Original Articles

The ability and factors related with floor sitting after total hip arthroplasty with a posterolateral approach

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Background

Prosthesis dislocation following total hip arthroplasty (THA) is one complication that affects treatment outcome and increases the cost of treatment. Currently, many surgeons prohibit patients from performing floor-based activities; however, these prohibitions might affect the lifestyle of a number of patients.

Objective

This study aimed to evaluate the ability of floor sitting after THA, and factors associated with this ability

Methods

This study was a retrospective cohort study, evaluating 240 patients who underwent THA with a posterolateral approach, in a single tertiary hospital. Patient demographic data, preoperative clinical data, prostheses type, and postoperative radiographic were extracted from the electronic medical records. Postoperative ability to perform floor sitting was evaluated at 6 months postoperatively.

Results

There were 52 patients (21.66%) who were able to sit on the floor postoperatively. Multivariate logistic regression analysis showed independent association between three factors with ability to sit on the floor after surgery: pre-operative external rotation range of motion (OR 1.03; 95% CI, 1.01-1.06; P = 0.01), pre-operative Harris Hip Scores (OR 1.05; 95% CI, 1.01-1.10; P = < 0.01), pre-operative ability to sit on the floor (OR 10.2; 95% CI, 3.65-28.5; P = < 0.01).

Conclusion

There were a number of patients who could sit on the floor after THA. However, there were factors which were associated with this ability. Hence, these results could be useful for adjusted patient preoperative expectations, and did not preclude all patients to perform floor activities.

BACKGROUND

Total hip arthroplasty (THA) is an operation that can improve quality of life. However, postoperative dislocation is one of the complications that affect treatment outcome and increase the costs of treatment.[1,2] The postoperative protocol after THA, related to motion restriction, is still debatable among surgeons.[3] Traditional postoperative guidelines call for stringent restrictions in hip motion as well as several activities to prevent dislocation. The intention to restrict hip motion is to prevent early dislocations, and to protect posterior soft tissue repairs.[4] Nevertheless, modern postoperative protocols have less restriction of activity and

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hip motion, because of improvement in surgical techniques and increasing of femoral head sizes.[5]

The positions of the hip that usually cause posterior hip dislocation are flexion, adduction, and internal rotation. These positions are matched with the position when the patient sits in a low chair, while anterior dislocation is related to the position of hip extension, adduction, and external rotation.[6] The position of the hip, which is relative to anterior and posterior dislocation, is the position requirements for a patient to perform floor-based activities. These usually include sitting on the floor; such as, squatting, lotus position, side-knee bending, or kneeling.[7] However, many surgeons prohibit patients from performing floor-based activities; especially in the early postoperative period, and some surgeons even suggest patients avoid these positions for life. These prohibitions might affect the lifestyle of the patient; especially Asian patients, wherein many parts of their lifestyle involve floor-based activity.[8,9] There was a study that reported that common sitting positions used in daily life in Asia were squatting, kneeling, and floor-sitting.[10]

Currently, there are limited studies reporting on the fate of patients after THA, in the aspects of their ability to perform floor sitting postoperatively as well as to the factors related to these competencies. Therefore, this study aimed to evaluate these points, and the results of the study will be beneficial for a surgeon in advising patients and predicting their ability to perform floor sitting after THA, using a posterolateral approach.

METHODS

This study was a retrospective study, conducted at a tertiary hospital; from January 2012 to December 2019. The data were extracted from the hospital's electronic database for patients who had primary total hip arthroplasty. The exclusion criteria were patients with incomplete data and follow-up at of less than 6 months. This study was approved by the relevant Ethics Committee and Institutional Review Board (Human Research Ethics Committee, Faculty of Medicine, Prince of Songkla University, Thailand; Study approval number :62-406-11-1; waivers of consent for retrospective chart review)

A total data of 240 patients who underwent THA were recruited. All of the patients had THA with a posterolateral approach, in a lateral decubitus position. The operation was performed with standard THA instruments, without computer navigation. A hip capsule and short external rotators were repaired after the hip prostheses were implanted. On day one after the operation patients were able to walk with assistance. Patients underwent standard precaution protocol in aspects of hip position, for avoiding hip flexion of more than 90-degree, internal rotation, and adduction. Additionally, patients were advised to use a standard height chair and to avoid 'squat styled' toilets. At their 6 week follow-up visit, patients were allowed to perform daily activities without restriction. However, patients were recommended to avoid high impact exercises over their lifetime, so as to increase the longevity of implants.

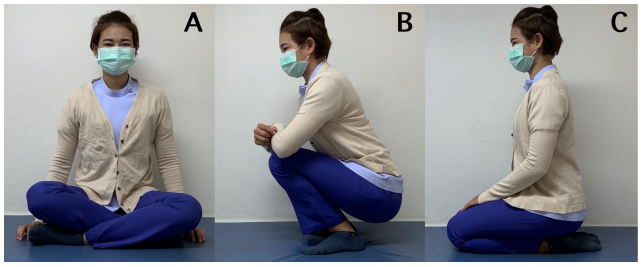

Figure 1. The illustrations show floor sitting position (A) cross-legged (B) squatting (C) kneeling

Patient demographic data, clinical data and surgical data were collected. The ability to sit or perform floor activities; whether the patient was able to sit on the floor before and at 6 months after surgery, and also the type of floor sitting; such as, cross-legged, squatting and kneeling, were retrieved. (Figure 1)

Statistical analysis was performed using R-program version 3.2.1 software ware (R Foundation for statistical computing, Vienna, Austria). Patient demographic data; such as, gender, side of THA, contralateral hip problems, pre/post-operative floor sitting, and implant type were evaluated with Pearson chi-square. Occupation, femoral head size was evaluated with Fisher exact test. An independent t-test was used to compare height, total range of motion, and radiographic acetabular cup position. Age, weight, body mass index (BMI), pre-operative range of motion, pre-operative HHS, femoral stem anteversion were assessed with The Wilcoxon rank-sum test. Multivariate logistic regression analysis was performed to identify the factors associated with the ability to perform floor activities, post-operatively. Values of $p < 0.05$ were considered statistically significant.

RESULTS

The data from 240 patients were reviewed; 52 patients (21.66%) were able to sit on the floor postoperatively. Patient demographic data of all patients are summarized in Table 1. The results demonstrated that patients who were able to sit on the floor were younger than those who could not. Patients who were able to sit on the floor had a higher preoperative hip range of motion, and a higher rate of ability to sit on the floor before their operation comparing with patients who could not. (Table 2) The type of prosthesis, femoral head size, and radiographic parameters were not different between groups. (Table 3)

Multivariate logistic regression analysis showed independent association between three factors with ability to sit on the floor after surgery: pre-operative external rotation range of motion (OR 1.03; 95% CI, 1.01-1.06; P = 0.01), pre-operative Harris Hip Scores (OR 1.05; 95% CI, 1.01-1.10; P = < 0.01), pre-operative ability to sit on the floor (OR 10.2; 95% CI, 3.65-28.5; P = < 0.01).

Table 1. Demographic data

Characteristic	Unable to floor sitting (*n* = 188)	Able to floor sitting (n = 52)	*p*-value
Gender			0.28
Female	112 (59.6%)	26 (50%)	
Male	76 (40.4%)	26 (50%)	
Age (years)	59 (49,67.2)	51.5 (42.8,63)	0.02
Weight (kg)	60 (52,71)	60.5 (54.1,70.3)	0.95
Height (cm)	159.6 ± 8.6	160.7 ± 8.5	
BMI (kg/m^2)	24 (20.9,27.7)	23.4 (21.2,25.7)	0.61
Occupation			0.11
Manager	7 (3.7%)	4 (7.7%)	
Clerk	33 (17.6%)	11 (21.2%)	
Sale person	31 (16.5%)	13 (25%)	
Farmer	31 (16.5%)	10 (19.2%)	
Craft worker	2 (1.1%)	1 (1.9%)	
Housewife	84 (44.7%)	13 (25%)	
Side of THA			0.11
Bilateral	39 (20.7%)	17 (32.7%)	
Unilateral	149 (79.3%)	35 (67.3%)	
Contralateral hip problem (unilateral THA)			0.87
Yes	35 (23.3%)	9 (26.5%)	
No	115 (76.7%)	25 (73.5%)	

DISCUSSION

As postoperative hip dislocation after THA is a major concern for many surgeons, some patients have been prohibited from sitting on the floor, or from performing floor based activities, so as to avoid this complication. However, for some patients; especially within Asian cultures, this restriction might affect their lifestyle. Moreover, there is currently limited evidence for providing information, preoperatively, for patients in terms of the chance to be able to sit on the floor after an operation, or factors related to this outcome. This study reported on the percentage of patients who were able to sit on the floor as well as factors associated with this ability. The results revealed that a number of patients were able to sit on the floor; approximately 20% postoperatively. This study also found that the ability to sit on the floor after surgery; pre-operative external rotation range of motion and pre-operative Harris Hip Scores, were associated with postoperative ability to sit on the floor.

To our knowledge, this study is the first studying reporting on the rate of patient ability to sit on the floor after THA. Our study found that an estimated 20 percent of patients were able to sit on the floor after THA. Although, some patients could not sit in all of the 3-sitting positions (squatting, cross-legged sitting, and kneeling). We hypothesized that these might be from the limitation of hip range of motion in some directions, which relates to each sitting position. The hip range of motion required for squatting is 130-degree flexion, 15-degree abduction, and 5-degree external rotation at the hip, while cross-legged sitting requires hip 90 degree-flexion, 45- degree-abduction, and 60-degree external rotation.[11] Hence, if a postoperative hip range of motion in each direction was less than these values, patients would be unable to sit in such specific sitting positions.

Multivariate analysis demonstrated an independent association between postoperative ability to sit on the floor with preoperative ability to sit on the floor, and preoperative external rotation range of motion and preoperative Harris Hip Scores. The reasons for why patients were able to sit on the floor postoperatively, aligning with a positive effect to preoperative, might also be related with soft tissue contracture preoperatively. Much the same as to the aspect for total knee arthroplasty, in that preoperative range of motion correlates with a postoperative range of motion.[12,13] Our study found that higher pre-operative Harris Hip Scores had a superior influence on postoperative floor sitting ability. The Harris Hip Scores have high validity and are a reliable instrument for assessing the outcome of total hip replacement.[14] This score is combined with patient pain, hip function, and physical examination; including, hip range of motion.[15] There was a study reporting that the Harris Hip Scores correlated with hip range of motion.[16] Therefore, we speculated that this might be the reason why higher preoperative Harris Hip Scores had a high percentage of patients who were able to sit on the floor.

There were some limitations in this study. First, this study was a retrospective study, in that the ability of floor sitting was based on patient reports instead of physical examination. So, we hypothesized that some patients have

Table 2. Pre-operative data

Characteristic	Unable to floor sitting (*n* = 188)	Able to floor sitting (*n* = 52)	*p*-value
Pre-operative ROM			
Flexion	90 (80,100)	90 (80,110)	0.193
Adduction	20 (15,30)	20 (13.8,30)	0.83
Abduction	30 (20,35)	30 (30,45)	0.005
External rotation	30 (20,45)	45 (30,45)	**< 0.001**
Internal rotation	10 (0,20)	10 (5,15)	0.954
Total ROM	180.2 (±47.1)	198.2 (±44.5)	**0.019**
Pre-operative floor sitting			**<0.01**
Yes	11 (5.9%)	19 (36.5%)	
No	177 (94.1%)	33 (63.5%)	
Pre-operative sitting each position			
Squatting			**< 0.001**
No	183 (97.3%)	40 (76.9%)	
Yes	5 (2.7%)	12 (23.1%)	
Cross-leg sitting			**< 0.001**
No	183 (97.3%)	40 (76.9%)	
Yes	5 (2.7%)	12 (23.1%)	
Kneeling			
No	180 (95.7%)	37 (71.2%)	**< 0.001**
Yes	8 (4.3%)	15 (28.8%)	
Pre-operative HHS	46 (37,55.5)	57 (45,57)	**< 0.001**

ROM: range of motion; HHS: Harris hip score

Table 3. Prosthesis and post-operative data

Characteristic	Unable to floor sitting (*n* = 188)	Able to floor sitting (*n* = 52)	*p*-value
Femoral stem type			0.309
Cementless	176 (93.6%)	51 (98.1%)	
Cemented	12 (6.4%)	1 (1.9%)	
Acetabular cup type			1
Cementless	181 (96.3%)	51 (98.1%)	
Cemented	7 (3.7%)	1 (1.9%)	
Acetbular liner type			0.539
Elevate lip	137 (72.9%)	35 (67.3%)	
Neutral	51 (27.1%)	17 (32.7%)	
Femoral head size			0.406
28 mm	5 (2.7%)	0 (0)	
32 mm	121 (64.4%)	31 (59.6%)	
36 mm	62 (33%)	21 (40.4%)	
Acetabular cup inclanation	39.9 (±6.7)	39.8 (±6.9)	0.91
Acetabular cup anteversion	24.3 (±11.4)	25.6 (±13.4)	0.483
Femoral stem anteversion	21 (13,30)	24 (15.5,30)	0.634
Bearing surface			0.146
Ceramic on polyethelene	92 (48.9%)	32 (61.5%)	
Metal on polyethelene	96 (51.1%)	20 (38.5%)	

ROM: range of motion; HHS: Harris hip score

never tried to sit on the floor; even they could, because they had already modified their lifestyle to avoid floor sitting before their operation. If our hypothesis is correct, the percentage of patients who were able to sit on the floor might be higher than the actual percentage presented. Second, even our postoperative care protocol allowed patients to sit on the floor, depending on patient comfort or need. However, our protocol does not motivate patients to sit on the floor, nor set it as a goal of treatment. Thus, this protocol might lower the ability to sit on the floor than other protocols that influence patients to try to sit on the floor. However, the authors still believe that a postoperative protocol, based on a patient's determination to try to sit on the floor or continue their lifestyle without floor activities, was a more reasonable and out of harm's way approach. Finally, this study evaluated patients at 6 months, postoperatively, which is a short-term outcome. We predicted that there was a possibility that more patients might be able to sit on the floor after this period.

CONCLUSIONS

This study demonstrated that approximately 20 percent of patients who had THA with a posterolateral approach could sit on the floor. The factors that were associated with this ability comprised of: preoperative floor sitting ability, higher preoperative external rotation range of motion, and higher preoperative Harris Hip Scores. Further studies evaluating this ability in THA, along with other surgical approaches or prospective studies with rigorous postoperative protocols, would be beneficial.

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AUTHORS' CONTRIBUTIONS

AN, VY designed the study and performed the analysis and manuscript preparation; TH, KI designed the study and reviewed the manuscript. All authors read and approved the final manuscript.

DECLARATION OF CONFLICTING INTERESTS

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REFERENCES

1. Harake R, Colen S, Mulier M. Inverted cup prosthesis to treat recurrent hip dislocation in frail elderly patients. *Ortop Traumatol Rehabil*. 2012;14(2):179-182. doi:10.5604/15093492.992284

2. Rowan FE, Benjamin B, Pietrak JR, Haddad FS. Prevention of Dislocation After Total Hip Arthroplasty. *J Arthroplasty*. 2018;33(5):1316-1324. doi:10.1016/j.arth.2018.01.047

3. Fortier LM, Rockov ZA, Chen AF, Rajaee SS. Activity Recommendations After Total Hip and Total Knee Arthroplasty. *J Bone Joint Surg Am*. 2021;103(5):446-455. doi:10.2106/jbjs.20.00983

4. Eannucci EF, Barlow BT, Carroll KM, Sculco PK, Jerabek SA, Mayman DJ. A Protocol of Pose Avoidance in Place of Hip Precautions After Posterior-Approach Total Hip Arthroplasty May Not Increase Risk of Post-operative Dislocation. *HSS J Musculoskelet J Hosp Spec Surg*. 2019;15(3):247-253. doi:10.1007/s11420-019-09708-9

5. Gromov K, Troelsen A, Otte KS, Ørsnes T, Ladelund S, Husted H. Removal of restrictions following primary THA with posterolateral approach does not increase the risk of early dislocation. *Acta Orthop*. 2015;86(4):463-468. doi:10.3109/17453674.2015.1028009

6. Morrey BF. Instability after total hip arthroplasty. *Orthop Clin North Am*. 1992;23(2):237-248. doi:10.1016/s0030-5898(20)31734-x

7. Tangtrakulwanich B, Chongsuvivatwong V, Geater AF. Habitual floor activities increase risk of knee osteoarthritis. *Clin Orthop*. 2007;454:147-154. doi:10.1097/01.blo.0000238808.72164.1d

8. Choy WS, Lee KW, Kim HY, Kim KJ, Chun YS, Yang DS. Mobile bearing medial unicompartmental knee arthroplasty in patients whose lifestyles involve high degrees of knee flexion: A 10-14 year follow-up study. *The Knee*. 2017;24(4):829-836. doi:10.1016/j.knee.2017.05.004

9. Fujita T. Osteoporosis in Japan: factors contributing to the low incidence of hip fracture. *Adv Nutr Res*. 1994;9:89-99. doi:10.1007/978-1-4757-9092-4_5

10. Fujita K, Makimoto K, Higo T, Shigematsu M, Hotokebuchi T. Changes in the WOMAC, EuroQol and Japanese lifestyle measurements among patients undergoing total hip arthroplasty. *Osteoarthritis Cartilage*. 2009;17(7):848-855. doi:10.1016/j.joca.2008.11.012

11. Singh U, Wason SS. Multiaxial orthotic hip joint for squatting and cross-legged sitting withhip-knee-ankle-foot-orthosis. *Prosthet Orthot Int*. 1988;12(2):101-102. doi:10.3109/03093648809078207

12. Farahini H, Moghtadaei M, Bagheri A, Akbarian E. Factors Influencing Range of Motion after Total Knee Arthroplasty. *Iran Red Crescent Med J*. 2012;14(7):417-421.

13. Kotani A, Yonekura A, Bourne RB. Factors Influencing Range of Motion After Contemporary Total Knee Arthroplasty. *J Arthroplasty*. 2005;20(7):850-856. doi:10.1016/j.arth.2004.12.051

14. Söderman P, Malchau H. Is the Harris hip score system useful to study the outcome of total hip replacement? *Clin Orthop*. 2001;384(384):189-197. doi:10.1097/00003086-200103000-00022

15. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am*. 1969;51(4):737-755. doi:10.2106/00004623-196951040-00012

16. Behery OA, Foucher KC. Are Harris Hip Scores and Gait Mechanics Related Before and After THA? *Clin Orthop*. 2014;472(11):3452-3461. doi:10.1007/s11999-014-3886-1