

Research Article

Kinesiophobia and its association with functional outcome and quality of life 6-8 years after total hip arthroplasty

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ABSTRACT

Objective: The aim of this study was to assess the incidence and severity of kinesiophobia, and to determine the relationship between Tampa Scale of Kinesiophobia (TSK) scores, functional outcome and quality of life (QoL) 6-8 years after Total Hip Arthroplasty (THA).

Methods: 161 patients (78 male and 83 female) with unilateral primary osteoarthritis (OA) treated with THA between September 2010 and December 2013 were included in this study. Western Ontario and McMaster Universities Osteoarthritis (WOMAC) and EQ-5D scores were measured preoperatively. At 6-8 years follow-up, these scores were repeated and TSK scores were also measured. According to the TSK, patients were divided into two groups for further comparisons and analysis: without kinesiophobia (TSK-score ≤ 36) and with kinesiophobia (TSK-score >36).

Results: There were 99 patients (61.5%) with no kinesiophobia (TSK score ≤ 36 , TSK mean 28.4, SD 4.7) and 62 patients (38.5%) with kinesiophobia (TSK score > 36 , TSK mean 42.8, SD 5.3). Patients with and without kinesiophobia were not statistically different regarding age, sex or body mass index. ($P = 0.20$, $P = 0.99$, $P = 0.22$, respectively). In the group with no kinesiophobia, the mean 6-8 years WOMAC was 12.4 (SD 15.6), while the absolute delta (Δ) value between preoperative and 6-8 years WOMAC was 46.2 (SD 20.4), compared to the group with kinesiophobia where the mean 6-8 years WOMAC was 32.2 (SD 23.4), while the absolute delta (Δ) value between preoperative and 6-8 years WOMAC was 32.3 (SD 25.5); both $P < 0.001$. The group with no kinesiophobia had a mean 6-8 years EQ-5D of 0.81 (SD 0.22), while the absolute delta (Δ) value between preoperative and 6-8 years EQ-5D was 0.44 (SD 0.26), compared to the group with kinesiophobia where the mean 6-8 years EQ-5D was 0.57 (SD 0.23), while the absolute delta (Δ) value between preoperative and 6-8 years EQ-5D was 0.33 (SD 0.26); $P < 0.001$ and $P = 0.03$, respectively. TSK scores were associated with worse WOMAC and EQ-5D scores, higher proportion of dependence on walking aids and increased THA-related adverse events (all $P < 0.05$).

Conclusion: This study has shown us that there is a high incidence of kinesiophobia 6-8 years after surgery and treating kinesiophobia early after THA might improve the outcome.

Level of Evidence: Level IV, Therapeutic Study

Introduction

For patients with hip osteoarthritis (OA) who experience severe pain and functional disability, total hip arthroplasty (THA) has been a commonly performed routine surgical procedure with very good outcomes.¹ It aims to alleviate pain and improve function and quality of life (QoL). The majority of patients are satisfied after THA, although complications can occur. A group of THA patients report persistent pain and suboptimal functional outcome at long-term follow-up.² Given the increase in the annual number of THA performed, the absolute number of dissatisfied patients is expected to rise. Therefore, it is important to investigate and manage any factors that might be associated with adverse THA outcomes. Several studies discussed the impact of age, gender, medical comorbidities, and body mass index (BMI) on THA.³ However, the influence of pain misperceived as threatening (known as kinesiophobia or pain-related fear of movement) on THA outcome is still uncertain.

Kinesiophobia leads to decreased range of motion and often perpetuates a cycle of pain and disuse that may result in chronic pain syndrome, walking difficulties, and decreased physical function. The Tampa Scale of Kinesiophobia (TSK) is a validated instrument for measuring kinesiophobia. Previous studies have reported good internal validity and test-retest reliability of TSK when administered to orthopedic patients. Among others, Woby et al⁴ studied psychometric properties of the TSK in a group of chronic low back pain patients and confirmed the utility of TSK to detect a clinically significant change in a patient's pain-related fear of movement. Patients with kinesiophobia show an increased risk of developing long-term disabilities, with reduced participation in daily activities.⁵ Previous studies have indicated that identifying and treating patients with an increased risk of kinesiophobia might improve the clinical results.^{6,7} In THA patients, 1 recent prospective cohort study comprising 269 patients found that early functional outcome measured using the Iowa Level of Assistance

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scale on the fifth postoperative day was not correlated with the level of kinesiophobia.⁸ Similar studies investigating the medium or long-term functional outcome have not, to the best of our knowledge, yet been published.

The purpose of this study was to evaluate the incidence and severity of kinesiophobia and to determine whether TSK scores were associated with functional outcome and QoL 6-8 years after THA.

Material and Methods

All patients with unilateral primary OA who underwent THA at Sundsvall Teaching Hospital, Sweden, between September 2010 and December 2013 (n=285) were included in the study. We excluded patients with secondary OA, previous pelvic, spinal and lower limb fractures, and surgical interventions.

Before the operation, patients were assessed using 2 self-administered questionnaires. The first questionnaire was the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index measuring functional outcomes. This questionnaire consists of 24 items divided into 3 subscales: pain (5 items: during walking, using stairs, in bed, sitting or lying, and standing upright), stiffness (2 items: after first waking and later in the day), and physical function (17 items: using stairs, rising from sitting, standing, bending, walking, getting in/out of a car, shopping, putting on/taking off socks, rising from bed, lying in bed, getting in/out of bath, sitting, getting on/off toilet, heavy domestic duties, light domestic duties). The test questions are scored on a scale of 0-4, which correspond to none=0, mild=1, moderate=2, severe=3, and extreme=4. Higher scores on the WOMAC indicate worse pain, stiffness, and functional limitations.

The second questionnaire was the EQ-5D, which measures QoL over 5 dimensions. These include self-care, usual activities, mobility, pain/discomfort, and anxiety/depression. Additionally, patients rated their health status using a visual analog scale.

Body mass index was also measured by the patient or outpatient personnel as kg/m².

The THA was performed or supervised by a specialist orthopedic surgeon. We used the postero-lateral approach in all patients who used same postoperative rehabilitation program. We documented any postoperative THA-related adverse events such as infection, prosthetic dislocation, peri- and prosthetic fractures, as well as dependence on walking aids.

The study population was followed up 6-8 years postoperatively with the WOMAC and EQ-5D questionnaires. Also, the TSK was

administered to all patients. The TSK is a 17-item questionnaire that uses a 4-point Likert scale and contains 4 negatively worded, reversed-scored questions to measure patients' fear of movement.^{4,9-11} According to the TSK, patients are divided into 2 groups for further comparisons and analysis: without kinesiophobia (TSK score ≤ 36) and with kinesiophobia (TSK score > 36).⁹

The study was performed in accordance with the Declaration of Helsinki, and it was approved by the regional ethics committee of Umeå University (Dnr 07-052M). Written informed consent was obtained from all patients who participated in this study.

Statistical analysis

To calculate the required sample size, a power analysis was performed using G*Power software,¹² comparing the means of WOMAC and EQ-5D scores between the 2 groups. With a power of 0.80 and a significance level (alpha) of 0.05, a minimum of 60 patients would be needed in each group to detect a clinically significant 10% difference (standard deviation (SD): 20). Demographic data were analyzed by descriptive statistics and presented as means and SD. Comparisons between the 2 groups' patient characteristics were performed by chi-squared tests (for categorical variables), or independent sample *t*-tests, or Mann-Whitney *U* tests (for continuous variables). A *P*-value < 0.05 was considered significant.

Results

Of the 285 patients who were considered for inclusion, 21 were excluded and 5 refused to participate in the study. During the study period, a total of 98 patients died or were lost to follow-up. Therefore, at the 6-8 years follow-up, 161 patients (78 males and 83 females) were included in the study.

There were 99 patients (61.5%) with no kinesiophobia (TSK score ≤ 36 , TSK mean: 28.4, SD: 4.7) and 62 patients (38.5%) with kinesiophobia (TSK score > 36 , TSK mean: 42.8, SD: 5.3).

In the group with no kinesiophobia, the mean age was 66.3 years (SD: 9.9), compared to the group with kinesiophobia where the mean age was 68.4 years (SD: 9.6), *P* = 0.20.

In the group with no kinesiophobia, there were a total of 48 males and 51 females compared to the group with kinesiophobia where there were 30 males and 32 females, *P* = 0.99.

Regarding BMI, the group with no kinesiophobia had a mean BMI of 27.4 (SD: 4.8), compared to the group with kinesiophobia where the mean BMI was 28.4 (SD: 4.6), *P* = 0.22.

Outcome measures at 6-8 years follow-up

In the group with no kinesiophobia, the mean 6-8 years WOMAC was 12.4 (SD: 15.6), while the absolute delta (Δ) value between preoperative and 6-8 years WOMAC was 46.2 (SD: 20.4), compared to the group with kinesiophobia where the mean 6-8 years WOMAC was 32.2 (SD: 23.4), while the absolute delta (Δ) value between preoperative and 6-8 years WOMAC was 32.3 (SD: 25.5), both *P* < 0.001 .

Also, the group with no kinesiophobia had a mean 6-8 years EQ-5D of 0.81 (SD: 0.22), while the absolute delta (Δ) value between preoperative and 6-8 years EQ-5D was 0.44 (SD: 0.26), compared to the group with kinesiophobia where the mean 6-8 years EQ-5D was 0.57 (SD: 0.23),

HIGHLIGHTS

- There are many studies about the effect of age, gender, comorbidities and body mass index on outcomes following total hip arthroplasty (THA). However, the influence of pain misperceived as threatening (known as kinesiophobia or pain-related fear of movement) on THA outcome is still uncertain. This study aimed to evaluate the relationship of kinesiophobia and the mid-term outcome following THA.
- The results showed that kinesiophobia was associated with worse WOMAC and EQ-5D scores, as well as increased dependence on walking aids. Additionally, THA-related adverse events were also found to be associated with kinesiophobia.
- The results indicate that kinesiophobia, 6-8 years after THA, is associated with lower functional outcome and QoL. Pain management, pain neuroscience education, and physical therapy may improve outcome following THA in these patients.

Table 1. Summary of the study results comparing the 2 study groups

	No kinesiophobia, n=99	Kinesiophobia, n=62	P
6-8 years mean WOMAC	12.4 (SD 15.6)	32.2 (SD 23.4)	<0.001
(Δ) preoperative/6-8 years mean WOMAC	46.2 (SD 20.4)	32.3 (SD 25.5)	<0.001
6-8 years mean EQ-5D	0.81 (SD 0.22)	0.57 (SD 0.23)	<0.001
(Δ) preoperative/6-8 years mean EQ-5D	0.44 (SD 0.26)	0.33 (SD 0.26)	0.03
THA-related adverse events	n=8 (8%)	n=12 (20%)	0.04
Dependency on walking aids	n=9 (9%)	n=13 (21%)	0.05

while the absolute delta (Δ) value between preoperative and 6-8 years EQ-5D was 0.33 (SD: 0.26), $P < 0.001$ and $P = 0.03$ respectively.

Regarding the THA-related adverse events (postoperative wound infection, dislocation, and residual pain/tenderness at the operated hip), there were 8 patients (8%) in the group with no kinesiophobia compared to 12 patients (20%) in the group with kinesiophobia, $P = 0.04$. Also, 9 patients (9%) were dependent on using walking aids in the group with no kinesiophobia compared to 13 patients (21%) in the group with kinesiophobia, $P = 0.05$.

The results are summarized in Table 1.

Discussion

Our study reveals that kinesiophobia was a relatively common problem 6-8 years after THA. It was associated with lower functional outcome and QoL and higher incidence of using walking aids and postoperative adverse events. We found no differences in regard to age, sex, or BMI between the 2 groups. Old age, female gender, and obesity were reported to be associated with higher TSK scores in different articles.¹³⁻¹⁵ However, we found no differences in these parameters between the 2 study groups. These findings are interesting and were not actually expected. One possible explanation for this could be the limited sample size in each group to detect such differences.

The TSK questionnaire is a validated instrument, with good internal validity and test-retest reliability when the TSK is administered to orthopedic patients. A previously validated cut-off score of 37 on the TSK was set in order to allocate knee arthroplasty patients to the no kinesiophobia (TSK \leq 36) or kinesiophobia (TSK $>$ 36) group.⁹ Also, the WOMAC index and EQ-5D questionnaires are commonly used outcome measures in THA. Both of them are well validated including the Swedish version.

The incidence of kinesiophobia in this study was relatively high (62 out of 161 patients, 38.5%). This is in line with other studies, which found that around 50% of patients could be affected.^{16,17} This may indicate that kinesiophobia could be an important yet underestimated associated factor for poor outcome after THA.

A greater focus has been placed on the relationship/association between pain catastrophizing and surgical outcomes rather than the fear of movement. Riddle et al¹⁸ reported that patients who exhibited a high degree of preoperative pain catastrophizing were 2.7 times as likely to have an unsatisfactory outcome at 6 months (defined as a $<$ 50% improvement in preoperative pain scores) after controlling for other psychological risk factors, including self-efficacy and kinesiophobia. Surgeons must be aware that the emotional health of the patient influences the patient's physical recovery after surgery.

Previous reports suggested that patients with anxiety and depressive symptoms had worse outcome and were less satisfied after joint arthroplasty.^{19,20} However, there is still controversy in literature regarding the association between kinesiophobia and post-surgical outcomes. In the present study, we found that increased TSK was associated with lower functional outcome, evaluated with WOMAC score, most probably due to the troublesome physical activity these patients experienced. Activities such as using stairs, rising from sitting, standing, bending, walking, getting in/out of a car, shopping, putting on/taking off socks, rising from bed, getting in/out of bath, getting on/off toilet, domestic duties, etc. are affected. Using, and being dependent on, walking aids such as crutches and sticks could reduce the associated fear of movement/physical loading and may explain the reported increased incidence in our study. Secondly, the quality of life can also be deteriorated and scored lower in these patients.

Kinesiophobia appears to be a strong contributor to high rates of lack of return to sport after anterior cruciate ligament reconstruction. Flanigan et al²¹ reported that a large subset of those patients might have difficulty in fully returning to their pre-injury activity levels because of persistent fear of re-injury. Also, Ardern et al²² demonstrated in a cross-sectional study that patients who do return to sport had low levels of kinesiophobia. Moreover, Filarado et al²³ showed that kinesiophobia was a factor influencing the outcome after total knee arthroplasty, independently from other psychological variables and this was in agreement with other studies. Therefore, identifying patients who show risk factors of developing pain catastrophizing and kinesiophobia such as anxiety, depression, exaggerated pain experiences, etc., is an important part of perioperative care. Implementation of psychotherapeutic measures such as cognitive behavioral therapy alongside adequate analgesia and physiotherapy might enhance a fruitful postoperative recovery. A prospective cohort study examined the role of pain neuroscience education (PNE) on kinesiophobia in the setting of TKA in patients with knee osteoarthritis. One group of patients received knee joint mobilization and "biomedical education," whereas the other group received knee joint mobilization and PNE and found a statistically significant reduction in TSK scores at 3 months follow-up post-TKA.²⁴ Another randomized controlled trial, comparing the effect of combined inpatient physiotherapy and a 4-week out-patient cognitive behavioral therapy with only the latter, found a statistically significant reduction of TSK scores at 6 month follow-up.²⁵ Likewise, Russo et al²⁶ found a statistically significant reduction in TSK scores at 3 months follow-up by using a video treatment to give patients insights into kinesiophobia, while Monticone et al²⁷ compared home-based functional exercises to standard physiotherapy, to suggest that the former produces a statistically significant reduction in TSK scores at 6 months and 12 months follow-up post-TKA. Another study examining an integrative approach found significant reduction in TSK scores for TKA but were not able to find a statistically significant reduction using the same model in THA patients.²⁸

This study has some limitations. One limitation is that the TSK score was not documented before the operation. Thus, we could not make any comparisons or associations between pre- and postoperative measures. Also, the questionnaires used have a ceiling/floor effect and therefore might not optimally categorize the difference between the 2 study groups over/below a certain threshold. Despite this, these questionnaires have been evaluated and indicate a high validity score. Additionally, the questionnaires are broadly utilized and allow for comparison with other studies in the field. Another limitation of this

study is that the study population is limited to specific characteristics, namely symptomatic unilateral hip osteoarthritis. Therefore, our findings may not be generalizable to all patients. On the other hand, having only 1 type of orthopedic diagnosis could minimize the risk of bias produced by the changes of OA in the opposite hip. Another limitation is the lack of knowledge about the psychological state of the patients (anxiety, depression) and the level of pain catastrophizing and exercise habits. These limitations are counterbalanced by the strengths of the study, including adequate sample size with relatively long follow-up. Furthermore, a staff member not involved in the care of patients prospectively documented all parameters. The TSK score is validated in Swedish and also in many other languages such as the Turkish language.^{29,30}

In conclusion, kinesiophobia, 6-8 years after THA, is associated with lower functional outcome and QoL, as well as increased dependence on walking aids and THA-related adverse events. This association is of interest as treating kinesiophobia with suitable measures such as optimal postoperative analgesics, cognitive neuroscience education, and physical therapy might improve outcome after THA.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Umeå University (Approval No: Dnr 07-052M).

Informed Consent: Written informed consent was obtained from all patients who participated in this study.

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