



Investigation of long-term fall prevalence after total knee arthroplasty in Hatay: A cross-sectional study

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Abstract

Falls and fractures caused by falls in the elderly affect their daily activities, creating fear of movement and alienating the individual from social participation. Fall related-injuries are some of the main afraid complications after total knee arthroplasty surgery. The aim of this study is to determine the incidence of falling and fear of movement in the long period (one year and more after surgery) in patients who had total knee arthroplasty surgery. Patients who had total knee arthroplasty surgery in Hatay Mustafa Kemal University Department of Orthopedics and Traumatology between 01.01.2016 and 01.10.2020 enrolled in the study. Demographic information was recorded from the patient file or asked to the patients/caregivers via telemedicine. The falls before the surgery, falls after the surgery within 3 months, within 3 to 6 months, within 6 to 12 months which caregiver/relative's remember recorded via telemedicine. Fear of movement assessed with the Tampa Kinesiophobia Scale was asked. 149 Patients with, mean age 67.06±8.72 years, female (85.9%), mostly house wives (80.5%) was the cohort. Their education time (89.8 %) were less than 5 years, and the huge majority of the patients did not have exercise habits (83.2%). The fall rate before the surgery was (35.6%), after the surgery was (36.9%), within the first 3 months (6.7%), 3 to 6 months (6%) and 6 to 12 months (11.7%). 7.4 % of our patients had a fall related-fractures including: 2 radius distal fractures (1.3%), 3 hip fractures (2%), 3 periprosthetic fractures (2%), 1 patella fracture (0.7%) and 2 vertebral compression fractures (1.3%). Tampa Kinesiophobia Scale score was 41(38-44). There was a positive correlation between kinesiophobia and those who did not have exercise habits and those who fell preoperatively (r: 0.31, p:0.01). Some of TKA patients were falling and had fear of movement. New researches should be conducted about what is the reason that makes the patients posture and movement more stable or which mechanism alters the balance. In order to prevent complications that may occur due to falls, new studies, treatment modalities and rehabilitation programs focusing on the etiology of falling in the elderly individuals should be organized.

Keywords: knee replacement, kinesiophobia, fall risk, osteoarthritis

1. Introduction

Falls and fractures caused by falls in the elderly affect their daily activities, creating fear of movement and alienating the individuals from social participation. Thus, prevention of falls is extremely important for elderly individuals to be independent in their daily living activities and to increase their mobility. Deformed and painful joints are among the risk factors for falls. The knee, foot or spine's age-related deformities impair the stability and balance of the spine, increasing the frequency of falls. Especially, it has been reported that osteoarthritis causes deformation of the knee joints and pain during walking, thus increasing the risk of falling and fracture and triggering the fear of movement (1, 2). Knee arthritis is an established risk factor for falls due to pain, stiffness and functional limitation that are more associated with fall risk. It has been reported significant improvements in pain, function and proprioception after total knee arthroplasty (TKA) in patients with knee osteoarthritis. Although these factors are expected to reduce the frequency of falls in elderly people after TKA, Some studies have

shown that balance deficits may develop due to proprioceptive reasons following TKA. Also, it has been shown that this situation can increase the risk of falling and lead to fear of movement (3). In another study, it was reported that the functions of many mechanoreceptors were affected as a result of loosening or removing some ligaments in order to correct the intra-articular geometry during knee arthroplasty surgery, and as a result, motion control and balance were affected (4). Therefore, it is seen that the probability of falling is affected, although not as much as before the surgery and that those who did not fall before the surgery also fell after the surgery. It has also been reported that the incidence of falls after TKA is higher compared to asymptomatic healthy elderly, which ranges from 17-48% (5, 6). Swinkels et al., 2009 reported a 10% fall after TKA in the patients with no previous fall history (3). 54.2% of the group reporting preoperative fall did not fall in the first year after TKA; in 45.8%, it was stated that the falling action continued. They reported that 17.3% (13/75) of those who did not fall before

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the operation fell after the operation. 24.2% of the people who had TKA surgery were those who fell within the 3 months before the surgery. The rate of falling in the postoperative follow-up of this group was 11.7–11.8% for every 3 months in the first year. Functional scales and balance confidence improved after TKA. However, it is known that the falling action continues in 45.8% of patients with a history of falling preoperatively (7). Therefore, rehabilitation programs should be developed to prevent the fear of movement (kinesiophobia) and falls that may develop in these patients and to increase independence in daily living activities. In order to contribute to these rehabilitation programs, it is important to determine the prevalence of long term fall and kinesiophobia after TKA applied. The aim of this study is to determine the incidence of falling and fear of movement in the long period (one year and more after surgery) in patients who had TKA surgery in Hatay Mustafa Kemal University Health Practice and Research Hospital.

2. Materials and Methods

2.1. Participants

All patients who had surgery in Hatay Mustafa Kemal University Department of Orthopedics and Traumatology between 01.01.2016 and 01.10.2020 and completed the first year after surgery were scanned from the archives. Patients were called via telemedicine method. The information of 268 TKA patients was obtained. 115 patients refused to participate. Four patients with TKA could not be interviewed because of the unreachable (Fig. 1). One hundred forty nine patients with TKA agreed to participate in the study. The inclusion criteria were as follows: patients operated as primary TKA, completed the first year after surgery. The exclusion criteria were as follows: history of lower extremity congenital deformation or musculoskeletal injury, neurologic or orthopedic diseases leading to gait disturbance, balance and postural problems, postoperative infection, deep venous thrombosis and revision TKA surgeries.

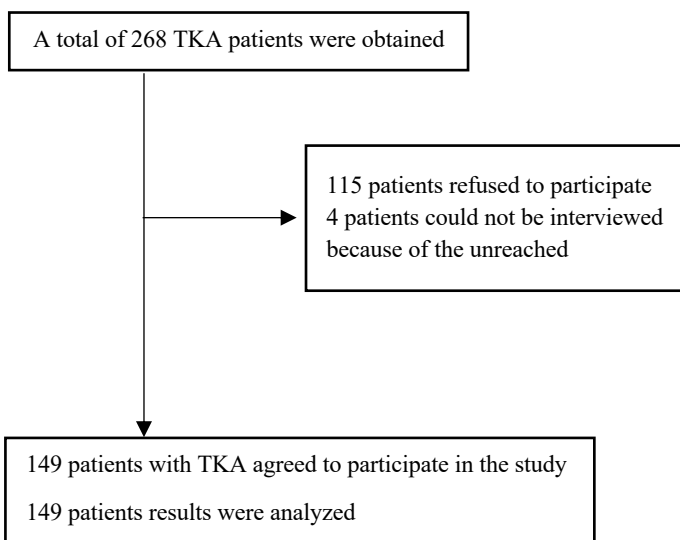


Fig. 1. Flow chart of the study

2.2. Study design

The study was approved by the Ethics Committee of the Hatay Mustafa Kemal University (Decision No. 6, dated 4.10.2021) and performed in accordance with the Declaration of Helsinki. Verbal informed consent was obtained from all patients to participate in the study. Demographic information was recorded from the patient file or asked to the patients. The preoperative fall status of the patients who accepted to participate in the study was recorded from the patient file and by asking the patient and the caregiver/relatives, and the number of falls in the last one year after surgery was recorded with questions prepared by the researchers. Falls before the surgery from patients' records, falls before the surgery which patients remember, falls before the surgery which caregiver/relatives remember, falls after the surgery, falls after the surgery within 3 months, falls after the surgery within 3 to 6 months, falls after the surgery within 6 to 9 months, falls after the surgery within 6 to 12 months, falls after the surgery which caregiver/relative's remember recorded via telemedicine. Patients' relatives/caregivers were called at after three days and falls status of the patients before and after the surgery were asked. Fall related-fracture rate calculated by questioning the patients and searching the medical records. All the replies were recorded.

Fear of movement assessed with the Tampa Kinesiophobia Scale (TKS) was asked via telemedicine. This 16-item questionnaire, which includes the subjective evaluation of kinesiophobia, has validity and reliability in Turkish. Each statement of the 16 items is scored between "strongly disagree" (score 1) and "strongly agree" (score 4) on a four-point Likert scale. The 4th, 8th, 12th and 16th items of the questionnaire are reversed and scored. Total score is between 17-68 points. A high score on the scale indicates that kinesiophobia perception is also high (8).

2.3. Statistical analysis

Statistical analysis was performed via the Windows based SPSS 20 (IBM Corp. Armonk, New York, USA.) The suitability of the variables to normal distribution was examined by visual (histogram and probability graphs) and Kolmogorov-Smirnov, an analytical method. Mean and Standard deviation values were given for normally distributed variables and percentages (%) for variables uncountable variables. Non-normally distributed data were expressed as median (quartiles) and were compared using the Mann-Whitney U test. Correlations were analysed using Pearson's and Spearman's rank correlation coefficients, as appropriate.

3. Results

Clinico-Demographic data of the patients with TKA were presented in table 1. Mean age was 67.06 ± 8.72 years and most of the patients (85.9%) were female. Most of the participants (80.5%) were housewives, the education time of the participants was mostly (89,8 %) less than 5 years and the highest education level was 'literate' (61.1%). The huge

majority of TKA patients did not have exercise habits (83.2%). The ratio of the operated side was left (34,2), right (33.6) and both knee (32.2), respectively.

Fall incidence and kinesiophobia in patients with TKA were shown in table 2. According to the archive, the highest rate of preoperative fall was "none". Most of the patients stated that they did not fall before the operation (64,4%), similar to this their relatives/caregivers (73.8) mostly stated that there was no fall in TKA patients before surgery. In the period of after the surgery till the questionnaire the highest falling status was ‘none fall’ with the rate of (63.1%), within the first 3 months (93,3%), 3 to 6 months (94%) and 6 to 12 months (89.3%). After the surgery falls rate was in “1 fall” 34,9%, in “2 fall” 1.3%. Most patients were asked, “Have you fallen in the last 12 months from today?” and mostly of the patients (66.4%) answered the question "none fall". Falls after the surgery which caregiver/relatives’s remember was mostly (65.1) in ‘none fall’. According to caregiver/relatives’s the rate of falling after surgery was 30.3 %, while it was 35,6% according to patients (Table 2, Fig. 2). Falls rate before the surgery was 34.2 % according to patients, while it was 22,7% according to caregivers/relatives (Fig. 2, Table 2).

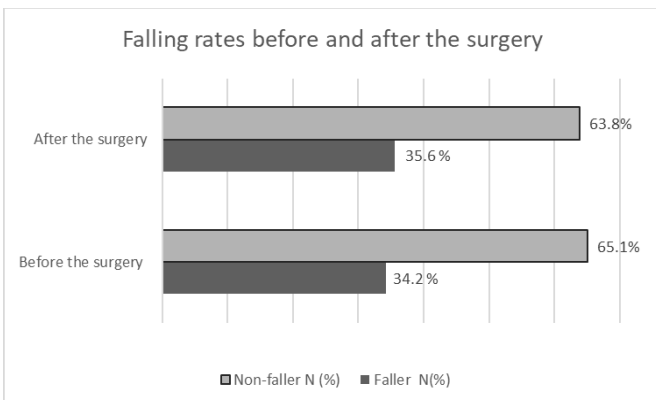


Fig. 2. Falling rates before and after the surgery in patients with TKA 7.4% of our patients had a fall related-fracture similar with the literature including: 2 radius distal fractures (1.3%), 3 hip fractures (2%), 3 periprosthetic fractures (2%), 1 patella fracture (0.7%) and 2 vertebral compression fractures (1.3%)

The fear of movement (kinesiophobia) was found with TKS score which was 41(38-44) (Table 2). The relationship between kinesiophobia and age, fall-related fracture, BMI, exercise habits, preoperative and postoperative fall frequency was evaluated. There were no statistically significant relation between kinesiophobia and age (p:0.67 r:-0.03), fall related-fracture (p: 0.49 r:-0.05), BMI (p: 0.54 r: 0.05). However, there was a positive correlation between kinesiophobia and those who did not have exercise habits (p.0.03 r:0.17) and those who fell preoperatively (p: 0.01 r: 0.31). Total kinesiophobia scores of falling and non-falling patients were similar (p>0.05, Table 4). Also, the TKS scores between the patients who have and don't have fall related-fracture were similar. Also, when the answers of the patients and their

caregivers to the questions asked about fall data were examined, there were differences before surgery (35.4 & 27.2%), but when they were asked about their recalls about fall rates after surgery, the comparison was similar.

There was no relationship between falling in the perioperative or postoperative period and knee surgery side or unilateral or bilateral TKA surgery.

Table 1. General informations about participants

| | N (%) / Mean±SD / Median (IQR) |
|------------------------------------|--------------------------------|
| Age (years) | 67.06±8.72 |
| BMI (kg/m ²) | 32.85(29.06-36.82) |
| Gender n (%) | |
| Male / Female | 21 (14.1) / 128 (85.9) |
| Profession n (%) | |
| Housewife | 120 (80.5) |
| Farmer | 7 (4.7 %) |
| Old age pensioner | 10 (6.7 %) |
| Driver | 3(2 %) |
| Self-employment | 4(2.7 %) |
| Other | 4(2.7%) |
| Education Time n (%) | |
| <5 years | 134(89.8%) |
| 6-8 years | 8(5.4%) |
| 9-11 years | 2(1.4 %) |
| >11 years | 5 (3.4%) |
| Education Level n (%) | |
| Literate | 91 (61.1) |
| Primary school | 46(30.9) |
| Middle school | 5 (3.4) |
| High school | 3(2) |
| University | 4 (2.7) |
| Exercise Habit n (%) | |
| Yes/No/No stated | 24(16.1%)/124 (83.2%) / 1(0.7) |
| Surgical Side n (%) | |
| Right knee /Left knee/both of knee | 50 33.6% /51(34.2%)/48(32.2) |

Table 2. Fall risk and kinesiophobia in patients with knee arthroplasty

| | n (%) / Median (IQR) |
|--|----------------------|
| Falls before the surgery | |
| None | 98 (65.8) |
| 1 fall | 49 (32.9) |
| 2 fall | 1 (0.7) |
| Not stated | 1(0.7) |
| Falls before the surgery which patients remember | |
| None | 96(64.4) |
| 1 fall | 23(15.4) |
| 2 fall | 11(7.4) |
| 3-4 fall | 7(4.7) |
| 4-5 fall | 3(2.0) |
| 5-6 fall | 3(2.0) |
| 6-7 fall | 1 (0.7) |
| Not state | 5 (3.4) |
| Falls before the surgery which caregiver/relatives remember | |
| None | 110 (73.8) |
| 1 fall | 16 (10.7) |
| 1-2 fall | 10 (6.7) |
| 3-4 fall | 3 (2.0) |
| 4-5 fall | 2 (1.3) |
| 5-6 fall | 3 (2.0) |
| Not stated | 5 (3.4) |
| Falls after the surgery | |
| None | 94(63.1) |

| | |
|--|------------|
| 1 fall | 52 (34.9) |
| 2 fall | 2 (1.3) |
| Not stated | 1 (0.7) |
| Falls after the surgery within 3 month | |
| None | 139 (93.3) |
| 1 Fall | 1 (0.7) |
| 2 Fall | 1 (0.7) |
| 3 Fall | 1 (0.7) |
| Not stated | 7 (4.7) |
| Falls after the surgery within 6 month | |
| None | 136 (91.3) |
| 1 fall | 5 (3.4) |
| 2 fall | 0 (0) |
| 3 fall | 1 (0.7) |
| Not stated | 7 (4.7) |
| Falls after the surgery within 9 month | |
| None | 140(94) |
| 1 fall | 0(0) |
| 2 fall | 0(0) |
| 3 fall | 2 (1.3) |
| Not stated | 7 (4.7) |
| Falls after the surgery within 12 month | |
| None | 133 (89.3) |
| 1 fall | 6 (4.0) |
| 2 fall | 0 (0) |
| 3 fall | 2 (1.3) |
| 4 fall | 1 (0.7) |
| Not stated | 7 (4.7) |
| Have you fallen in the last 12 months from today? | |
| None | 99 (66.4) |
| 1 fall | 29 (19.5) |
| 2 fall | 8 (5.4) |
| 3 fall | 4 (2.7) |
| 4 fall | 0 (0) |
| 5 fall | 1 (0.7) |
| Not stated | 8 (5.4) |
| Falls after the surgery which caregiver/parent's remember | |
| None | 97 (65.1) |
| 1 fall | 28 (18.8) |
| 2 fall | 12 (8.1) |
| 3 fall | 4 (2.7) |
| 10 fall | 1 (0.7) |
| Not stated | 7 (4.7) |
| Tampa Kinesiophobia Scale median (IQR) | |
| Total score | 41(38-44) |

4. Discussion

The most important findings in the present study were as follows: (1) Fall rate before the surgery was 35.6 % (one or more time fall event) (Table 2) (2) Fall rate after the surgery was 36.9% (Table 2) (3) The proportion of those who did not fall both before and after surgery was 41.9 %, those who did not fall before the operation but fell after the operation was 24.3 %, those who fell before surgery but did not fall after surgery 23 % and those who fell both before and after the operation was 10.8 %.

According to Centers for Disease Control and Prevention Center's (United States) Morbidity and Mortality Weekly Report in 2018, 27.5% of adults aged ≥65 years had at least one fall in the past one-year period (9). Knee osteoarthritis (10) and TKA (11) has been implicated as a risk factor for falls. In previous studies, preoperative fall status was determined as a factor predicting postoperative fall events. According to the study of Hill; of the 283 patients who

completed the questionnaire, 41% reported one or more falls in the previous year of TKA surgery (12). Swinkels et al reported a 24.2 % of preoperatively fall rate in the 3 months prior to TKA surgery (7). We found a higher fall rate before surgery which is stated at the CDC MMWR (9). Although preoperative fall rate was less but correlated with the literature; 50 (33.6%) of our patients fell 1 or more times before surgery.

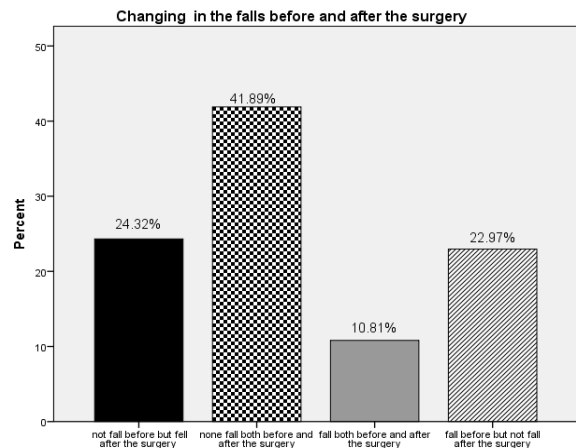


Fig. 3. Changing in the falls before and after the surgery

Table 3. Changes in the falls before and after the surgery

| | n (%) |
|--|-----------|
| Preop none fall but fall after the surgery | 36 (24.3) |
| Both pre and post-surgical fall | 62 (41.9) |
| Both pre and post-surgical fall | 16(10.8) |
| Fall before but not fall after the surgery | 34(23) |

Table 4. Kinesiophobia results between the faller and non faller patients

| | Faller | Non- faller | p |
|--------------------------|--------------|--------------|------|
| | Median (IQR) | Median (IQR) | |
| Preop Tampa Total score | 42(39-44.5) | 41(38-43.75) | 0.18 |
| Postop Tampa total score | 42 (39-45) | 41(38-43) | 0.14 |

Mann-Whitney Test, p<0.05

According to the literature there are some studies reporting the prevalence of falls between 17% and 48% in patients 12 months following TKA (5, 6, 7, 13). Matsumoto et al. designed a study with monthly pre-stamped postcards sent for assessing the incidence of falls. They reported that 23 of 70 patients (32.9 %) fell during the observation period (13). Also opposite the literature Riddle and Golladay stated that the fall rates of the persons with and without kneearthroplasty were similar over an 8-year period among (14). However we found a similar fall rate after surgery as 36.9% (Table 3).

In the report of a retrospective review to identify falls in patients admitted for elective orthopaedic procedures conduted By Mandl, There were 868 falls among orthopaedic

patients (Of 38,2% TKA surgery). The fall rate was 0,9% of admissions, or 2,0 per 1000 inpatient days (15). Johnson et al reported that the fall rate during hospital stay after surgery was 15, 3 per 1000 patients (16). No fall accident occurred during the hospital stay in our patients. In our study none of our patient had a fall history during the postoperative hospital stay. This may be explained because of the small sample size.

In a prospective study, Levinger et al questioned the patients about physical activity, fear of falls and history of falling in the 12 months post-surgery. 60 of the 243 participants (34,1%) reported 1 or more fall in the 12 months post-operatively following TKA. Also they stated that increased planned physical activity and previous falls in the preceding year were predictors of falls. According to the results patients who fell 1 or more times pre-operatively were three times more at risk of fall post-operatively (17). Our patients were predominantly sedentary (83,2%) and TKS scores were significantly correlated.

In many previous studies it was shown that there is a relation between mobility status, falls and developing fear of falling (18, 19). Although there was a positive correlation between kinesiophobia and exercise habit of our patients who did not have exercise habits and those who fell preoperatively, we could not explain this activity level-fall-fear of falling relation because of the similar TKS scores between fallers and nonfallers.

Fall related-injuries are some of the main afraid complications after TKA surgery. In the CDC MMWR report it's been stated that 10.2% of adults aged ≥ 65 years had a fall-related injury (9). Thus, the results of the fall events must be considered in a separate view. According to the results reported by Jorgensen, they classified the fall injuries as "none" or minor in 39.8%, moderate in 9.6%, and major in 50.6%. In addition, they reported that of 1.6% fall-related hospital admissions (20). Matsumoto et al stated the fracture rate due to falling as 6.2% (13). In addition, fall-related fractures are seen at a substantial rate after TKA. According to the results of a cohort study by Tromp et al, the total number of fractures was 85 of 5145 patients, including 23 wrist fractures, 12 hip fractures, and nine humerus fractures (5.8%) (21) In our cohort 7,4 % of our patients had a fall related-fracture similar with the literature including: 2 radius distal fractures (1,3%), 3 hip fractures (2%), 3 periprosthetic fractures (2%), 1 patella fracture (0,7%) and 2 vertebral compression fractures (1.3 %).

Swinkels and Allain determined the fall rate timing period. In their study seven of 30 (23.3%) patients fell in the 3 months before surgery and 5 (22.7%) in the 6 months after surgery. Also, per quarter fall rate was 11.7-11.8% and overall fall rate was 24,2% in the first year after surgery (22). In comparison with these rates after surgery our results were lesser as: within the first 3 months (6,7%), 3 to 6 months (6%) and 6 to 12 months (11,7%). On the other hand after surgery a

overall fall rate was higher as 35.6%. Other results reported by Swinkels and Allain should be noted: 45.8% of preoperatively falled patients continued to fall, 17.3% of patients who did not fall preoperatively fell postoperatively. When our data is analyzed in this perspective, patients who did not fall before the surgery but fell after the surgery was 24.3 %, patients who fell before surgery but did not fall after surgery 23 % and patients who fell both before and after the operation was 10.8 %. An important question has been raised as a result of our findings: 'What is the mechanism or reason that make the patients' fall or doesn't fall?' or 'Which parameters change after the TKA surgery?'

Our recommendation is not to ignore the high risk of falling before and after TKA in the elderly. To the best of our knowledge, this is a rare study that assesses the fall rate and fear of falls in patients with total knee replacements in terms of both preoperatively and postoperatively.

New researches should be conducted about what is the reason that makes the patients posture and movement more stable or which mechanism alters the balance. In order to prevent complications that may occur due to falls, new studies, treatment modalities and rehabilitation programs focusing on the etiology of falling in the elderly individuals should be organized.

There are some limitations in our study. Although many factors such as health status, posture, static and dynamic balance problems are shown to be responsible among the causes of falls in the elderly, we did not evaluate our patients in terms of the etiology of falls. Although the fear of falling and the events of falling were questioned in our patients, the injuries accept fractures that developed around the knees or other body parts due to these falls were not questioned. In addition, it was not questioned whether TKA complications due to falling occurred or not. Therefore, the potential effects of falling in TKA patients are unknown. No research has been conducted on the etiology of falls, such as prosthetic designs and surgical approaches the contribution of the other knee with osteoarthritis to the fall has not been examined.

Conflict of interest

The authors declare that there is no conflict of interest.

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