Prevalence of fall in Patients with Total Knee Arthroplasty Living in the Community

Apirada Soison BSc*,
Saowaluck Riratanapong BSc*, Nopporn Chouwajaroen BSc*, Chindawan Chantowart BSc*,
Ladawan Buranapiyawong BSc*, Sagheemas Kaewkot BSc*, Weerachai Kosuwon BSc, MSc, MD**

** Orthopedic Nurse, Nursing Division, Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*
*** Department of Orthopedics, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*

Background: *Knee osteoarthritis (OA) with pain, stiffness and functional limitations is associated with risk of falls. Total knee arthroplasty (TKA) is an effective treatment for OA knee and affords significant improvements in pain, function and proprioception. Many studies have shown proprioceptive/balance deficits and decreases in knee extension strength following TKA, which could increase risk of falls.*
Objective: *To identify the prevalence rate and fall-risk in Thai TKA patients.*
Material and Method: *A cross-sectional study was conducted among patients with TKA diagnosed with primary OA who living in the community.*
Results: *There were 54 patients (46 females, 8 males). Mean time between surgery and interview was 38.9±16.6 (7-73) months. The one-year prevalence of falls among patients was 42.6% (23/54 patients): total frequency was 34 times (1-4 times/case). Three fallers needed treatment: one by open reduction and internal fixation with plate and screws of periprosthetic fracture of the femur, and the others needed hospitalization due to hemathrosis of non-TKA knees. The WOMAC pain and stiffness scores were significantly higher in the faller group than the non-faller group. Limitation of joint motion was the main fall-risk factor (OR 6.3; 95% CI 1-67.2, p<0.05).*
Conclusion: *The prevalence rate of falls for this group of TKA patients was about 42%. Limited motion and pain of the knee joint were associated with falls in this study group.*

Keywords: *Elderly, Falls, Total knee arthroplasty, Community*

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A fall is "an unexpected event in which the participant comes to rest on the ground, floor, or lower level[1]". When people get older, they may fall more often - about 30% may fall in a year - for a variety of reasons including poor vision, problems with balance, and dementia[2]. Falls arecommon among community-dwelling elderly people[3]. Falls are one of the major health problems affecting the quality of life among older adults. Decreasing muscle strength is associated with the aging process which increasesthe risk of falling[4]. Knee osteoarthritis (OA) is a major cause of disability. Knee OA is an established risk factor, with pain, stiffness and functional limitation being more associated with fall-risk than radiographic changes[5]. Several studies report significant improvements in pain, function and proprioception following total knee arthroplasty (TKA)[6,7]. By contrast, some studies have shown proprioceptive/balance deficits and decreases in knee extension strength following TKA,which could increase the risk of falls[8-10]. Sitting or kneeling on the floor is common in Thai Buddhist culture - a posture of respect and for socializing as in other Southeast Asian nations - and this may increase the risk of falls in TKA patients in this region. This study aims to report the prevalence of the rate of falls, the number of fallers and the risk factors associated with falls among Thai TKA patients.

Correspondence to:
Kosuwon W, Department of Orthopedics, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand.
Phone: 081-262-5055
E-mail: weera_ko@kku.ac.th

Material and Method

A cross-sectional study was conducted on patients who underwent TKA at Srinagarind University Hospital, Khon Kaen, Thailand. An interview and physical examination were performed at the annual meeting of "The New Joint People" at Srinagarind Hospital in 2013. Participants and their relatives were interviewed by an advanced practitioner nurse in arthroplasty (APN) and an orthopedic nurse.

Information recorded included: fall events, causes, places, and timeswithin the last year. The APN performed and recorded the results of the physical examinations, and the Western Ontario and McMaster Osteoarthritis Index (WOMAC) for each participant. The definition of limitation of motion of the knee joint was met when flexion was <120° and/or the join was not able to fully extend (0°).

Statistical analysis

Data analysis was done using STATA version 10 statistics/data analysis software. The association of falls and their risk factors were analyzed using Pearson's Chi-square tests. The independent t-test and Chi-square test were used for continuous and categorical variables, respectively. The study was conducted in accordance with the Declaration of Helsinki, was approved by the Khon Kaen University Ethics Committee for Human Research (HE531190) and informed consent was obtained from all patients.

Results

Fifty-four patients with TKA attended the 6th annual meeting in 2013. The mean time to interview after surgery was 38.9±16.6 (7-73) months. Nine patients met the definition for difficulty of motion of their knees. The characteristics of these patients are presented in the Table 1. The one-year prevalence rate of falls among these patients was 42.6% (23/54 patients). The total frequency of falls was 34 times (range 1-4). Fifty-two patients (96.2%) were diagnosed as having primary osteoarthritic knees and 21 underwent bilateral TKAs. There were 3 fallers needed treatments, one case was operated by open reduction and internal fixation with plate and screws of periprosthetic fracture of the femur, another cases needed hospitalization caused by hemathrosis of non-TKA knees. The respective mean total WOMAC score and VAS (100 mm) was 60.5±52.1 and 10.5±2.4. A respective 14, 8 and 1 cases fell once, twice and four times. Most (24/34 or 67.6%) of the falls occurred in the morning and afternoon. Seven of the 12 cases fell indoors on a slippery surface while 11 of 16 fell outdoor on an uneven surface (Table 2). Vision problems in both fallers and non-fallers were not different. The only significant difference in characteristics between fallers and non-fallers (Table 3) was height and difficulty of motion; fallers were shorter and had more difficulty in joint motion than non-fallers (p<0.05). The odds of a fall in the TKA patients with limited motion was 6.3 times more than TKA patients without difficulty of joint motion (95% CI 1-67.2, p<0.05). However, the results from multiple regression analysis (Table 4) revealed that

Table 1. Patient characteristics

Age (years)	67.0±8.1 (44-83)
Sex (female:male)	46:8
Height (cm)	155.6±6.2 (145-179)
Weight (kg)	66.5±9.88 (52-96)
Body mass index	24.0±4.1 (18-38)
Rt:Lt:bilateral TKA	16:17:21
Time after surgery (month)	38.9±16.6 (7-73)
VAS (mean, mm)	10.5±2.4 (0-80)
WOMAC pain score	4.9±5.8
WOMAC stiffness score	2.8±3.42
WOMAC functional score	2.5±20.8
Total WOMAC score	60.5±52.1
Limit motion of the knee joint (cases)	9
Concomitant diseases	
Eye problems	27
Hypertension	24
Diabetes mellitus	8
GI	15
Vision problems	27
Others	2
Rheumatoid	1
SLE	1
Thalassemia	-
Occupation	
Farmer	35
Other	19
Income (baht)	11,718±12,378 (600-100,000)
History of OA knee treatments before TKA (no:yes)	
Education in osteoarthritis	50:4
Weight reduction	34:20
Knee brace	11:7
Exercise	33:21
Acupuncture	34:20
Acetaminophen	43:11
NSAIDs	28:26
Others (herbs)	46:8

Rt = right; Lt = left; TKA = total knee arthroplasty; VAS = visual analog scale; WOMAC = Western Ontario and McMaster osteoarthritis index; GI = gastrointestinal; SLE = systemic lupus erythematosus; NSAIDs = non-steroidal anti-inflammatory drugs

only the WOMAC pain, stiffness scores and limit knee joint motion (p<0.05) in the TKA patients were significantly associated with falls.

Table 2. Falls, numbers of fallers and characteristics of falls

Fall	Case or times
Faller, cases (%)	23/54 (42.6)
Total number of falls in one year, times (range)	34 (1-4)
Period(s) of falls (times)	
Morning	11
Afternoon	13
Evening	8
Night	2
Place(s) of falls (cases/times)	
Inside the house	13/13
Bedroom	0
Bathroom	4/4
Common room	7/7
Other(s)	2/2
Outside the house (cases/times)	20/21
Uneven pathway	11/11
Farm field	2/2
Other(s)	7/8
Conditions inside the house associated with falls (cases)	
Poor lighting	2
Untidy or poorly arranged furniture	1
Slippery surface	7
Other(s)	2

Discussion

The annual prevalence of falls in the elderly is between 30% and 50%[11]. In a recent systematic review, Deandrea[12] identified many risk factors for falling. External factors account for about 15% of most falls[3]. The current study found that the prevalence of falls in post TKA patients was 42.6%, which was a higher rate than reported by Swinkes et al[10]. The present retrospective study may have had a recall bias by the TKA patients; on the other hand, the relatives who were also interviewed confirmed the fall history. Importantly most of the patients in the current study were active-representing highly functional TKA patients-which might explain why there was such a high prevalence of falls. The prevalence rate for falls in OA knee patients in Thailand has never been reported, so it is not possible to make comparisons of prevalence ratesamong old age OA knee patients. The external factors contributing to falls in the current study were slippery and uneven surfaces (floors and pathways), which Rolita[13] also noted in an epidemiological study.

The major finding in the current study was that difficulty moving the knee after surgery was associated with falls in this particular group. Difficulty bending the knee may be the result of (a) sitting on the floor (b) less flexibility and (c) proprioception of the joint while slipping. A previous review of these three issues was inconsistent and controversial[14]. As with the study by Foley[15], vision problems in our study were not associated with falls, while the

Table 3. Comparison of characteristics between fallers and non-fallers

	Faller (23 cases)	Non-faller (31 cases)
Age (year)	68.00±6.44	65.00±9.11
Weight (kg)	68.32±6.44	65.24±9.18
Height (cm)*	154.26±4.22	156.06±7.29
Body mass index	25.04±3.81	23.76±4.36
Time after surgery (months)	39.60±3.70	38.40±3.70
VAS (mean mm)	18.91±21.79	20.00±26.42
WOMAC pain score	6.13±6.04	4.06±5.66
WOMAC stiffness score	2.60±2.80	2.96±3.81
WOMAC functional score	25.39±17.87	20.26±22.77
Total WOMAC score	68.52±44.55	54.60±57.28
Satisfaction score (maximum score 10)	9.34±0.28	8.70±0.29
Limited knee joint motion (case)**	7	2
Vision problem	16	11

Significantly different: * p<0.005, ** p<0.05

Table 4. Multiple linear regression of fallsamong TKA patients and its risk factors

Fall	Coefficient	Standard error	t	$p>\|t\|$	95% confidence interval
Sex	-0.263	0.261	-1.01	0.320	-0.792 to 0.265
Vision problems	0.002	0.008	0.27	0.792	-0.015 to 0.020
Weight	0.000	0.012	0.01	0.993	-0.026 to 0.026
Height	-0.006	0.016	-0.39	0.696	-0.038 to 0.026
Body mass index	0.005	0.029	0.18	0.854	-0.054 to 0.065
VAS	-0.003	0.003	-1.01	0.317	-0.011 to 0.003
WOMAC pain*	0.048	0.021	2.27	0.028	0.005 to 0.092
WOMAC function	-0.034	0.021	-1.64	0.109	-0.077 to 0.008
WOMAC Stiffness**	-0.141	0.049	-2.86	0.007	-0.241 to -0.041
Total WOMAC	0.019	0.010	1.86	0.070	-0.001 to 0.040
Limit knee joint motion**	0.594	0.227	2.61	0.013	0.134 to 1.053

Significant difference: * $p<0.05$,** $p<0.025$

WOMAC subscales for pain and function were significantly associated with reaction time, balance, knee extension strength and proprioception. Bachmeier et al[16], however, found that these parameters were not predictors of falls in TKA patients, perhaps because in activity reduces the likelihood of falling; in contrast to our active patients. Taken together,our findings suggest that a post-operative change in the prevalence of falls is likely attributable to reduced mobility following surgery. This conclusion may be controversial, but our study confirmed that WOMAC pain, and stiffness scores were associated with falls, likely due to limited motion of the knee in TKA fallers.

Conclusion

The prevalence rate of falls for this group of TKA patients was about 42%. Limited motion of the knee joint, a high WOMAC pain, and stiffness scores were associated with falls in this study group.

What is already known on this topic?

This is a new issue for specific group of active patient with total knee arthroplasty (TKA) who lives in the community in the northern part of Thailand. Our patients normally work at home sit on the floor and work in the field. This is absolutely different from previous reports that patients with who live in the special nursing care, home help care or only in the modern home.

What this study adds?

This article will apply to EU, USA citizens who married with Thai women and live in Thailand. Moreover, ASEAN health care providers will have this information for applying to their patients.

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Potential conflicts of interest

None.

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ความชุกของการล้มในผู้ป่วยเปลี่ยนข้อเข่าเทียมที่อาศัยในชุมชน

อภิรดา สร้อยสน, เสาวลักษณ์ ริรัตน์พงษ์, นพพร เชาว์เจริญ, จินดาวรรณ จันโทวาท, ลดาวัลย์ บูรณะปิยะวงศ์, ศจีมาส แก้วโคตร, วีระชัย โควสุวรรณ

ภูมิหลัง: *ข้อเข่าเสื่อมที่มีอาการปวด ข้อขัด และขัดขวางการใช้งานมีความสัมพันธ์กับการเสี่ยงต่อการล้ม การรักษาข้อเข่าเสื่อมด้วยข้อเข่าเทียมนั้น มีประสิทธิภาพมากในการลดอาการปวด เพิ่มการทำงาน และความรู้สึกของข้อเข่า อย่างไรก็ตามมีหลายการศึกษาพบว่าการผ่าตัดเปลี่ยนข้อเข่าเทียมอาจจะเพิ่มความเสี่ยงของการล้ม เนื่องจากปัญหาความรู้สึกในเข่ากับความสมดุลที่ลดลงและความแข็งแรงของกล้ามเนื้อการเหยียดเข่าที่น้อยลง*

วัตถุประสงค์: *เพื่อหาความชุกของการล้มในคนไทยที่เปลี่ยนข้อเข่าเทียม*

วัสดุและวิธีการ: *เป็นการศึกษาเชิงบรรยายชนิดภาคตัดขวาง ในผู้ป่วยข้อเสื่อมชนิดปฐมภูมิที่ได้รับการเปลี่ยนข้อเข่าเทียมและอาศัยอยู่ในชุมชน*

ผลการศึกษา: *มีผู้ป่วยทั้งหมด 54 ราย และญาติได้รับการสัมภาษณ์โดยพยาบาลเฉพาะทางและพยาบาลทางออร์โธปิดิกส์ ระยะเวลาเฉลี่ยหลังผ่าตัด จนถึงวันสัมภาษณ์เท่ากับ 38.9±16.6 (7-73) เดือน ความชุกของการล้มใน 1 ปี เท่ากับร้อยละ 42.6 (23/54 ราย) จำนวนความถี่รวมของการล้มเท่ากับ 34 ครั้ง (จำนวนครั้งที่ล้ม 1-4 ครั้ง/ราย) มีผู้ที่ล้ม 3 ราย ต้องการการรักษาในโรงพยาบาลเนื่องจากการล้ม คะแนนด้านการปวด การยึดข้อ WOMAC ในคนที่ล้มมีค่ามากกว่าคนที่ล้มอย่างมีนัยสำคัญ ข้อเข่าเทียมที่มีพิสัยการเคลื่อนไหวที่ลดลงเป็นปัจจัยสำคัญที่ทำให้เกิดการล้มอย่างมีนัยสำคัญ (OR 6.3; 95% CI 1-67.2, p<0.05)*

สรุป: *ความชุกของการล้มในผู้ป่วยข้อเข่าเทียมเท่ากับร้อยละ 42 อาการปวดและการจำกัดพิสัยการขยับของข้อเข่าเทียมมีความสัมพันธ์กับการล้ม*