | 3 | 23.1 | 11 | 84.6 | | 5 | 35.7 | 11 | 78.6 | |
| Only 1 or 2 nights | 1 | 7.1 | 1 | 7.7 | | 1 | 7.7 | 1 | 7.7 | | 1 | 7.1 | 3 | 21.4 | |
| Some nights | 4 | 30.8 | 2 | 15.4 | | 7 | 53.8 | 1 | 7.7 | | 8 | 57.1 | 0 | 0.0 | |
| Most nights | 2 | 15.4 | 0 | 0.0 | | 1 | 7.7 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| Every night | 1 | 7.7 | 0 | 0.0 | | 1 | 7.7 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |

A Wilcoxon signed-rank test. OHS uses 12 items to ask about pain and the body function of the hip in everyday life on a 5-point Likert scales; scores range from 12 to 60 points. A rating of 12 points is the lowest quality of life, and a rating of 60 is the highest.

THA and the OHS and EQ-5D results. It is important to understand the pain status and regulate physical activity accordingly. In addition, support during the intervention, such as at the time of surgery, is crucial.

Additionally, when the improvements of physical activity (PA) function in THA patients was compared with healthy controls, it was improved to 90% 12 months post-surgery[17]. Furthermore, in the 2 years after operation, the difference in the amount of exercise was shown to be similar[18].

An increase in the physical active mass and improvement of health-related QOL were confirmed by patients who had undergone surgery. In a study of patients after THA, a risk of ischemic heart disease has been reported[19], which causes a decrease in the improvement of physical mass. Because high-risk patients also include those suffering from hypertension and diabetes, the BMI of our study participants confirmed that that an additional result may be the prevention of lifestyle-related diseases. This study confirmed an increase in the daily steps and a change in the health-related QOL of participants.

The QOL of patients after THA has been reported to be high three years after the procedure[20], however a longer evaluation period is required in future studies.

By providing patients with helpful information regarding pain and the postoperative care required, in addition to the fact that an improvement in body function can be ex-

**Table 3**  Changes in the six-month postoperative EQ-5D results in patients who underwent THA

| | | Bilateral THA | | | | | Unilateral THA (with arthritis in the opposite joint) | | | | | Unilateral THA (without arthritis in the opposite joint) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Preoperative | | Postoperative | | P | Preoperative | | Postoperative | | P | Preoperative | | Postoperative | | P |
| | | Mean ± SD | | Mean ± SD | | | Mean ± SD | | Mean ± SD | | | Mean ± SD | | Mean ± SD | | |
| EQ-5D | effect values | 0.63 | 0.15 | 0.74 | 0.16 | 0.255 | 0.57 | 0.09 | 0.77 | 0.16 | 0.003 | 0.7 | 0.17 | 0.84 | 0.12 | 0.015 |
| | | n | % | n | % | | n | % | n | % | | n | % | n | % | |
| Items | Mobility | | | | | | | | | | | | | | | |
| | None | 3 | 23.1 | 5 | 38.5 | | 0 | 0.0 | 5 | 38.5 | | 7 | 50.0 | 10 | 71.4 | |
| | Mild to moderate | 10 | 76.9 | 8 | 61.5 | | 13 | 100.0 | 8 | 61.5 | | 7 | 50.0 | 4 | 28.6 | |
| | Severe | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |
| | Self-care | | | | | | | | | | | | | | | |
| | None | 6 | 46.2 | 9 | 69.2 | | 5 | 38.5 | 12 | 92.3 | | 11 | 78.6 | 12 | 85.7 | |
| | Mild to moderate | 7 | 53.8 | 4 | 30.8 | | 7 | 53.8 | 1 | 7.7 | | 2 | 14.3 | 2 | 14.3 | |
| | Severe | 0 | 0.0 | 0 | 0.0 | | 1 | 7.7 | 0 | 0.0 | | 1 | 7.1 | 0 | 0.0 | |
| | Activities of daily living | | | | | | | | | | | | | | | |
| | None | 2 | 15.4 | 4 | 30.8 | | 1 | 7.7 | 5 | 38.5 | | 8 | 57.1 | 10 | 71.4 | |
| | Mild to moderate | 11 | 84.6 | 8 | 61.5 | | 11 | 84.6 | 8 | 61.5 | | 5 | 35.7 | 4 | 28.6 | |
| | Severe | 0 | 0.0 | 1 | 7.7 | | 1 | 7.7 | 0 | 0.0 | | 1 | 7.1 | 0 | 0.0 | |
| | Pain | | | | | | | | | | | | | | | |
| | None | 3 | 23.1 | 7 | 53.8 | | 0 | 0.0 | 9 | 69.2 | | 4 | 28.6 | 11 | 78.6 | |
| | Mild to moderate | 8 | 61.5 | 6 | 46.2 | | 11 | 84.6 | 4 | 30.8 | | 8 | 57.1 | 3 | 21.4 | |
| | Severe | 2 | 15.4 | 0 | 0.0 | | 2 | 15.4 | 0 | 0.0 | | 2 | 14.3 | 0 | 0.0 | |
| | Anxiety/depression | | | | | | | | | | | | | | | |
| | None | 9 | 69.2 | 12 | 92.3 | | 9 | 69.2 | 10 | 76.9 | | 10 | 71.4 | 14 | 100.0 | |
| | Mild to moderate | 3 | 23.1 | 1 | 7.7 | | 4 | 30.8 | 3 | 23.1 | | 4 | 28.6 | 0 | 0.0 | |
| | Severe | 1 | 7.7 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | | 0 | 0.0 | 0 | 0.0 | |

A Wilcoxon signed-rank test. The scores of the EuroQol five dimensions questionnaire (EQ-5D). There are three kinds of answers for the five items (3 means there is no problem, 2 that there is a small problem, 1 that there is a problem), and we digitized the state of health results and calculated health-related quality of life scores. Total scores range from −0.11 to 1, where 1 corresponds to perfect health and 0 to death.

**Table 4**  Association of steps after bilateral THA with QOL

| Bilateral THA | OHS | EQ-5D |
|---|---|---|
| Steps/day | −0.614* | 0.583* |

$P<0.05$*.

pected after surgery, we can help them in decision-making and planning as well as to provide appropriate support during treatment, including discharge guidance.

By taking two sets of data, before and six months after surgery, of patients undergoing bilateral or unilateral total hip replacement, we determined the differences in daily step counts and changes in the health-related QOL of patients before and after unilateral or bilateral THA. However, a larger sample size and longer evaluation period is necessary for future studies.

## Conclusion

For patients who underwent unilateral THA (without arthritis in the opposite joint), a significant difference was observed in the daily step count before and after the procedure, with no significant differences observed in patients who underwent bilateral THA. However, an improvement in hip joint function was observed after both operative procedures in terms of OHS.

The EQ-5D results of patients who underwent unilateral THA (without arthritis in the opposite joint) suggested that a significant difference existed for unilateral THA (with arthritis in the opposite joint). The EQ-5D results found a correlation between the daily step counts of patients who underwent bilateral THA and the OHS on the health-related QOL.

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