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ORIGINAL INVESTIGATION

Differences in one year outcome after primary total hip and knee arthroplasty in elderly patients with osteoarthritis: a cohort study

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Background. Patients submitted to primary total hip (THA) and knee (TKA) arthroplasty show better clinical outcomes, improved quality of life and increased participation in leisure activities. However, the discrepancy between primary THA and TKA in elderly patients are unknown.

Aim. To compare the Western Ontario and McMasters University Osteoarthritis Index (WOMAC) scores and WOMAC change scores, the Medical Outcomes Study 12-item short-form version 2 (SF-12) mental and physical health scales, satisfaction, and frequency of participation in leisure activities in elderly osteoarthritis patients (≥ 65 years) who underwent primary THA and TKA, respectively.

Methods. Data from 170 THA and 169 TKA patients were collected one week preoperatively through self-reporting of WOMAC scores, and SF-12. One year postoperatively, the latter parameters and satisfaction frequency for participation in leisure activities were collected by self-reporting questionnaires.

Results. THA group patients showed better WOMAC scores ($p < 0.05$), WOMAC change scores ($p < 0.05$), physical component summary (PCS) of SF-12 ($p < 0.01$), and PCS change scores ($p < 0.01$) compared with the TKA group. In addition, THA patients showed higher overall satisfaction (91.90 *vs* 83.60%), pain relief satisfaction (87.20 *vs* 77.40%), and functional improvement satisfaction (90.10 *vs* 83.08%) in comparison with TKA patients. Furthermore, higher frequency of participation in leisure activity was obtained in THA patients, except the intellectual leisure activity.

Conclusions. Our findings suggest that primary THA offers superior clinical outcomes, quality of life, satisfaction, and participation in leisure activity compared with primary TKA in elderly patients.

Key words: THA, TKA, Leisure activity, Quality of life, Elderly patients

INTRODUCTION

Total hip and knee arthroplasty (THA and TKA) are considered to be cost-effective and reliable, enhancing the quality of life and maintaining independence in patients with osteoarthritis (OA) [1]. Hip and knee OA is the major cause of lower extremity disability among elderly adults [2 3]. Previous studies have predicted that approximately 60% of the U.S. population aged ≥ 65 years will have arthritis by 2030 [4]. The conservative treatments for hip and knee OA are effective in the early stages. However, their efficacy gradually declines with disease progression. THA and TKA are considered to be the optimum selections for end-stage hip or knee OA. Both procedures can relieve pain, restore function, and improve the quality of life [5 6]. Consequently, the primary THA and TKA rates have increased, respectively, by 16 and 42% per 100,000 persons between 1991 and 2004 in the UK [7]. Investigators have predicted an increase of as much as 174 and 673%, respectively, for THA and TKA by 2030 [8].

THA and TKA have been used successfully, with higher

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patient satisfaction in the treatment of advanced OA [9]; nevertheless, multiple scholars believe that THA is better than TKA in pain relief and function improvements [10]. Indeed, Ethgen et al. [11] carried out a meta-analysis and demonstrated that although both surgeries are valid in enhancing health-related outcomes, patients treated with THA have a better function than those who received TKA. In addition, Bachmeier et al. [12] reported a better improvement in SF-36 scores (except emotional) and Western Ontario and McMasters University Osteoarthritis Index WOMAC scores for patients who underwent THA than those treated with TKA. Similar results were observed in other studies [13,14]. Liang er al. [15] found no significant differences regard to the improvement Quality of Well-Being Scale between patients undergoing THA and TKA. Ritter et al. [16] found substantial improvement in the quality-of-life after THA and TKA, and no significant difference was found between patients treated with THA and TKA, respectively. These findings indicated that patients treated with THA obtain greater pain relief and functional recovery compared with those receiving TKA, although it was not clear which of these surgeries provides the best quality of life. The previous studies aimed at evaluation the total population, and no work was specifically focused on elderly individuals. Leisure activities are defined as activities different from work or daily life duties, which could bring individuals enjoyment or wellbeing [17]. Leisure activities belong to the top 5 concerns of patients undergoing joint replacement [18]. Patients with end stage OA participate in far less leisure activities [19]. After joint replacement, patients greatly improve their ability to participate in leisure activities, but approximately a quarter of them find these activities difficult to undertake [20,21]. A study revealed that the patient's leisure activity expectations were likely not to be fulfilled one year after TKA [22]. However, leisure activities are rarely included in the assessment of patient outcomes after joint replacement [23]. Little is known about the difference in leisure activity participation between elderly patients treated with THA and TKA, respectively.

To determine the WOMAC scores, SF-12, and satisfaction, we contrasted the therapeutic effect of primary THA with primary TKA in elderly patients after one year. In addition, we compared the patients that received these treatments with regard to participation in leisure activities.

PATIENTS AND METHODS

To explore this research, a large population-based cohort study was conducted at the First Affiliated Hospital of Guangzhou Medical University. OA patients ≥ 65 years, who had undergone primary TKA or THK in the period from January 2013 to March 2015, were eligible to participate in this study. Six orthopedic doctors from the same department implemented the operations. During follow-up (1 year post-operation), patients who had other lower-limb surgery, died, were diagnosed with malignant diseases, had cognitive limitations, or were unable to answer the questionnaires were excluded. The inclusion criteria were met by 374 consecutive patients, while 35 were eliminated, 6 had other lower-limb surgery, 9 had died between the time of surgery and follow-up end (2 from lung cancer, 1 pneumonia patient, 3 myocardial infarction victims, 1 traffic accident victim, 2 unidentified deaths), 4 were diagnosed with malignant diseases, 5 had cognitive limitations and were unable to answer the questionnaires; 11 were lost to follow-up. The study collected 319 effective questionnaires, including 170 and 149 individuals treated with THA and TKA, respectively. This research had approved by the Ethics Committee at the First Affiliated Hospital of Guangzhou Medical University.

Baseline data and preoperative questionnaires were collected from patients 1 week before surgery. The baseline data included age, gender, weight and height (used to figure out body mass index), comorbidity, living status (live alone: yes/no). The preoperative questionnaire included WOMAC, SF-12 and the Self-Administered Comorbidity Questionnaire (SCQ) [24]. One-year postoperative questionnaire surveys were collected by mail, and included WOMAC, SF-12, patient satisfaction, and leisure activity. Data were collected by the same group of surgeons and postgraduates. In order to obtain maximum response rates, we reminded the patients to perform survey after they received the questionnaires.

Pain, stiffness, and functional level assessment

WOMAC score is a 3 domains (pain, stiffness, physical function) index including 24 items [25], and the index were ranged on a numerical scale from none (0), mild (1), moderate (2), severe (3) to extreme (4), which lower score reflected a better state. In orthopedics, raw WOMAC scores are commonly transformed and normalized into a 0 to 100 scale, with 0 to 100 reflecting worst to best state change [26]. The alteration of WOMAC score takes a great part in pre-operational and post-operational evaluation which measured by subtracting the pre-operational WOMAC score from the one obtained 1-year post-operation.

Quality of life assessment

The health-related quality of life was evaluated using the SF-12 questionnaire [27], which consists of 12 questions from eight domains (physical functioning, role

limitation because of physical health problems, bodily pain, general health, vitality, social functioning, role limitation due to emotional problems and mental health) about health-related quality of life. Physical and mental component summary (PCS and MCS) scores of the SF-12 were gathered according to the scores, and higher scores represent a better quality of life. It has been validated for the Chinese population [28].

Satisfaction

The assessment of patient satisfaction used a survey which included three questions: (1) global satisfaction of patients with surgery; (2) patients satisfaction on pain remission; and (3) patients satisfaction about functional improvement. Each answer was graded and categorized as satisfaction (satisfied, very satisfied) and dissatisfaction (neutral, dissatisfied, very dissatisfied) [29].

Leisure activity assessment

To our knowledge, there is no consistent assessment scale to measure leisure activities. Moreover, there are significant differences in leisure activities among various populations due to distinct cultural backgrounds. To select leisure activity items, we used the experience of Hong Kong for elderly people because of the two regions having similar habits and Cultural backgrounds [30]. The leisure activity questionnaire included 4 categories: (1) the intellectual portion comprised reading, web surfing or computer operation, gambling or cardplaying, finance and stock investment, taking part in open forum events or debates, drawing, painting, playing a musical instrument, writing, and doing artwork and crafts; (2) the social category included participating the interest group, involving in voluntary activities, visiting the museum, joining exhibitions, catching various shows, and meeting people; (3) the recreational category was composed of enjoying music, movies, shopping, having pets, cooking, fishing, facial and massage; (4) the physical part comprised running, hiking, practicing Chinese martial arts and Chinese traditional sports, playing ballgames and exercise machines, swimming, and cycling. All leisure activity which participants involved in were summarized. The frequency of participation was recorded as “daily (which got 7 points)” “several days per week (which got 4 points)” “once weekly (which got 1 points)” “occasionally (which got 0 points)” or”never (which got 0 points)”.

Comorbidity assessment

SCQ is a short, easily understood survey which is efficient to assess comorbidity in clinical and health services research [28 36], and can be completed by individuals with no medical background. It includes 13 defined medical problems that might impact functioning and 3 optional non-specified medical problems. For each condition, it was asked whether (1) it was present (yes/no); (2) treatment was received (yes/no); and (3) it imposed functional limitations (yes/no). Every ‘yes’ is given one point. So, the maximum total score was 45 points (the open-ended items used).

Statistical analysis

The results were expressed as means ± SD, and frequencies and percentages were used for better understand. Statistical were analyzed with SPSS software version 17 (SPSS Inc, Chicago, IL). The socio-demographic characteristics of the two groups, gender (men/women), living alone and patient satisfaction were compared using the chi-square test. Differences in age, BMI, SCQ, WOMAC scores, SF-12 scores, leisure activity scores, the difference between WOMAC scores were evaluated by the Student’s t-test. Differences in SF-12 change scores were evaluated by the Mann-Whitney U test. An outcome was considered statistically significant with $P < 0.05$.

RESULTS

Totally, 44 patients (21 THA, 23 TKA) did not answer the questionnaires. The response rates remain 85.90% (149 patients) in the THA and 84.25% (126 patients) in the TKA groups. The demographics and characteristics of patients received presented no significant differences in age, sex, SCQ, BMI, and live alone (Tab. I), and there were no significant different variables between non-responders and the responders.

Pre-operatival WOMAC total scores (all three domains)

Table I. Demographic distributions of the primary total hip and knee arthroplasty.

Joint demographics	Hip	Knee	P-value
Age (mean + SD)	75.38 (6.85)	75.13 (7.57)	0.770
Body mass index (mean + SD)	25.32 (5.52)	25.54 (6.14)	0.745
Female (%)	63.80%	67.10%	0.543
Live alone (%)	20.10%	19.20%	0.836
SCQ (mean + SD)	2.66 (1.47)	2.97 (1.46)	0.081

did not suffer significant differences between the THA and TKA groups. However, significant differences were obtained in postoperative WOMAC total scores as well as in individual domain scores (Tab. II); in addition, patients treated with primary THA presented more effective than those underwent primary TKA in the light of pain relief, joint stiffness, function, and total scores which reflected in WOMAC change scores (Tab. III).

There were no significant differences in preoperative SF-12 scores (PCS, MCS) between both groups. Interestingly, significant differences were obtained in postoperative PCS but not MCS (Tab. II). The PCS change scores were better in the THA group than in TKA treated patients (Tab. III).

The patients who underwent THA obtained higher leisure activity scores ($p < 0.01$) in the social, recreational, and physical categories compared with those treated with TKA, indicating that THA patients had a reduced hindrance to participating in leisure activities, except for the intellectual leisure activity (Tab. IV).

One-year after surgery, the patients treated with THA reported greater global, pain relief, and functional improvement satisfaction than those who underwent TKA (Tab. V).

DISCUSSION

The present research confirmed the capture joint-specific and generic quality of life outcomes, patient satisfaction, and leisure activity scores through reported patient measures. These comprehensive questionnaires allow for assessment of actual differences between primary THA and TKA. We found that elderly patients treated with primary THA had a better outcome and greater improvement in joint-specific and generic quality of life outcomes, patient satisfaction, and leisure activity scores compared with those who underwent primary TKA. A relationship was found between pain or function and part of leisure activity 1-year after joint replacement.

Table II. Comparison of WOMAC and SF-12 between patients who underwent primary THA and TKA.

	THA	TKA	P-value
Preoperative WOMAC (SD)			
Pain	40.07 (17.77)	41.89 (15.34)	0.347
Stiff	39.56 (16.09)	41.05 (16.55)	0.433
Function	41.19 (16.48)	40.87 (15.51)	0.868
Total	40.27 (10.32)	41.27 (8.26)	0.359
Postoperative WOMAC (SD)			
Pain	88.79 (15.40)	84.91 (12.84)	0.020
Stiff	85.42 (13.37)	78.49 (14.73)	< 0.001
Function	85.23 (15.29)	79.90 (14.23)	0.002
Total	86.48 (8.67)	81.10 (7.50)	< 0.001
Preoperative SF-12 (SD)			
PCS	26.09 (6.52)	27.38 (6.08)	0.080
MCS	47.13 (10.61)	47.24 (11.28)	0.934
Postoperative SF-12 (SD)			
PCS	43.01 (6.72)	39.99 (7.63)	< 0.001
MCS	51.86 (10.36)	51.47 (8.93)	0.732

Table III. Improvement in WOMAC and SF-12 of patients who underwent primary THA and TKA.

	THA	TKA	P-value
WOMAC change scores			
Pain	48.72 (16.99)	43.03 (16.34)	0.004
Stiff	45.87 (17.45)	37.44 (15.46)	< 0.001
Function	44.04 (14.77)	39.03 (14.60)	0.004
Total	46.21 (9.74)	39.83 (8.58)	< 0.001
SF-12 change scores			
PCS	17 (12,21.5)	12 (6,18)	< 0.001
MCS	4 (0,9)	4 (-1,8)	0.991

Table IV. Comparison of leisure activities between patients who underwent primary THA and TKA.

Leisure activity	THA	TKA	P-value
Preoperative			
Intellectual	7.11 (3.60)	7.07 (3.46)	0.925
Social	2.01 (1.11)	1.81 (0.89)	0.103
Recreational	4.50(2.16)	4.58 (2.50)	0.772
Physical	6.30 (3.37)	5.58 (3.43)	0.068
Postoperative			
Intellectual	7.12 (3.56)	6.78 (3.25)	0.402
Social	4.79 (1.82)	4.09 (1.49)	< 0.001
Recreational	7.27 (3.00)	6.21 (2.43)	0.001
Physical	9.23 (4.41)	7.21 (3.78)	< 0.001

Table V. Satisfaction for patients who underwent primary THA and TKA.

	THA (n%)	TKA (n%)	P-value
Global satisfaction	91.90%	83.60%	0.028
Pain relief satisfaction	87.20%	77.40%	0.026
Functional improvement satisfaction	90.10%	83.08%	0.032

WOMAC and quality of life

Previous studies have shown that patients can obtain pains decrease and more body flexible after THA and TKA [6 11 31]. In addition, THA resulted in better outcomes and greater satisfaction than TKA [11 14 32]. Fortin et al. [33] found that contrasting with those who underwent TKA, patients who received primary THA treatment have gone more smoothly in SF-36 physical function, WOMAC pain, and WOMAC function outcomes. While this research operated 6 months after surgery, and the results did not reflect the actual differences between THA and TKA on account of clinically hip and knee replacement occurring among 6 to 12 month after survery [34]. Bourne et al. [14] demonstrated that primary THA offered superior outcomes compared to primary TKA on several section, such as the willingness to undergo surgery again, WOMAC change scores, expectations met, and satisfaction. However, assessment of the quality of life was not carried out in this study. In addition, previous studies have included all patient ages; although the subjects averaged between 60 to 70 years old, the findings did not adequately reflect the actual situation of joint replacement in elderly patients. Our research aimed at the age group ≥ 65 years. We demonstrated that elderly patients who underwent primary THA had better WOMAC scores and improved quality of life (SF-12) compared with those treated with primary TKA, except the MCS.

Leisure activity

Taking part in leisure activities is strategic for patients performing joint replacement, but still a quarter of patients after joint replacement cannot perform their valued leisure activities due to joint problems [21], and patients' expectations of leisure activities are not met [22]. Our study demonstrated that patients treated with THA had greater participation in social, recreational, and physical leisure activity categories compared with those who underwent THK at 1-year follow-up. This finding was consistent with previous observations [21]. The social, recreational, and physical leisure activities are closely related to the lower limb joint function and status. Especially, physical leisure activities are closely associated with joint pain and function. We reasonably speculated that patients that underwent primary THA would have better outcomes than those treated with primary TKA: reduced pain, less stiffness, and improved functioning, which allow the THA patients to obtain greater participation in social, recreational, and physical leisure activities compared with individuals that received primary TKA.

Another finding was that there was not much significant difference in intellectual leisure activities. We believe that intellectual leisure activities, which mostly are sedentary (e.g. playing chess), hardly involve lower limb function, joint pain, or joint stiffness. Correlation analysis in this study also confirmed that intellectual leisure activities were not associated with joint status.

Satisfaction

Patients that underwent THA presented a better overall satisfaction (91.90 *versus* 83.60%), pain relief

satisfaction (87.20 *versus* 77.40%), and functional improvement satisfaction (90 *versus* 83%) comparing with those suffering TKA, in agreement with previous findings [14].

Limitations

Several limitations existed remains to be solved. First, the recruited patients had their surgery in academic, first-class ternary hospitals. This may limit the generalizability of the results, especially for those treated in hospitals with different levels of service. However, it has been reported that no significant difference exists in functional outcomes of joint-replacement surgery among different types of hospital [35]. Second, this study was a single-center retrospective study; the sample size needs to be expanded and further validation is required through a prospective multicenter study. Thirdly, the artificial joints used herein were not obtained from the same manufacturer, and different manufacturing settings might affect sample homogeneity.

Almost 13% (44 patients) of all patients recruited have lost to trace, which may introduce a bias that the progression of those patients are often with poor prognosis, in keeping with previous reports [36].

CONCLUSIONS

Overall, this research demonstrated that elderly patients who underwent primary THA seem to have favourable prognosis, quality of life, satisfaction, participation in leisure activity than those treated with primary TKA at 1-year follow-up. Nevertheless, additional work are still necessary in evaluating the potential factors responsible for these differences such as patient, surgical, and implant-related parameters, and assess the factors that prevent elderly patients with joint replacement to participate in leisure activity.

Conflict of Interest

The authors declare no conflict of interest.

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