

## PHYSICAL FUNCTIONING AND HEALTH-RELATED QUALITY OF LIFE: BEFORE AND AFTER TOTAL HIP REPLACEMENT

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Total hip replacement (THR) is a commonly adopted procedure for arthritis-related diseases. Although the THR efficacy in pain relief and restoration of physical functioning has been extensively studied, it remains unclear how health-related quality of life is affected by THR. The major purpose of this study was to examine and compare the differences in physical functioning and health-related quality of life for THR patients before and after operations. Based on a prospective study design, 46 THR patients at one medical center were reviewed and followed up (six months after operations) during the period from March 1997 to June 1998, with a follow-up rate of 88%. The THR subjects were interviewed and measured by the Modified Harris Hip Scale and the Chinese-version Short-form 36-item Health Survey (SF-36). Patient characteristics and the information related to procedures were derived from chart review. The results indicated that the THR patients had statistically significant improvements in physical functioning and health-related quality of life. In terms of the Harris Score, the mean Harris score was 91.6 (SD=10.7) 6 months after THR, as compared to 45.2 (SD=17.3) before THR. The eight ratings in the SF-36 measures were also statistically significantly improved ( $p < 0.001$ ). Specifically, "role limitations due to physical functioning" demonstrated dramatic improvements after THR (15.2 vs. 63.5), followed by "role limitations due to emotional problems" (25.4 vs. 85.5). The findings confirm the effectiveness of THR outcomes in terms of physical functioning, pain relief, and health-related quality of life, which can be revealed by disease-specific (Harris Scale) and generic health measures (SF-36).

**Key words:** total hip replacement (THR), SF-36, health-related quality of life (HRQOL)

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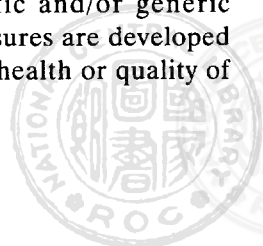
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The application of health-related quality-of-life (HRQOL) instruments to clinical studies and health outcomes evaluation has gained in recognition over the past decade [1-3]. Health-related quality of life is a multidimensional concept, which is comprised of many domains of objective and subjective measures, such as physical functioning, psychological well-being, social functioning, and life satisfaction [4]. The HRQOL can be evaluated by disease-specific and/or generic measures. Disease-specific measures are developed to detect progressive changes in health or quality of



life after interventions. Therefore, disease-specific measurement instruments are commonly administered in longitudinal studies or clinical trials to measure patients' improvement after treatment or operation, especially focusing on activity functioning and pain relief [5-8]. On the other hand, generic instruments are designed for applications across a wide range of diseases or conditions, and thus are usually adopted by health service researchers to obtain an overall evaluation of health status [9-12].

Today, total hip replacement (THR) has become a widely adopted procedure by orthopaedists for patients suffering rheumatoid arthritis (RA), osteoarthritis (OA), avascular necrosis (AVN), or fracture [13-15]. The number of discharged patients undergoing total hip replacement increased by 90% from 1980 to 1987 in the United States [16]. During the same period, however, there was a 10% decrease in the total number of discharges. In Taiwan, the Kaohsiung-Pingtung Branch of the Bureau of National Health Insurance reported 558 primary THR procedures performed in 1996, and 776 cases in 1997, with a rate of increase of 40% [17].

A successful total hip replacement can help relieve patients from pain suffering and restore patients' mobility, especially when analgesics are no longer in use. However, the primary aim of total hip replacement is not only to extend individuals' longevity, but also to enhance quality of their remaining life. Most of the THR outcome study in Taiwan limited their measurements in the area of pain relief and physical functioning. [18-20]. Therefore, the present study is intended to measure THR outcomes in terms of improvements in physical functioning and other dimensions of health-related quality of life. Specifically, the purpose of this study was to examine the changes in physical functioning and health-related quality of life for patients undergoing total hip replacement.

## MATERIALS AND METHODS

### Study design and sample

To evaluate the outcomes of THR, a prospective study was designed for data collection. From March 1997 to June 1998, all patients receiving primary THR procedures by one orthopaedist at one medical center in southern Taiwan were eligible for sample selection. The THR cases caused by traffic accidents and the mute patients were excluded from data collection.

### Outcome assessments of THR: disease-specific and generic measures

Two approaches of THR outcome assessment were adopted for the study, which included two measurement instruments: the Modified Harris Hip Scale (disease-specific measure) and the Chinese-version of Medical Outcomes Study (MOS) 36 Short-form Health Survey (SF-36) (generic measure).

The Harris Hip Scale has been successfully used for the evaluation of physical functioning on clinical sites in Taiwan and other nations [18, 19, 21, 22]. It was initially developed for the evaluation of pain levels, function (gait and activity), deformity, and range of motion for patients with a traumatic disorder of the hip. For now, it is commonly used as a follow-up instrument to measure physical functioning of patients who have operations on account of degenerative disorder of the hip [21, 23]. A total score from 0 to 100 and five sub-scale scores (pain 0-44, physical function 0-46, deformity 0-5, and range of motion 0-5) are generated by the Harris scale. In total, the highest possible score is 100 points for patients feeling no pains or no difficulty in mobility; a score of 70 points or below indicates poor functioning [24]. However, it has been argued that the Harris Hip Scale could not exclusively reflect HRQOL for THR patients [21, 22]. In this regard, a supplemental instrument is used in this study, that is, the SF-36.

The SF-36 has been proven to be a valid and reliable instrument in evaluating health status of patients and is used widely by clinicians and surgeons [25-27]. The SF-36 measures eight dimensions of health, which include physical functioning (PF); role limitations due to physical health problem (RP); bodily pain (BP); vitality (energy/fatigue) (VT); general health perceptions (GH); social functioning (SF); role limitations due to emotional problems (RE); and general mental health (i.e. psychological distress and psychological well-being) (MH) [28]. The assessment result of each domain of the SF-36 was transformed to a single score (0 to 100). The higher the SF-score was, the better health-related quality of life implied. Usually, it takes less than 15 minutes to complete all 36 items, which makes the SF-36 practical in clinical settings [29, 30].

For the present study, the Modified Harris Hip Scale was performed by one orthopaedist before surgery; meanwhile, one trained interviewer conducted the measurement of the SF-36 Health Survey [28]. Six months after the THR operation, the same orthopaedist examined the X-ray transcript and conducted the second Harris Scale evaluation. Similarly, the same reviewer administered the second assessment of the SF-36. The strength of maintaining the same orthopaedist and the reviewer to administer the measure-

ments is assumed to control for rater reliability. However, potential systematic errors are also possible. Fortunately, the internal consistency of the Harris Scale and the SF-36 is well established, which can help with the best possibility of measurement reliability.

#### Chart review and statistical analysis

In addition to the information derived from the two measurement tools, one certified specialist in medical records extracted medical information from medical charts of the sampled THR patients. The major purpose of chart review was to collect the information relating to THR outcomes, which included primary diagnosis, secondary diagnosis, length of stay, prosthesis type and brand of prosthesis, duration of surgery, and type of anesthesia. The collected information was first analyzed for the distributions of patient characteristics and operation-related information. The changes in health-related quality of life (i.e. before vs. after operation) were examined and compared by Wilcoxon signed ranks test and paired-samples t-test for any significant difference.

## RESULTS

#### Patients characteristics

At baseline, 52 THR cases were collected for the data analysis. By the end of December 1998, a six-month follow-up was successfully completed on 46 patients, with a follow-up rate of 88%. Among the follow-up sample, 5 patients received bilateral total hip replacements; in these cases, only the latest THR operations were analyzed. The lost cases for follow up included: three cases who refused to return for follow-up visits; two of them lost contact, and one who was

re-hospitalized because of surgical complications.

Table 1 lists the characteristics of the 46 THR patients. The subjects included twenty-five men and twenty-one women; their mean age was 52 (SD=17), ranging from 16 to 79 years old. Most THR patients were Taiwanese (89.1%) and married (67.4%). Around 70% of the subjects had finished elementary school.

The principal diagnoses for the study sample were OA and AVN, representing 41.3% and 39.1%, respectively (Table 2). The mean operation time was 135.8 minutes (SD=33.7). The average length of stay was 9.9 days (SD=3.1). On average, each patient had 1.5 secondary diagnosis (SD=1.23). The average duration of disease for most of the THR patients was 36 months. The majority of the patients used Harris-Galante hip prosthesis (Zimmer)(52.2%), followed by AML hip prosthesis (Depuy) (34.8%) and Omnifit hip prosthesis (Ostentec) (13%).

#### Changes in physical functioning

As compared to a relatively low score of 45.2 (SD=17.3) before THR, the mean Harris score was 91.6 (SD=10.7) 6 months after operation, with an improvement rate of 103% (Table 3). Such difference in the total Harris score indicated a statistically significant improvement in overall physical functioning after THR. According to the results of t-test, furthermore, statistically significant improvements were found in each domain of the Modified Harris Hip Scale after operation ( $p<0.001$ ). Specifically, the area of pain relief had the most improvement (137%), followed by the gait function (112%). The least improved domain was deformity, with an improvement rate of 32%.

#### Changes in health related quality of life

The mean score for each dimension of the SF-36

Table 1. Selected patient characteristics (n=46)

Variable	No. of cases	%
Gender	Man	25
	Woman	21
Ethnicity	Taiwanese	41
	Others	5
Age	Under 40	14
	41-64	18
	65 and over	14
Marital status	Married	31
	Others	15
Education	Illiterate	7
	Elementary or junior	28
	Senior high or more	11

Table 2. Selected procedure-related descriptive statistics (n=46)

Variable	No. of cases	Mean $\pm$ S.D %
Diagnosis		
Avascular necrosis	18	39.1
Osteoarthritis	19	41.3
Rheumatoid arthritis	3	6.5
Others	6	13.0
Type of prosthesis		
AML hip prosthesis (Depuy)	16	34.8
Harris-Galante hip prosthesis (Zimmer)	24	52.2
Omnifit hip prosthesis (Ostenic)	6	13.0
Type of anesthesia		
Epidural	37	80.4
General anesthesia	9	19.6
Operation time (minutes)	-	135.8 $\pm$ 33.7
Average length of stay (days)	-	9.9 $\pm$ 3.1
No. of secondary diagnosis	-	1.52 $\pm$ 1.23
Duration of disease (months)	-	36.0*

\*median

Table 3. Comparison of physical functioning: the Harris score before and after THR (n=46)

Category	Mean score (S.D)		Improvement rate	t-value
	Before THR	After THR		
Pain	17.2 (8.9)	40.5 (5.1)	137%	14.78***
Function				
A. Gait	13.3 (8.0)	28.2 (4.8)	112%	11.82***
B. Activity	6.5 (2.7)	11.0 (2.4)	69%	10.68***
Deformity	3.8 (1.3)	5.0 (0.0)	32%	5.95***
Range of motion	2.8 (1.4)	4.9 (0.8)	75%	9.65***
Total score	45.2 (17.3)	91.6 (10.7)	103%	15.75***

\*\*\*P&lt;0.001

(before and after operation) is presented in Table 4. Each dimension of HRQOL showed a statistically significant improvement ( $p<0.001$ ). Role limitations due to physical functioning (RP) demonstrated the most significant improvement; the mean score was 15.2 (SD=25.5) before THR as compared to 63.5 (SD=37.8) after THR, with an improvement rate of 317%. The mean scores for role limitations due to emotional problems (RE) had been changed from 25.4 to 85.5 after operation, which made RE as second most improved dimension, with an improvement rate of 236%. The least improved dimension of the SF-36 was vitality, with an improvement rate of 8%.

## DISCUSSION

Based on the assessments of the Modified Harris Hip Scale and the SF-36, the current study provides empirical findings to confirm the efficacy of THR in pain relief and restoration of physical functioning. More important, the health-related quality of life is also improved for the patients after THR.

According to standard guidelines suggested by previous studies [24, 31], the Harris Hip Score reaching 90 points or more indicates a successful total hip replacement. As with the suggested criteria, the THR patients in the present study did receive well-done THR operations (with a mean Harris score of 91.6 six months after THR). By each domain of the Modified Harris



Table 4. Comparison of health-related quality of life: the SF-36 before and after THR (n=46)

Dimension	Mean score (SD)		Improvement rate	t-value
	Before THR	After THR		
Physical functioning	43.8 (22.8)	73.8 (17.4)	68%	7.74***
Role limitations-physical	15.2 (25.5)	63.5 (37.8)	317%	8.68***
Bodily pain	49.5 (21.5)	79.5 (19.5)	61%	6.38***
Vitality	58.7 (13.4)	63.5 (15.1)	8%	1.51***
General health	52.3 (12.3)	65.2 (15.3)	25%	4.77***
Social functioning	43.5 (20.7)	83.7 (15.3)	92%	10.51***
Role limitations-emotional	25.4 (39.2)	85.5 (32.6)	236%	9.22***
Mental health	64.6 (14.0)	73.0 (13.3)	13%	2.93***

\*\*\*P&lt;0.001

Hip Scale, the areas of “pain relief” and “gait function” had a relatively high level of improvement as compared to the other two domains. Indeed, it is not surprising to have higher improvement rates in the areas of “pain” and “gait function” than in others because of pain relief and function restore were direct outcome of THR. For the patients, moreover, pain relief and improvement in physical functioning are probably the most significant indicators of THR effectiveness.

For the assessment of health-related quality of life, RP and RE were two of eight dimensions with the most significant improvements in terms of improvement rates (i.e., 317% and 236%, respectively). Before THR operations, the mean scores for the domains of RP and RE were relatively lower as compared to other domains, which may be due to the fact that role playing was soundly limited by the individuals’ physical functioning and emotional status. Once physical limitations and emotional problems were eliminated by THR operations, the patients could resume their roles more significantly. Consequently, alleviation of role limitations can help patients to enhance their functioning in other dimensions of health (such as social functioning) and ultimately to achieve a higher level of overall quality of life.

In addition to the measures including in the Harris Scale and the SF-36, there are other indicators of THR outcomes as indicated in the clinical guidelines [24, 31], such as length of stay and the possibility of re-hospitalization. As requested by the clinical guidelines, a 10-day length of stay is acceptable for THR patients on average. For the present study, the average length of stay for the sample was 9.9 days, which may imply adequate quality of THR. However, the relationship between length of stay and THR outcomes has not been further evaluated. In considering the possibility of re-

hospitalization, moreover, if a patient is re-hospitalized within 30 days of primary operation, it could be considered as an indicator of poor quality of surgery and/or care. In this study, only one THR case was re-hospitalized within 30 days of the primary THR, which accounted for 1.9% of the total number of cases (1 of 46) and exceeded the acceptable criteria of 1% [31]. However, the small number of THR cases may explain this slightly higher figure, which needs to be further investigated in future research.

As a matter of fact, the small number of THR cases may be the major limitation of the present study, which also restricts the generalizability of findings. For future research, a larger scale of THR sample is proposed, which can serve as a superior basis for further examining the determinants of THR outcomes, such patient characteristics, principal diagnosis, medication behaviors, and related factors. Moreover, the effectiveness of THR operation is highly associated with level of surgical skills, technology development, and facility resources. However, all 46 THR patients in the present study received operations from one surgeon working at the study medical center. Given this design, it may better control for potential confounding factors of THR outcomes as mentioned. On the other hand, the impact of surgeon and facility variations on THR outcomes could not be examined. For future research, a heterogeneous study sample is necessary, such as generating THR from multiple hospitals.

In conclusion, the present study confirms that THR not only relieves patients from pain (as evidenced by the Modified Harris Hip Scale) but also helps them remove role limitations due to physical and emotional problems (as confirmed by the results of the SF-36). Therefore, a comprehensive assessment of THR outcomes should comprise assessments in physical func-

tioning and health-related quality of life. In terms of measurement approaches, the Harris Hip Scale and the SF-36 represent disease-specific and generic measures, respectively. To maximize the strengths and advantages of the two measurement approaches, A study of THR effectiveness should adopt disease-specific and generic measures simultaneously in order to provide a better picture of THR outcomes and the quality of care for future research.

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# 全人工髖關節置換前後身體功能及健康相關生活品質之比較

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全人工髖關節置換術為關節相關疾病之主要手術。雖然確知本手術可解除病人之疼痛和恢復身體功能，但對於該手術是否同時改善病人與健康相關之生活品質則所知有限。本研究旨在同時探討病人接受全人工髖關節置換術前後，其身體健康狀況及健康相關生活品質之變化與改善情形。本研究係採用前瞻性之研究設計，以南部某醫學中心接受某位骨科專科醫師所執行之全人工髖關節置換病人為研究對象。資料收集期間(86年3月至87年6月)，計有46病人成功完成術前評估，並在術後六個月接受再評估，成功追訪率為88%。本研究所使用之療效評估工具有哈里斯量表中文修訂版及中文簡短版健康狀態評估量表(SF-36)。病患基本資料及與手術相關之其他資料(如合併症)則取自病歷審查。本研究結果發現，接受全人工髖關節置換術之病人在術後6

個月後，身體功能及健康相關生活品質均達到顯著水準之改善。就哈里斯量表分數而言，整體身體功能平均分數由術前之45.2(SD=17.3)，改善為91.6(SD=10.7)。另就中文簡版健康狀態評估量表結果，比較術前術後各面向評分之改善程度亦達顯著水準( $p<.001$ )；其中以「因身體功能所造成角色扮演限制」一項呈現最明顯之改善(15.2 vs. 63.5)，其次為「因情緒問題所造成之角色扮演限制」(25.4 vs. 85.5)。整體而言，全人工髖關節置換術確可顯著的減輕病人之疼痛及改善其身體功能，並可更進一步地增進其健康相關生活品質。因此，若欲對THR病人進行全面性之療效評估，須同時以髖關節特定疾病量表(如Harris Scale)與整體性健康評估量表(如SF-36)進行評估，以窺得THR療效之全貌。

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