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Chinese Patients' Satisfaction With Total Hip Arthroplasty: What Is Important and Dissatisfactory?

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ABSTRACT

Through validated self-administered questionnaires, we conducted a retrospective investigation in 818 patients (1009 hips) who underwent primary THA, to collect data on overall satisfaction plus satisfaction and importance rating for 16 specific functions and issues. Overall, 8.1% patients were dissatisfied with the surgery. The top 3 important items are pain relief, squatting, and walking. The top 3 dissatisfactory items are jogging, squatting, and rising after squatting. The strongest risk factors for dissatisfaction with walking were pain (6.1×), muscle weakness(3.7×), and LLD (3.3×). The strongest risk factors for dissatisfaction with squatting were low postoperative HHS ROM (3.7×) and muscle weakness (2.6×). For Chinese patients, ROM, muscle strength and LLD are very important.

Modern total hip arthroplasty (THA) has tremendously ameliorated the prognosis for patients with end-stage hip disease. However, 3.3% to 16.3% patients are still not satisfied with the outcomes currently possible for THA [1–7]. Dissatisfaction is reported to be associated with pain, poor function, and other issues such as leg-length discrepancy (LLD), squeaking, and limitations on range of motion (ROM) [1,8–10].

Patient-centered subjective evaluation is gaining importance in outcome assessment for arthroplasty because of apparent discrepancies between patient- and clinician-oriented outcomes [2,11–15]. After all, it is patients instead of clinicians who are the authority on their quality of life and their perception of medical treatment. Despite the copious reports on patients' general satisfaction level after THA, very few reports focus on patients' rating of postoperative satisfaction regarding specific functions or residual issues. However, without knowing what exactly patients are dissatisfied with, it is difficult to determine the strengths and weaknesses of current THA techniques.

Meanwhile, it has been reported that patients do not lay importance evenly on different functions [16]. Besides, the importance of specific activities perceived by Eastern patients may differ from Western population [16,17]. Because the preferences of Western patients do not necessarily hold for Eastern patients, satisfaction ratings for the former population may not mean the same thing for the latter population.

To determine the current status of THA outcomes as assessed by patients and what further improvements must be made to increase THA satisfaction levels, we asked three major questions: (1) What is the overall level of satisfaction for Chinese patients? (2) How satisfied were our patients regarding each particular function or issue? (3) Which of those functions and issues are more important as perceived by Chinese patients? (4) What are the risk factors for dissatisfaction with the 2 most important functions?

Patients and Methods

With the approval of the institutional review board of our hospital, we conducted a retrospective survey study to answer those three questions. We reviewed the case details for 972 (1199 hips) eligible patients who underwent primary THA between November 2001 and April 2010 in our hospital. The surgeries were conducted by three senior surgeons in our department. Criteria for inclusion were as follows: age >18 years, primary THA, no complications requiring postoperative admission. We excluded patients who underwent revision arthroplasties, those with severe complications warranting a second admission to the hospital, and those without complete addresses for correspondence. We sent every patient a THA satisfaction questionnaire. Six weeks later, we made phone calls to nonrespondents, three times at most on three different days, to remind them to reply to the questionnaire. Patients were counted as lost to the study if they could not be reached or refused to answer the questionnaire. In total, 106 patients (11%) were lost, 7 patients (1%) had died because of diseases irrelevant to THA, and questionnaires for

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41 (4%) were excluded from the final results because of incomplete answers. 818 patients (84%; 1009 hips) for whom complete survey results were available were included.

Of the 818 patients, 627 (76.7%) had a unilateral operation, 167 (20.4%; 334 hips) had simultaneous bilateral operations, and 24 (2.9%; 48 hips) had staged bilateral operations. 803 (98.2%, 991 hips) received posterior lateral approaches, 13 (1.6%, 18 hips) had direct lateral approaches, and 1 (0.1%, 2 hips) had anterior–lateral approach. All patients were treated with non-cement prostheses. Among the 1009 hips, bearing surfaces were as follows: 517 (51.2%), ceramic-on-ceramic; 302 (29.9%), metal-on-polyethylene; 165 (16.4%), ceramic-on-polyethylene; and 25 (2.5%), metal-on-metal. Among that same group of hips, 526 (52.1%) had no other symptomatic or successfully reconstructed joints (Charnley type A), 412 (40.8%) had a symptomatic contralateral hip at the time of surgery (Charnley type B), and 71 (7.0%) had symptomatic knee joints in addition to a symptomatic contralateral hip (Charnley type C).

Preoperative and postoperative information was collected by the registry center in our hospital. The enrolled cohort had an average age of 53.3 ± 13.1 years (range, 19–89 years) and a mean duration of follow-up of 4.9 ± 2.2 years (range, 2–10 years). Of the entire cohort, 412 (50.4%) were women and 406 (49.6%) were men, and they had a mean body mass index (BMI) of 24.8 ± 3.7 kg/m^2 (range 14.8–37.7 kg/m^2). 627 patients (627hips, 62.1%) undertook a unilateral surgery, and 191 patients (382hips, 37.9%) had bilateral arthroplasties. 331 patients (430 hips, 42.6%) were under gainful employment. Diagnoses indicating a need for surgery were as follows: primary osteoarthritis in 203 (20.1%) hips, avascular necrosis of the femoral head in 432 (42.8%), nonunion after femoral neck fracture in 70 (6.9%), developmental dysplasia of the hip in 208 (20.5%), postinfectious arthritis in 31 (3.1%), and inflammatory arthritis in 65 (6.4%; ankylosis spondylitis in 46 and rheumatoid arthritis in 19).

We constructed and validated the satisfaction questionnaire with a pretrial survey. 50 patients were asked at 1 year after their operations to rate their satisfaction regarding 25 functions or residual symptoms. The final questionnaire included only 16 functions and residual symptoms. The other 9 were excluded because less than 50% patients said that they had taken part in the activity or experienced the symptom in the preceding 6 months: riding a bicycle, climbing into a bathtub, climbing mountains, jumping, swimming, returning to work, engaging in sexual intercourse, depression, and gardening.

The final version of the questionnaire includes three major parts (Appendix 1):

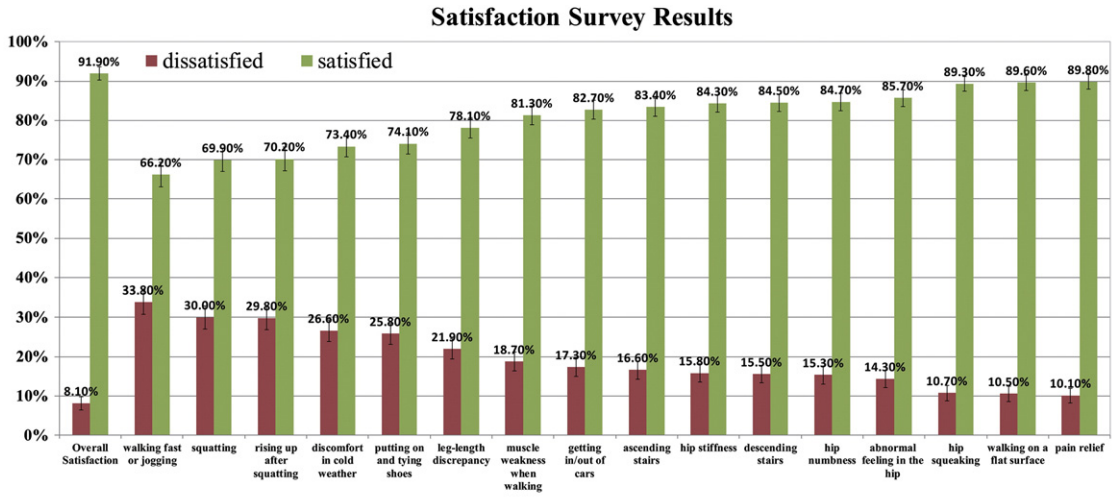
1. General satisfaction level after THA
2. Satisfaction level for 16 subordinate items: pain relief, walking on a flat surface, ascending stairs, descending stairs, getting in/out of cars, squatting, rising after squatting, putting on and tying shoes, walking fast or jogging, LLD, hip squeaking, hip stiffness, abnormal feeling in the hip, muscle weakness when walking, hip numbness, and discomfort in cold weather
3. Ranking the top 5 important functions or issues among the 16 items, with "important" being defined as what patients are currently most concerned with

For each question, patients were asked to designate their level of satisfaction: very dissatisfied, dissatisfied, neutral, satisfied, or very satisfied. Then a two-category satisfaction outcome was determined for each question by combining patients who answered "very dissatisfied," "dissatisfied," or "neutral" into the "dissatisfied" group and combining those who answered "satisfied" or "very satisfied" into the "satisfied" group [5,18]. These two categories were used for all statistical analysis.

To examine the test–retest reliability, 56 randomly selected patients were mailed the questionnaire again 4 weeks later, and 50 patients returned complete answers. To measure internal consistency of the questionnaire, Cronbach's alpha (α) and split-half coefficient were calculated based on all the satisfaction items.

The preoperative HHS (Harris Hip Score) values were recorded by physicians and their full-time assistants in our hospital. During following up, HHS values were obtained at 3 months, 6 months, 1 year, and then every 3 years. The HHS values were collected in the following categories [19,20]: pain, function, deformity, range of motion, and total. Comparison of the average HHS values showed no significant difference in preoperative HHS scores between satisfied and dissatisfied groups (50.2 ± 17.9 vs. 52.9 ± 16.5), but dissatisfied patients had significantly lower postoperative HHS scores (76.6 ± 16.2 vs. 89.2 ± 9.3) and less improvement from preoperative scores (26.4 ± 24.1 vs. 36.3 ± 18.2) than satisfied patients did.

We ranked functions and symptoms in descending order by dissatisfaction level (Fig. 1) and importance percentage order (Fig. 2), respectively. We then created a scattergram to clearly show the interrelationship between dissatisfaction and importance (Fig. 3). Furthermore, in order to find out the risk factors for dissatisfaction



Dissatisfied group	8.1%	33.8%	30.0%	29.8%	26.6%	25.8%	21.9%	18.7%	17.3%	16.6%	15.8%	15.5%	15.3%	14.3%	10.7%	10.5%	10.1%
Satisfied group	91.9%	66.2%	69.9%	70.2%	73.4%	74.1%	78.1%	81.3%	82.7%	83.4%	84.3%	84.5%	84.7%	85.7%	89.3%	89.6%	89.8%

Fig. 1. Results of satisfaction survey. Specific functions or issues are arranged in ascending order by percentage of patients satisfied with each item.

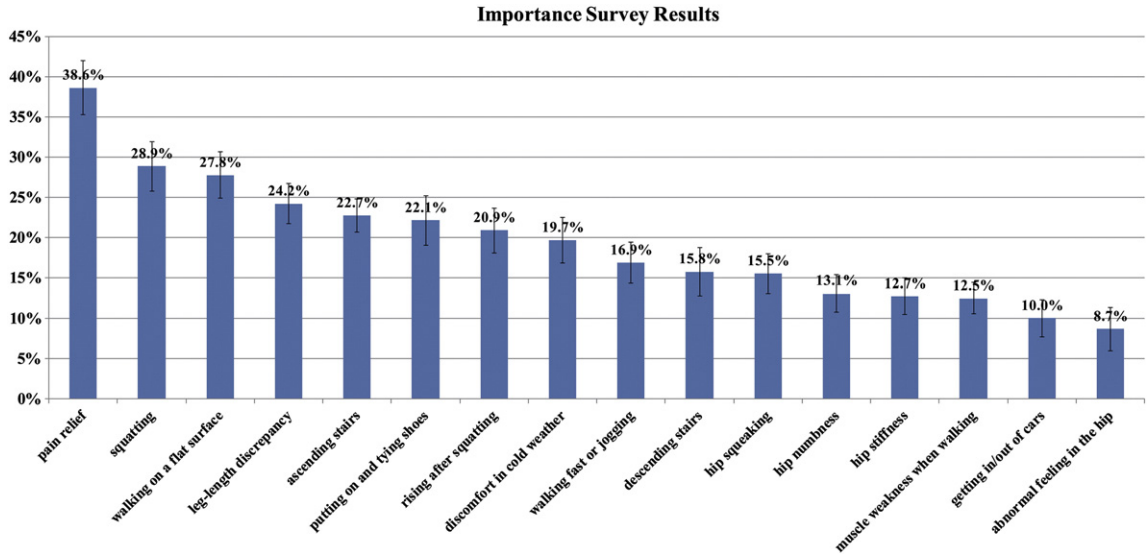


Fig. 2. Results of importance survey. Items are arranged in descending order by percentage of patients considering each item important.

regarding the top 2 important functions, one factor analysis was conducted for the preoperative, intraoperative and postoperative factors by dividing all the patients into either a "satisfied" (people who answered "satisfied" or "very satisfied") group or a "dissatisfied" (people who answered "very dissatisfied" ,"dissatisfied" or "neutral") group, according to the satisfaction levels of the functions [18]. Categorical variables (gender, affected side of the body, employment, primary diagnosis, bearing surfaces, femoral head diameter, and charnley classification) were analyzed by cross-tabulation using the chi-square test (Table 1). Scale variables (age, BMI, preoperative and postoperative HHS values) were analyzed with the Wilcoxon non-parameter test (Table 1).

Forward stepwise logistic regression was performed to reveal the risk factors for dissatisfaction with the top 2 important functions. According to the univariate analysis, factors with significant difference among the major variables (age, gender, diagnosis of DDH, unilaterally replaced, insurance coverage, preoperative and postoperative HHS scores, dissatisfaction with residue symptoms, Charnley classification, bearing surfaces, and head diameter) were introduced into the 2 regression models, respectively (Table 2). Before inclusion, variables were tested for interdependence through correlations and those highly correlated (postoperative HHS score of pain, dissatisfaction with hip stiffness) were excluded from both the 2 regression models. Odds ratios were reported for significant variables (Table 2). All statistical analysis was done using SPSS software (version 15.0; IBM, Armonk, NY, USA), and p values of <0.05 were considered significant.

Results

Of the 818 patients, 91.9% patients (representing 928 hips) were generally satisfied with THA; 64.8% of those (654 hips) were very satisfied and 27.2% (274 hips) were satisfied. Of the rest, 8.1% patients (representing 81 hips) were dissatisfied with surgery; 5.4% of those (54 hips) were neutral, 1.9% (19 hips) were dissatisfied, and 0.8% (8 hips) were very dissatisfied. The satisfaction percentage for each of the 16 items ranged from 66.2% to 89.8% (Fig. 1).

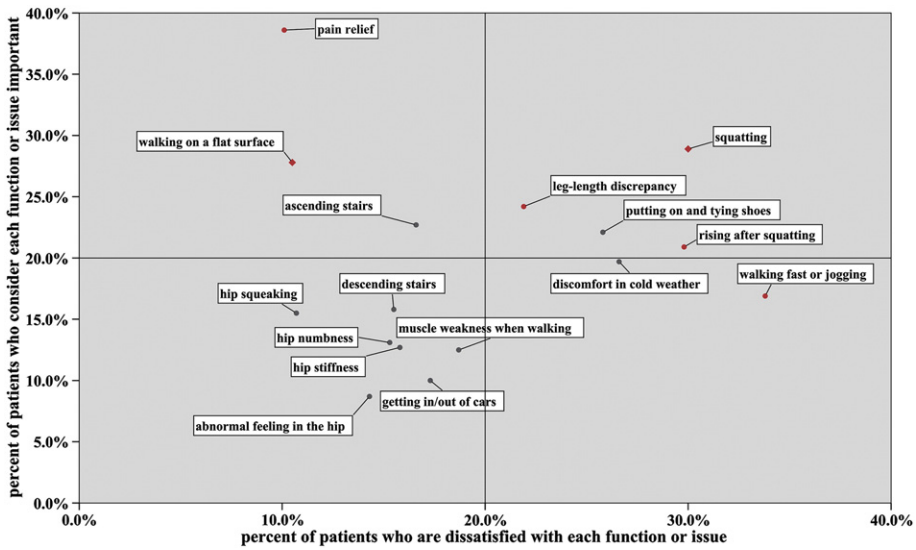


Fig. 3. Scattergram of percentages of dissatisfaction and importance for each function or issue as evaluated by patients.

Table 1
Comparisons Between Groups Satisfied and Dissatisfied With the Top 2 Important Functions.

Variable	Walking on a Flat Surface			Squatting		
	Dissatisfied	Satisfied	*P* Value	Dissatisfied	Satisfied	*P* Value
Age	53.7 ± 14.4	52.6 ± 12.9	0.305	54.7 ± 13.8	51.4 ± 12.6	0.000
Female gender	53.8%	46.4%	0.153	59.6%	41.0%	0.000
Diagnosed as DDH	31.1%	19.7%	0.006	27.7%	18.0%	0.001
Unilaterally replaced	61.3%	62.2%	0.856	61.1%	61.8%	0.819
Posterior lateral approach	97.2%	98.3%	0.425	97.2%	98.8%	0.079
Covered by insurance						
>70%	7.5%	7.6%		5.3%	8.7%	
30%–70%	70.8%	70.8%		69.1%	71.5%	
<30%	21.7%	21.6%	1.000	25.6%	19.8%	0.039
Preoperative HHS value						
Pain	24.4 ± 10.0	24.1 ± 9.9	0.858	24.0 ± 9.6	24.1 ± 10.1	0.867
Limp	3.0 ± 3.6	3.5 ± 4.1	0.208	3.4 ± 3.8	3.5 ± 4.2	0.931
Walking support	5.4 ± 4.2	6.8 ± 4.4	0.001	6.5 ± 4.3	6.7 ± 4.4	0.704
Distance walked	3.9 ± 2.3	4.5 ± 2.6	0.017	4.2 ± 2.4	4.6 ± 2.6	0.047
Deformity	3.5 ± 1.4	3.5 ± 1.3	0.815	3.3 ± 1.5	3.5 ± 1.3	0.072
ROM	2.0 ± 1.5	1.9 ± 1.3	0.799	1.7 ± 1.3	2.0 ± 1.4	0.009
Postoperative HHS value						
Pain	38.2 ± 7.9	42.0 ± 2.6	0.000	40.5 ± 5.7	42.1 ± 2.5	0.000
Limp	7.6 ± 2.9	9.5 ± 1.9	0.000	8.6 ± 2.6	9.5 ± 1.9	0.000
Walking support	7.7 ± 3.4	9.3 ± 2.9	0.000	8.5 ± 3.3	9.4 ± 2.8	0.000
Distance walked	8.0 ± 3.2	8.4 ± 2.8	0.349	7.7 ± 3.1	8.6 ± 2.7	0.000
Deformity	2.6 ± 1.9	3.7 ± 1.1	0.000	3.1 ± 1.7	3.8 ± 1.0	0.000
ROM	4.0 ± 0.9	4.2 ± 0.9	0.143	3.5 ± 0.8	4.4 ± 0.7	0.000
Dissatisfaction with residue issues						
Pain	46.1%	6.0%	0.000	17.9%	6.5%	0.000
LLD	61.8%	17.4%	0.000	35.1%	16.2%	0.000
Hip stiffness	57.1%	10.9%	0.000	35.7%	8.4%	0.000
Hip squeaking	30.5%	8.4%	0.000	16.8%	8.9%	0.000
Muscle weakness in walking	58.5%	13.9%	0.000	34.0%	11.6%	0.000
Charnley classification						
A	51.9%	52.1%		48.8%	52.9%	
B	35.8%	41.6%		38.9%	42.4%	
C	12.3%	6.3%	0.062	12.3%	4.7%	0.000
Femoral head diameter						
≤28 mm	10.8%	89.2%		84.4%	74.5%	
≥32 mm	9.1%	90.9%	0.476	15.6%	25.5%	0.001

Continuous variables are expressed as mean ± SD; $P < 0.05$ is considered significant.
DDH = Developmental Dysplasia of the Hip; ROM = Range of Motion; LLD = Leg Length Discrepancy; HHS = Harris Hip Score.

The top 3 important functions or issues were pain relief, squatting and walking on a flat surface (Fig. 2).

The top 3 dissatisfactory items were walking fast or jogging, squatting and rising after squatting (Fig 1).

The univariate comparison between patients satisfied and dissatisfied with "walking on a flat surface" revealed that, compared with satisfied patients, the dissatisfied group had more patients diagnosed as DDH (31.1% vs. 19.7%), lower preoperative HHS scores in walking support (5.4 vs. 6.8) and distance walked (3.9 vs. 4.5), lower postoperative HHS scores in pain (38.2 vs. 42.0), limp (7.6 vs. 9.5), walking support (7.7 vs. 9.3) and deformity (2.9 vs. 3.9), and higher dissatisfaction with residue symptoms of pain (46.1% vs. 6.0%), LLD (61.8% vs. 17.4%), hip stiffness (57.1% vs. 17.4%), squeaking (30.5% vs. 8.4%) and muscle weakness (58.5% vs. 13.9%) (Table 1). In the regression model of walking, significant risk factors were low preoperative HHS of walking support, low postoperative HHS of deformity and walking support, and dissatisfaction with pain relief, muscle weakness, and leg length discrepancy. The strongest risk factors were dissatisfaction with pain relief (6.1×), muscle weakness (3.7×), and leg length discrepancy (3.3×) (Table 2). The univariate comparison between patients satisfied and dissatisfied with "squatting" revealed that the dissatisfied group was older (54.7 years vs. 51.4 years), had more female patients (59.6% vs. 41.0%), higher unemployment rate (66.7% vs. 51.6%), higher proportion of DDH (27.7% vs. 18.0%), lower preoperative HHS scores in ROM (1.7 vs. 2.0) and distance walked (4.2 vs. 4.6), lower postoperative HHS scores in pain (40.5 vs. 42.1), limp (8.6 vs. 9.5), walking support (8.5 vs. 9.4), distance walked (7.7 vs. 8.6), deformity (3.1 vs. 3.8) and ROM (3.5 vs. 4.4), and higher dissatisfaction with residue symptoms of pain (17.9% vs. 6.5%), LLD (35.1% vs. 16.2%), hip stiffness (35.7% vs. 8.4%), squeaking (16.8% vs. 8.9%) and muscle weakness (34.0% vs. 11.6%),

Table 2
Odds Ratios for Risk Factors Obtained Through Logistic Regressions of the Top 2 Important Functions.

Variable	Functions	
	Walking on a Flat Surface	Squatting
Age	/[*]	–[#]
Female gender	/	1.96
Diagnosed as DDH	–	–
Dissatisfaction with pain relief	6.10	2.02
Dissatisfaction with LLD	3.28	–
Dissatisfaction with Hip squeaking	–	–
Dissatisfaction with Muscle weakness in walking	3.70	2.57
Femoral head diameter ≤28 mm	–	1.65
Low preoperative HHS walking support	1.07	/
Low preoperative HHS distance walked	–	–
Low preoperative HHS ROM	/	–
Low postoperative HHS limp	–	–
Low postoperative HHS walking support	1.12	–
Low postoperative HHS distance walked	/	1.09
Low postoperative HHS deformity	1.30	1.40
Low postoperative HHS ROM	/	3.72

[*] Variables non-significant in univariate analysis were not introduced in the regression model.
[#] Odds ratios for variables that were non-significant ($P > 0.05$) are not reported.

Table 3
Comparison of Reported Satisfaction Percentages After Primary Total Hip Arthroplasty.

Author	N	Duration of Follow-Up (Years)	Satisfaction Rate (%)
Hossain et al [3]	448	5	96.7
Brokelman et al [2]	193	6	83.7
Anakwe et al [1]	850	1	93.0
Hamilton et al [4]	1410	4–6	91.0
Bourne et al [5]	1280	1	89.0
Mahomed et al [6]	843	1	96.6
Mariconda et al [7]	250	11–23	96.0
Current study	1009	2–10	92.0

more patients of Charnley type C(12.3% vs. 4.7%), and more femoral heads ≤28 mm (15.6% vs. 25.5%), compared with satisfied patients (Table 1). In the regression model of squatting, significant risk factors were female gender, femoral head ≤28 mm, low postoperative HHS in ROM, deformity and distance walked, and dissatisfaction with pain relief and muscle weakness. The strongest risk factors were a low postoperative HHS ROM score (3.7×), muscle weakness (2.6×), pain relief (2.0×), female gender (2.0×), and femoral head ≤28 mm (1.6×) (Table 2).

The test–retest stability values of the 17 items range from 0.736 to 0.921. The Cronbach's alpha (α) of the whole 17 items is 0.946, and split-half coefficient is 0.856.

Discussion

Overall Satisfaction

Our investigation revealed that the postoperative satisfaction rate of Chinese patients for THA is 91.9%, with 64.8% being very satisfied and 27.2% being satisfied. Our findings are comparable with those already published for Western patients (Table 3). Patients' rating of their satisfaction varied a lot for specific items, ranging from 66.2% to 89.8% (Fig. 1). However, patients attached varying importance to each function or issue, so all items should not be considered with the same emphasis (Fig. 2). In addition, certain risk factors (poor postoperative HHS values, dissatisfaction with pain relief, muscle strength and LLD) are associated with dissatisfactory functions of squatting and walking. To our knowledge, our study is the first one focused on both patient-perceived satisfaction and patient-ranked importance of specific functions or issues after THA.

Pain Relief

Ranking first regarding both satisfaction and importance (Fig. 3), pain relief is reckoned as the most satisfactory outcome of THA and also considered the most important issue by Chinese patients. This shows that modern THA is clearly successful at relieving pain: 89.8% of our patients were satisfied. However, 10.1% of our patients were still dissatisfied with their level of postoperative pain. Bourne et al also reported that 9.4% their patients were dissatisfied with postoperative pain when walking, 16.5% with pain when climbing stairs, and 8.9% with pain when lying or sitting [5]. Anakwe et al [1] have shown that pain relief is directly associated with general satisfaction. Besides, as shown in our two regression models, pain was the strongest risk factor for dissatisfaction with walking (6.1× greater risk), and also dissatisfaction with squatting (2.0× greater risk), which were the top 2 important functions (Table 2). Since a painless hip is the very base for good function, our data suggest surgeons should spare no effort to relieve pain in order to lay down a foundation for overall satisfaction, and that there is still a long road ahead to radical elimination of pain.

Squatting

To our surprise, squatting ranked second most importance among all items, and the most important function, even higher than function of walking (Fig. 2). Nearly a third (29.8%) of all patients were dissatisfied with squatting. Previous research has shown that the ability to perform activity of squatting is related to ROM [21,22]. Our work of logistic regression confirmed that the strongest risk factor for a dissatisfactory function of squatting was a low postoperative HHS ROM value (3.7× greater risk), and femoral head diameter ≤28 mm (1.6× greater risk) also heralded the dissatisfaction with squatting (Table 2). Koyanagi et al [23] found that the mean maximum ROM for in vivo hip flexion after arthroplasty was 86.2° (range, 55.1°–117.4°). However, numerous studies have shown that hip flexion of >120° is required for squatting [22,24,25]. Our data reveal that Chinese persons place such a high value on an extended ROM of the hips, which may be due to the prevalence of high-flexion postures in Asian cultures [24,26], as many Asians squat when eating, resting, or toileting. Therefore, for Chinese patients, the goal for ROM should be further improved, instead of being limited to that required for walking and climbing stairs, as it is for Western populations [27,28].

Walking

Our patients ranked the basic functions of walking on a flat surface the third most important (Fig. 2), and reported satisfaction rates as 89.6% (Fig. 1). As revealed by the regression model of walking, the strongest risk factors for dissatisfaction with walking were with pain relief (6.1 × greater risk), muscle weakness when walking (3.7 × greater risk), and leg length discrepancy (3.3 × greater risk) (Table 2). Our survey indicated that although the function of walking ranked the 2nd most satisfactory item and 2nd most important function (Fig 3), there was still 1 in 10 (10.4%) patients discontented with his or her walking activity. The strongest risk factor was pain (6.1 × greater risk), which is consistent with Bourne's report that the dissatisfaction with pain in walking after primary THA was 9.4% [5]. As reported previously, inadequate muscle strength was associated with slowed walking speed, and abnormal gait, leading to restricted function of walking. Our findings indicate that it is prerequisite to wipe out pain, to equalize the lower extremities and to strengthen muscles before normal walking abilities can be restored.

Jogging and Rising After Squatting

The two functions of jogging and rising after squatting fell into the top 3 dissatisfactory items: (Fig. 3). We were surprised to find that dissatisfaction regarding walking fast or jogging (33.8%) was greater than for all other functions, and as many as 29.8% patients were dissatisfied with rising after squatting. Compared with walking and squatting jogging and rising after squatting require greater muscle strength [29,30] and are components of an active lifestyle. Therefore, for Chinese patients, additional muscle strength is necessary so that they can engage in activities more demanding than walking and climbing stairs.

Leg Length Discrepancy

More than a fifth of patients (22.0%) felt dissatisfied about postoperative LLD in their cases. Furthermore, LLD ranked fourth in importance among all factors. The importance and prevalence of LLD have been established in the literature, and our data confirmed this point [8,31,32]. As Konyves and Bannister [8] reported, the proportion of existing anatomical discrepancy (56%) is still larger than the percentage of patients who perceived it (33%). Therefore, a dissatisfaction rate of 22.0% actually represents a much larger proportion of patients with true anatomical inequality. In addition, the regression

model of walking revealed that discontent with LLD was a significant risk factor for dissatisfaction regarding walking on a flat surface (3.3 × greater risk). This finding is consistent with previous reports that leg length discrepancy was associated with limp, pain, and worse functional outcomes [33,34]. Our data suggest that LLD played an important role in achieving Chinese patients' satisfaction.

Other issues addressed in our study were rated as producing relatively high dissatisfaction levels but low importance: numbness, descending stairs, abnormal feeling in the hip, getting in and out of cars, squeaking, and stiffness, meaning that THA produces quite good results in those aspects. However, because the dissatisfaction rates ranged between 10.7% and 33.8%, surgeons should still make an effort to avoid producing symptoms such as numbness, squeaking, and discomfort in cold weather and to improve patients' ability to descend stairs.

Our study had several limitations. First, 84.2% patients were successfully monitored, but we believe that this response rate is acceptable and relatively high when compared with rates reported in other studies, including patients from both urban and rural areas, of different ages, and those given prostheses of different designs. Second, this survey was conducted retrospectively, so patients' preoperative expectations may be quite different from their postoperative experience. Besides, since all patients were investigated at a minimum of 2 years of follow up, the outcome cannot reflect the dynamic change of patients' expectations without short term data. However, as previously reported by many studies, the satisfaction levels of THA were still comparable although the follow up length varied greatly (Table 3). Third, the THA satisfaction questionnaire was newly created for outcome measurement, with no previous reports. Nevertheless, according to our pretrial survey, the test–retest reliability (0.736–0.921), the Cronbach's alpha ($\alpha = 0.946$), and the split-half coefficient (0.856) show that the internal consistency and test–retest reliability of this questionnaire are acceptable. In addition, our survey did not investigate the influence of psychological factors on subjective evaluation, but we note that patients' psychological status could affect their appraisal of their surgery.

Current THA techniques produce high levels of satisfaction in Chinese patients, but still warrant improvements. The top 3 important items are pain relief, squatting, and walking on a flat surface. Pain relief is the very foundation for patients' satisfaction, and can now be anticipated in a majority of patients. Our work helped identify the risk factors for dissatisfaction regarding the top 2 important functions, indicating that postoperative ROM, muscle strength, and LLD are very important for Chinese patients to improve their satisfaction level.

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