

# Patient-reported Mobility Problems after Total Hip Arthroplasty

Master thesis in Medicine  
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# 1. Abstract

## Background

Since 1979 the Swedish Hip Arthroplasty Register (SHAR) has been gathering data on patients being operated with a total hip prosthesis in Sweden. In 2002 SHAR introduced measurement of patient-reported outcomes (PROM) [1]. Six years later all Swedish hospitals were participating in this program. PROM-data are collected preoperatively and one, six and 10 years postoperative. One-year postoperative 14% of patients report having mobility problems associated with the operated hip.

## Purpose

The purpose of this study is to determine whether the patient reported problems with mobility can be identified using gait analysis.

## Patients & Methods

Patients operated at Sahlgrenska University Hospital during years 2011-2013, reporting problems with the mobility 1 year postoperatively were identified (n=54). 25 patients (Group I) accepted participation. A matched cohort (Group II, n=25), reporting no problems with mobility was included as controls. A portable gait analysis instrument was used to analyse the gait pattern.

## Results

Patients reporting problems with mobility had a lower range of motion in the operated hip (p=0.04).

## **Conclusions**

Our study shows a correlation between patient-reported mobility problems one-year post surgery and decreased hip range of motion measured with GaitSmart™. Further studies are needed to identify the reason for mobility problems in patients operated with a hip prosthesis.

## **Key words**

Gait analysis, patient-reported outcome, total hip arthroplasty, total hip replacement

## 2. Introduction

Osteoarthritis (OA) is a chronic joint disease that leads to loss of articular cartilage as well as new bone formation [2]. It is the most common joint disease worldwide. According to World Health Organization 10% of men and 18% of women aged over 60 years have symptomatic osteoarthritis and 80% of those with osteoarthritis will have limitations in movement. The prevalence of OA is more common in Nordic countries and it is estimated that every fourth person over 45 years of age has the disease in Sweden [3, 4]. There are several risk factors for developing OA such as age, gender, genetics, obesity and abnormal loading of the joint [5]. Joints that are commonly affected includes hips, knees and hands [6]. The disease causes physical impairments due to pain, stiffness, swelling and decreased range of motion [7]. Early symptoms are presented during exercise and straining activities, limiting daily activities. In some cases the symptoms progress and patients experience pain during rest. Treatment of hip OA initially includes non-pharmacological and pharmacological treatment [8]. Non-pharmacological treatment consists of physiotherapy and weight loss, while pharmacological treatment involves oral and topical analgesics and intra-articular corticosteroid injections. Total hip arthroplasty (THA) is the most commonly used surgical procedure in patients with hip osteoarthritis when non-surgical treatment is no longer sufficient. Each year approximately 17 000 THAs are performed in Sweden and the most common reason is osteoarthritis. Other indications for THA include certain hip fractures, avascular femoral necrosis and rheumatoid joint diseases [9].

### Swedish Hip Arthroplasty Register

The Swedish Hip arthroplasty Register (SHAR) was founded by Peter Herberts and his colleagues in 1979 with the purpose of improving the outcome of hip surgery and contribute to research [10, 11]. All Swedish hospitals performing THAs report to the SHAR and the

coverage is about 98 % [12]. Data such as age, gender, primary diagnosis, surgical techniques and type of prosthesis are collected in the SHAR. In 2002 SHAR introduced a patient reported outcome measure (PROM) program. Six years later all hospitals in Sweden were participating in this program [12, 13].

### **The Swedish PROM program**

PROM used by SHAR consist of 12 questions including a patient-reported Charnley classification, a visual-analogue scale (VAS) for pain assessment and the EuroQoL-5D (EQ-5D) [12]. These data are collected preoperatively, one, six and 10 years after surgery.

Postoperatively patients also report their satisfaction with the surgical outcome according to a VAS scale (Satisfaction-VAS).

The EQ-5D included in PROM is a standardized health-related quality of life instrument to measure health outcomes [1]. It consists of two parts, a questionnaire (EQ-5D) and a general health scale (EQ-5D VAS). EQ-5D has five dimensions consisting of mobility, hygiene, usual activities, pain/discomfort and anxiety/depression. Each of the dimensions has three options (1-3) where 1) implies no problem, 2) indicates moderate problems and 3) means severe problems. For the mobility dimension a 1) corresponds to 'walking without difficulties', 2) corresponds to 'can walk, but with some difficulties' and 3) corresponds to 'being bedbound'. The answers of the EQ-5D questionnaire are transposed into an index value, which functions as a general measure of health-related quality of life. EQ-5D VAS is a VAS scale ranging from 0 to 100 where 0 means worst possible health and 100 represents best possible health.

### **Gait analysis**

Gait analysis is the study of locomotion in human subject. It is used in various fields ranging from sports to medical specialties. The method is applied both in research and also used as a

diagnostic tool [14]. Gait has been analysed through various ways through times with the oldest descriptions dating back to Aristotle [15]. Today there are several ways to analyse gait, where the most accurate way is the use of invasive methods [16, 17]. Because of the inaccessibility and the risk of infection, the non-invasive method of using of high-speed video cameras and retro-reflective markers is more common. Another way to measure gait is through wearable inertial measurement sensors (IMU) that incorporate accelerometers and gyroscopes [14, 18, 19]. IMUs have the advantage of not being restricted to a gait laboratory. It is also inexpensive compared to the aforementioned systems [14].

In the orthopaedics sector gait analysis has been used to determine the gait pattern of THA patients before and after surgery [20-24]. The results of these studies show that most improvement occurs within the first three to six months after surgery, where the range of the operated hip significantly increases and approaches that of the contralateral healthy hip. There is however still remnants of the abnormal gait pattern even one to two years after surgery with a smaller range of motion on the operated hip [21, 22, 25]. Even after longer periods of time THA patients have impaired gait compared to normal controls in their age category [26-28].

### **Charnley Classification**

Patients with hip OA have historically been classified with several classification systems in order to predict the outcome of THA [29]. One of these is the Charnley classification system which was introduced in 1970's. This classification categorizes hip patients into three classes called A, B and C. Charnley A represents patients with OA in one hip only and no other joint problem, B stands for two hips with OA and C that there are other joints with OA or other comorbidities which refrains normal walking function in the patient [30, 31]. This is a rough categorization and it has since been modified, where patients categorized as Charnley B are divided into B and BB, where B represent one THA and a hip with OA and BB represent

bilateral THA [31]. In SHAR a self-reported Charnley classification is used [32]. Patients respond to the following question:

1. Do you have any symptoms from the other hip?
2. Do you have problems walking because of other reasons (e.g., pain from other joints, back pain, angina, or any other medical condition impairing your walking capacity)?

Patients responding no to both questions are classified as Charnley A. Positive response to question one corresponds to Charnley B and Charnley C represents patients responding yes to the second question. Self-administered Charnley has in previous studies shown to correlate well with the results of THA [32]. Charnley C category is a strong predictor of poor results after THA.

### **3. Aim**

The purpose of the study is to determine the correlation between the patient-reported outcomes (PROM) after Total Hip Arthroplasty (THA) and range of motion in lower extremities, measured with gait analysis. We hypothesise that patients who report problems with their mobility dimension in EQ-5D have a measureable lower range of motion in their hips during walking.



## 4. Materials and methods

Patients operated at Sahlgrenska University Hospital during years 2011-2013 with valid PROM-data reported one year postoperative were identified. Patients who had reported problems with both hips or comorbidities that could cause gait problems one year after surgery were excluded from the study. The inclusion criteria was: patients aged 40 to 80 years, primary osteoarthritis and self-reported Charnley A category one year postoperative. Patients were stratified into two groups based on their response in the mobility dimension of EQ-5D.

We identified a total of 54 patients reporting problems with the mobility dimension that fit the inclusion criteria. All patients had reported moderate problems corresponding to a 2) in the EQ-5D mobility parameter. Two of these patients were deceased. The remaining 52 patients were sent a letter describing the study, its purpose and the procedures being performed.

Patients were informed that that they would be contacted by phone the same week. During the phone call patients were given the opportunity to ask questions about the study and to decide whether they would like to participate. A total of 26 patients accepted participation (group I). Written consent was retrieved at the day of examination. Among the 26 patients included data from two of the patients could not be analysed due to technical difficulties. A control group (group II, n=25), reporting no problems in the mobility dimension was selected using propensity score [33]. Patients were matched, based on preoperative EQ-5D index, age, gender and BMI in order to create a comparable control group.

The flow-chart below shows the process of contacting the patients.

Patients that fit the criteria  
n=54

→ Deceased n=2

↓

Patients called by phone  
n=52

→ Didn't answer the phone n=3  
Couldn't participate due to comorbidity n=9  
Too far for them to travel to the hospital n=1  
Didn't state a reason n=11

↓

Patients accepted participation  
n=28

→ Didn't arrive n=2  
Data lost n=2

↓

Patients with complete data in group I  
n=24

↓

Propensity score done on 25 patients who participated 1:1 match\*

→ Didn't answer the phone n=3  
Didn't state a reason n=4  
Couldn't participate due to comorbidity n=1  
Couldn't be used because of comorbidity n=1  
↓ Didn't arrive n=1

Patients who accepted participation  
n=16  
New propensity score done on the remaining patients in group 1 n=25

→ Didn't answer the phone n=4  
Didn't state a reason n=5  
Didn't need to be contacted=6

↓

Patients who accepted participation  
n=10  
Patient with complete data in group II  
n=25

\*Unfortunately in one of the patients data could not be analysed

## Examining patients

The patients were examined in *Lundberg's laboratory for orthopaedic research* [34]. New questionnaires containing EQ-5D was obtained. Clinical examination of the hips and knees as well as measurements of height and weight was performed. Patients were asked if they had any problem or had got any treatment with other joints, if they had had any trauma the recent year and if they had any disease that could affect gait (cardiac, respiratory, neurological or metabolic disease).

## Gait analysis

After the clinical examination and case history the gait analysis equipment were applied. GaitSmart™ uses inertial measurement units (IMU) which consists of six sensors, each containing tri-axial accelerometers and tri-axial gyroscopes [35]. The sensors were applied according to instructions. The sensors were placed on the midline (above iliac crest), thighs and the widest part of the calves using straps and aligned into a straight vertical line.

With all sensors and markers in place the patients were told to walk at their normal walking pace a 10 metre corridor. All patients walked barefoot in order to avoid abnormal gait patterns that might be caused when shoes are used. Data registered from the motion sensors were collected and extracted using the GaitSmart™ software [36]. The parameters we looked at for this study was the hip and knee range of motion on both the operated and non-operated side.

The baseline demographics of the patients included in the study are illustrated in table 1. The mean preoperative EQ-5D index was 0.6 and 0.5 for group I and II respectively. One year postoperative the EQ-5D index had changed to 0.7 and 1.0 for group I and II respectively. The mobility parameter of the EQ-5D questionnaire one year postoperative was 2 corresponding to 'can walk, but with some difficulties' for group I and 1 corresponding to 'walking without difficulties' for group II.

**Table 1. Baseline demographics of included patients**

<b>Demographic data</b>	<b>Group I</b>	<b>Group II</b>
Age	73 (56 - 78)*	72 (51 - 80)*
Sex (male/female)	12 / 12	13 / 12
BMI**	27 (20 - 41)*	29 (22 - 44)*
Operated side (left/right)	8 / 16	11 / 14
EQ-5D index - preop	0.6 (0.1 - 0.7)	0.5 (0.1 - 0.7)
EQ-5D index - 1 year postop	0.7 (-0.1 - 0.8)	1.0 (0.8 - 1.0)
Charnley Category**	A	A

\* Numbers are given as median (range)

\*\* Body mass index

\*\*\* Patient reported Charnley category

## Statistics

All calculations were made using SPSS. Values are given as median and range. Non-parametric testing (Mann-Whitney-U-test) was used to compare the two groups [37]. The threshold for statistical significance was set to  $p=0.05$ .

## 5. Ethical consent

An ethical trial was sent to the local ethic committee (Regionala etikprövningsnämnden i Göteborg) in spring 2015. An approval was obtained in late summer 2015. Patients included in the study got information written and verbally. All questionnaires done in the study are being archived for 10 years.

## 6. Results

### General Results

There was a statistically significant difference in range of motion (ROM) in the hip joint between the two groups during walking. Group I had a mean hip ROM of 31.7° and group II had a mean of 34.8°. ( $p=0.04$ ) There was also a difference in range of motion in the knee on the leg of the operated side during walking, with a greater range of motion for group II. The differences of knees ROM however were not statistically significant ( $p=0.21$ ).

### Demographics

The EQ-5 D questionnaires obtained during the examination showed that some of the patients have changed the in the mobility dimension. Half of the patients in group I reported no problems in the mobility dimension. Six patients in group II reported moderate problems with their mobility. The median EQ-5D index for group I remained at 0.7. For group II the EQ-5D index had decreased to 0.9.

The ROM (ranges of motion) of the hip measured passively in the clinical examination is shown in table 2. There was no significant difference between the groups with regards to the clinical examination. The ROM was about the same for both groups in all aspects.

**Table 2. Findings at the examination**

Measurement	Group I	Group II
BMI	28 (20 - 41)*	29 (22 - 44)
EQ-5D index	0.7 (-0.2 - 1.0)	0.9 (0.6 - 1.0)
EQ-5D Mobility 1	12	19
EQ-5D Mobility 2	12	6
Hip flexion	115 (95 - 140)	120 (100 - 140)
Abduction	30 (15 - 60)	30 (15 - 50)
Adduction	25 (15 - 35)	25 (15 - 35)
External rotation	35 (20 - 45)	35 (25 - 50)
Internal rotation	20 (0 - 35)	20 (10 - 30)
Knee extension	0 (0 - 15)	0 (0 - 10)
Knee flexion	133 (115 - 145)	140 (125 - 150)

\*Numbers are given as median (range). The range of motion presented in the table is from the same side as the operated hip

### Clinical examination

All of the patients included in the study were self-reported as A in the Charnley category one year post surgery. However during the clinical examination many of the patients reported being operated with bilateral THA or having problems with pain in other joints (Table 3). 8 patients in group I had been operated in both hips: 1 had undergone THA after one year and 7 patients had undergone the surgery in the contralateral hip before the current hip.

Corresponding figures for group II were 7: 1 and 6 patients. About half of the patients reported having knee pain (12 in each group) and many showed signs of osteoarthritis during the clinical examination. Charnley categorization for the patients is shown in table 3.

**Table 3. Symptoms from lower extremities and Charnley classification**

<b>Findings at clinical examination</b>	<b>Group I</b>	<b>Group II</b>
Unilateral THA/true Charnley A	5	6
Bilateral THA	8	7
Contralateral hip pain	3	4
Ipsilateral hip pain	1	1
Knee problems*	12	12
Comorbidity**	2	4
Charnley Category		
A	5	6
B	5	6
C	14	13
Modified Charnley category		
A	5	6
B	1	2
BB	4	4
C	14	13

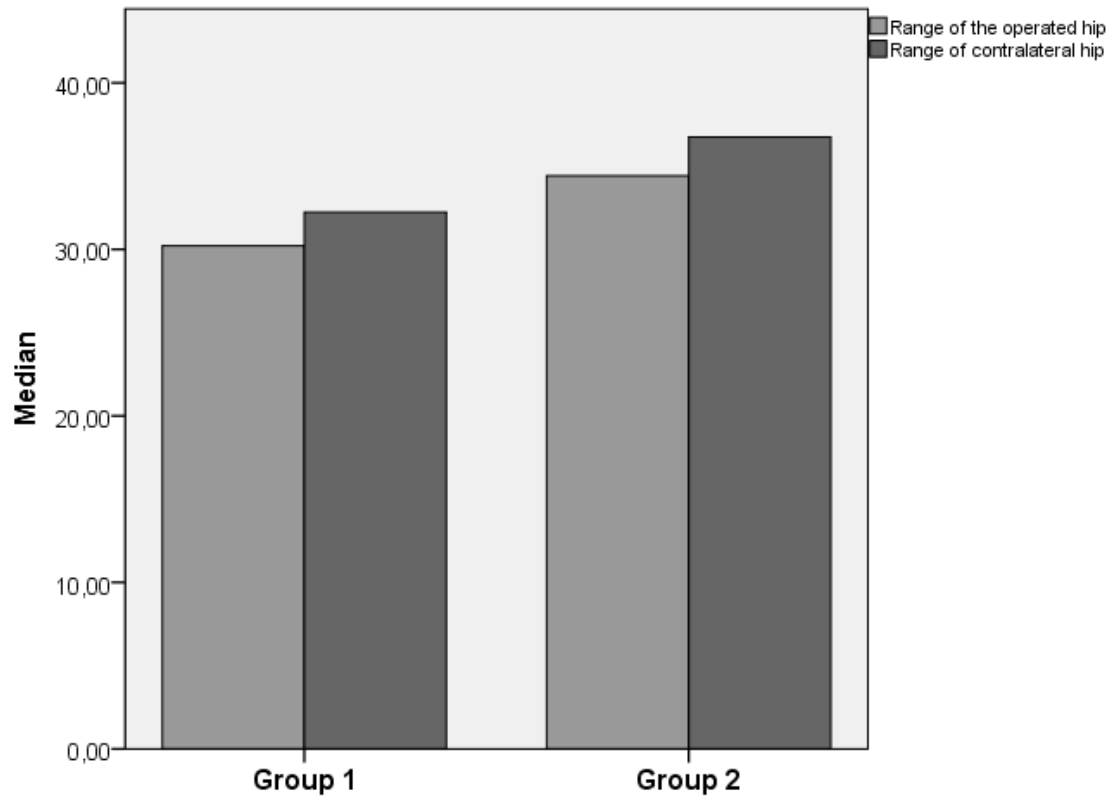
\* Patients reporting pain or presenting with clinical signs of knee osteoarthritis

\*\* Heart failure, spinal stenosis or neurological disease

## **Gait analysis**

The complete findings from the gait analysis are demonstrated in Table 4. Both groups demonstrated a greater range of motion on the contralateral hip compared to the operated side. For the operated side there was a significant difference in the hip ROM between the groups ( $p=0.04$ ), where group I had a median hip ROM of  $30.2^\circ$  and group II had a median of  $34.4^\circ$ . For the contralateral side the differences in hip ROM was not statistically significant ( $p=0.07$ ). Regarding the knee ROM there was a difference in both knees between the groups with a greater difference on the contralateral side, but neither of these were statistically significant ( $p \geq 0.12$ ).

## Median range of motion on both hips for each group



The values on the y-axis show the range of motion of the hip in degrees. The range is defined as flexion and extension.

**Table 4. Measurements using IMU sensors**

Measurements	Group I			Group II		
	Median	25 percentile	75 percentile	Median	25 percentile	75 percentile
THA hip	30.2	27.7	37.1	34.4	31.6	38.6
Contralateral hip	32.2	29.5	38.7	36.8	33.1	41.5
THA Knee	55.3	49.8	57.6	55.5	51.8	62.1
Contralateral knee	53.9	50.1	57.0	57.3	52.0	60.3



## 7. Discussion

Analysing range of motion during walking two to four years after surgery in patients operated with THA, we found a significantly lower hip ROM in patients reporting mobility problems. There was also a small difference, although not significant, on the knee range of motion in the operated leg.

Previous studies have demonstrated improved range of motion and gait symmetry postoperatively in patients operated with THA. However these patients do not achieve the same ranges of motion of the hip nor the same symmetry as healthy controls [20-22, 24, 25, 38]. According to previous studies the largest improvement in gait symmetry occurs within the first six months, but small differences between the operated hip compared to the healthy hip is still present after longer periods of time. Rasch et al [22] performed gait analysis two years after THA and reported a deficit in muscle strength around the operated hip. The authors suggested a more intense postoperative training could perhaps improve the outcome after surgery. Our findings support previous studies, in that our patients showed lower hip ROM two to four years after surgery compared to the hip ROM reported for healthy controls [26].

We used portable gait analysis equipment with motion sensors containing accelerometers and gyroscopes. This approach has previously been used in other studies investigating gait in THA patients. Rapp et al. [39] showed that differences in gait can be detected using accelerometers. Even though we did find a significant difference in hip range of motion in patients reporting mobility problems it would be of interest to compare our findings using IMU with findings of hip motion analysed with high speed video cameras and reflective markers.

In a recently published study there was a moderate correlation between hip ROM measured

with inertial sensor based gait analysis and self-reported function measured with Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) which is another PROM-instrument [40]. We chose to stratify patients in to two groups and found a statistically lower hip ROM in patients reporting problems with mobility.

Our study found a difference in the knee ROM between the groups, with a greater difference on the contralateral side, although these differences were not statistically significant. Such findings have been described in previous studies and can be explained by an asymmetric gait pattern used by patients with unilateral hip OA which results in increased loads on the contralateral knee joint [41]. If we would have studied a larger cohort or would have used the more well-tried optical gait analysis system it is possible that we would have found a statistically significant difference on the contralateral knee.

There were few limitations of the study. First there were a limited number of patients included in the study. This is partly due to limited number of patients reporting mobility problems after THA. However according to a power calculation, based on previous findings with GaitSmart™ 26 patients were needed to detect a difference of 8 degrees in hip ROM with a 95% power. Despite the fact that the number of patients in this study did not allow further statistical analysis i.e. adjusting for covariates such as BMI, sex and age we found a statistically significant difference between the studied groups. Further a propensity score matching was using when choosing the controls which should decrease the influence of abovementioned confounders.

Second, examining patients two to four years after the surgery majority of the patients whom were Charnley A (self-reported) did in fact belong to category B or C, according to the original Charnley classification. There might be several explanations to this interesting finding. A plausible explanation might be that patients didn't perceive their comorbidity as a

problem or a disease and therefore report themselves as Charnley A. There is also a possibility that comorbidities might have occurred after the one year control. However a large amount of patients were operated in the contralateral hip prior to the hip being studied supporting the fact that patients operated with bilateral THA do not experience problems from the previously operated hip when self-reporting. In future studies differences between patient-reported Charnley classification and the original classification described by Charnley should be taken into account.

Third, the gait analysis system used for this study has some limitations compared to the high speed video camera system. The motion sensors can only determine kinematics and not kinetics, thus it cannot calculate the moments for each joint. It can neither determine the walking speed of the patient. The walking speed of the patients in each group would be of interest, since other studies have shown that walking speeds differ between THA patients and controls [23, 39].

## **8. Conclusions**

According to our knowledge there are no published studies comparing patient reported mobility problems according to EQ-5D and hip ROM during normal walking. Despite the limitations mentioned in the discussion we did find a significantly lower hip ROM two to four years after surgery in patients reporting difficulties in the ED-5D mobility dimension one year post THA. Our findings supports that the patient reported mobility problems, in the EQ-5D instrument used by the SHAR is a valid outcome measure after THA. In order to further investigate the correlation between PROM and hip ROM during gait, further studies with larger cohort of patients are needed. Further it would be of interest to study differences in gait pattern between patients self-reporting as Charnley A and patients regarded as Charnley A according to the original classification system.

## 9. Populärvetenskaplig sammanfattning

**Simon Blixt, handledare Maziar Mohaddes**

Avdelningen för ortopedi, institutionen för kliniska vetenskaper, Sahlgrenska akademien, Göteborgs universitet, Göteborg, Sverige

### Bakgrund

Höftprotesoperation är en mycket vanlig behandlingsmetod inom ortopedin vid olika sjukdomstillstånd i höften. Ett exempel på en sjukdom som vanligen behandlas med höftprotes är artros som innebär att brosket i leden bryts ned och ger symptom i form av smärta och minskad rörlighet, etc. Andra exempel på sjukdomstillstånd är bl a frakturer och olika inflammatoriska ledsjukdomar. I Sverige görs ungefär 16 000 höftprotesoperationer varje år och över 80 procent av dessa görs på grund av artros i höften. Resultatet blir ofta lyckat då nio av tio patienter blir nöjda med sitt operationsresultat. Patienter som genomgår höftprotesoperation i Sverige har sedan 1979 registrerats i svenska höftregistret som startade med målet att förbättra utfallen efter höftkirurgi och bidra till forskning. År 2002 införde man så kallade *patientrapporterade utfallsmått* som är ett slags frågeformulär för att ta reda på hur väl patienter mår efter operation. Formuläret innehåller frågor där patienter får skatta sin egen rörelseförmåga, egenvård, vardaglig aktivitet, smärta samt oro på en tregradig skala. De enskilda stegen är 1) som är liktydigt med inga problem, 2) med måttliga problem och 3) stora problem. När man samlat ihop dessa svar kan man få fram ett index som är en siffra som speglar patientens livskvalitet. *Patientrapporterade utfallsmått* samlas in före operation, samt ett, sex och tio år efter operationen. På detta sätt kan man följa patienters utfall efter operation och se om det har blivit någon förbättring i livskvalitet efter höftoperationen. Det finns dock mycket få studier gjorda där man faktiskt har mätt patienters funktionella rörelseförmåga och jämfört detta med vad patienterna har svarat i de *patientrapporterade utfallsmåtten*.

För att mäta funktionell rörelseförmåga använder man sig av gånganalys. Det innebär att patienten går i normal takt medan teknisk apparatur registrerar rörelser. Vad man mäter vid en gånganalys beror på vilken frågeställning man har och vilken metod man använder sig av. En väl beprövad metod att använda är en optisk mätmetod där man låter höghastighetskameror registrera ett flertal markörer som fästs på försökspersonens leder. En annan metod är att använda sig av rörelsesensorer. Fördelen med den optiska metoden är att den ger mer information, nackdelen är att den inte kan utföras utanför gånglaboratorium. Fördelar med att använda sig av rörelsesensorer är att de är portabla och kan användas var som helst, samt att det är en mindre kostnadskrävande metod.

## Syfte

Syftet med denna studie är att ta reda på om det finns ett samband mellan hur patienter som genomgått höftprotesoperation skattar sin egen rörelseförmåga och de objektiva mätdata från gånganalys där vi använt oss av rörelsesensorer. Det vi specifikt tittar på är rörelseomfånget i höfter och knän.

## Patienter och metod

Patienter opererade med höftprotes på grund av höftartros på Sahlgrenska Universitetssjukhus under åren 2011-2013 som själva rapporterade problem med rörelseförmågan i *patientrapporterade utfallsmått* ett år efter operation söktes upp som försökspersoner till studien. Patienter som hade rapporterat problem från båda höfterna samt de som hade rapporterat någon annan sjukdom som skulle kunna påverka rörelseförmågan uteslöts. Totalt hittades 54 patienter som uppfyllde kriterierna för att delta i studien. Dessa patienter kontaktades via brev och telefon med information om studien och tillfrågades om de kunde tänka sig att delta. Av de patienter som valde att delta gjordes en matchad kontrollgrupp med

avseende på kön, ålder och BMI (body mass index) från patienter som opererats under samma tidsintervall, men som inte hade rapporterat några problem med rörligheten. På så sätt kunde vi jämföra två lika grupper av patienter där den huvudsakliga skillnaden var vad de hade svarat i *patientrapporterade utfallsmått*.

Patienterna i studien genomförde en gånganalys med rörelsesensorer för att upptäcka skillnader i rörelsemönster i höft och knä vid normal gång på den opererade och icke-opererade sidan.

## Resultat

Patienterna som hade rapporterat problem med sin rörelseförmåga hade ett mätbart lägre rörelseomfång i den opererade höftleden vid normal gång. Denna skillnad var statistiskt signifikant, vilket betyder att skillnaden i mätdata med stor sannolikhet inte beror på slumpen. Det förekom även ett lägre rörelseomfång i knäleden på den opererade sidan, men skillnaden var inte statistiskt signifikant.

## Diskussion

Vår studie fann att det föreligger ett samband mellan hur patienter skattar sin egen rörelseförmåga ett år efter operationen med vad man kan mäta objektivt med gånganalys. Detta visar att det som patienterna själva rapporterar om sin rörelseförmåga faktiskt speglar verkligheten och det finns således ett värde i att ha med *patientrapporterade utfallsmått* i det svenska höftregistret. Ytterligare studier kommer att behövas för att ta reda på varför patienter rapporterar problem med sin rörlighet efter sin höftoperation och hur man ska kunna åtgärda det.

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