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Original Research Article

Functional outcome after total hip replacement surgery

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ABSTRACT

Background: Total hip replacement (THR) surgery is a common and effective procedure to alleviate pain and improve function in patients with hip joint disorders, such as osteoarthritis. The aim of this study was to assess the functional outcome after THR surgery.
Methods: This cross-sectional study was conducted in department of orthopedics, medical college for women and hospital and other hospitals in Dhaka, Bangladesh, during the period from March 2017 to March 2022. The sample size was 120.
Results: In this study, mean age was 65.3 (SD±9.8) years and majority (52.5%) were male. At the 12-month follow-up, PCS scores improved, while MCS scores slightly decreased. Physical function, mental health, and PROM scores of Harris hip score (HHS), Western Ontario and McMaster universities osteoarthritis index (WOMAC), and EQ-VAS showed significant improvements. Gait speed exhibited a minor decrease. The complications observed included superficial infection in 6 patients (5.0%), femoral nerve palsy in 9 patients (7.5%), hip dislocation in 7 patients (5.8%) and etc. Overall, 81.67% had an excellent functional outcome, 11.67% had a good outcome, and 6.67% had a fair outcome after surgery.
Conclusions: The findings of our study demonstrate significant improvements in functional outcomes and PROMs following THR surgery.

Keywords: Functional outcome, THR surgery, Patient-reported outcome measures, Harris hip score, Western Ontario, McMaster universities osteoarthritis index

INTRODUCTION

Total hip replacement (THR), also known as total hip arthroplasty, is a common and effective surgical intervention for various hip joint pathologies, including osteoarthritis, rheumatoid arthritis, and traumatic hip injuries.[1] Over the past few decades, significant advancements in surgical techniques, implant design, and rehabilitation protocols have led to improved functional outcomes and patient satisfaction following THR.[2] This review aims to provide an up-to-date synthesis of the current literature on functional outcomes following THR, with a focus on factors influencing these outcomes and potential areas for future research. THR is considered the gold standard treatment for end-stage hip joint arthritis and other degenerative hip conditions, as it has been shown to significantly reduce pain, improve joint function, and enhance the overall quality of life in affected individuals.[3] In the United States alone, the number of primary THR procedures is projected to increase by 174% between 2020 and 2040, reaching an estimated 635,000 procedures annually.[4] This anticipated growth in demand underscores the importance of continued research and optimization of functional outcomes following THR. Functional outcomes following THR can be assessed using various subjective and objective measures, including patient-reported outcome measures (PROMs), range of motion, gait analysis, and muscle strength.[5] PROMs, such as the HHS, WOMAC, and Oxford hip score (OHS), are widely used

to evaluate pain, function, and patient satisfaction after THR.[6] Objective measures, on the other hand, can provide valuable insights into the biomechanics of the hip joint and the surrounding musculature, which can help guide surgical and rehabilitation strategies.[7] Several factors have been identified to influence functional outcomes following THR, including patient demographics, preoperative functional status, surgical technique, implant design, and postoperative rehabilitation protocols.[8] For instance, older age, higher body mass index (BMI), and worse preoperative functional status have been associated with poorer postoperative functional outcomes and slower recovery.[9] Additionally, various surgical approaches (e.g., anterior, posterior, lateral) and implant designs (e.g., cemented, uncemented, hybrid) have been shown to influence functional outcomes, although the optimal choice remains a subject of debate.[10] Postoperative rehabilitation is an essential component of the recovery process after THR, with the primary goals being to restore hip joint function, improve mobility, and reduce pain.[11] Various rehabilitation protocols have been proposed, including early mobilization, aquatic therapy, and home-based exercise programs, with mixed evidence supporting their effectiveness in improving functional outcomes.[12] Recent research has also highlighted the potential role of preoperative rehabilitation, or "prehabilitation," in optimizing functional outcomes following THR, although the optimal prehabilitation program remains to be determined.[13] Despite the substantial progress made in the field of THR, there remain opportunities for further research and improvement. For example, the development of personalized surgical and rehabilitation approaches based on patient-specific factors, such as biomechanics and genetic predispositions, may offer the potential for further enhancing functional outcomes.[14] Genetic factors, such as single nucleotide polymorphisms (SNPs), have been shown to influence the risk of complications and functional outcomes after joint arthroplasty, suggesting that genetic profiling could eventually be incorporated into preoperative assessments and individualized treatment planning.[14] Further research is needed to validate the clinical utility of these genetic markers and develop reliable methods for their integration into routine clinical practice. The current study is aimed to assess the functional outcome after THR surgery.

Objectives

Objectives were to assess the functional outcome after THR surgery.

METHODS

This cross-sectional study was conducted in department of orthopedics, medical college for women and hospital and other hospitals in Dhaka, Bangladesh, during the period from March 2017 to March 2022. Total 120 patients who underwent THR surgery were included in this study. Consent of the patients and guardians were taken before collecting data. The study was approved by ethical review committee of medical college for women and hospital and other hospitals, Dhaka, Bangladesh. After collection of data, all data were checked and cleaned. After cleaning, the data were entered into computer and statistical analysis of the results being obtained by using windows-based computer software devised with statistical packages for social sciences version 22. After compilation, data were presented in the form of tables, figures and charts, as necessary. P value of less than 0.05 was considered statistically significant.

Inclusion criteria

Patients who underwent THR surgery and age between 40-83 years were included in study.

Exclusion criteria

Patients aged below 40 years and over 83 years, patients with terminal diseases, patients who did not give consent and patients transferred to another hospital were excluded from study.

RESULTS

Table 1 presents the demographic characteristics of the 120 patients included in the study. The patients' ages ranged from 40 to 83 years, with a mean age of 65.3 (SD±9.8) years. Majority of the study patient (52.5%) were male. The mean patients' BMI was 28.4 (SD±3.8) kg/m^2. Regarding comorbidities, 21 patients (17.5%) had coronary heart disease, 45 patients (37.5%) had arterial hypertension, and 11 patients (9.2%) had diabetes mellitus. A total of 43 patients (35.8%) had no reported comorbidities. The patients were also classified according to the American society of anesthesiologists (ASA) grade: 34 patients (28.3%) were in grade 1, 77 patients (64.2%) were in grade 2, 8 patients (6.7%) were in grade 3, and 1 patient (0.8%) was in grade 4. Table 2 compares preoperative and 12-month follow-up measures of health status and gait speed in the study patients. Physical component summary (PCS) scores showed an improvement from a preoperative mean of 38.6 (SD=10.5) to a 12-month follow-up mean of 42.9 (SD=12.1), indicating an enhancement in physical health. In contrast, mental component summary (MCS) scores displayed a marginal decrease from a preoperative mean of 56.2 (SD=6.7) to a follow-up mean of 55.8 (SD=7.5). The physical function score demonstrated improvement, with a preoperative mean of 39.6 (SD=9.8) and a follow-up mean of 45.2 (SD=10.4). The mental health score also showed a slight increase from a preoperative mean of 52.4 (SD=6.3) to a follow-up mean of 53.7 (SD=7.8). Gait speed exhibited a minor decrease, with a preoperative mean of 0.95 m/s (SD=0.22) and a follow-up mean of 0.94 m/s (SD=0.2) at 12 months after surgery. Table 3 presents the PROM scores before and after THR surgery. The HHS demonstrated a significant improvement, with a preoperative mean of 56.48 (SD=11.33) and a 12-month follow-up mean of 93.25 (SD=13.61). The WOMAC total

score also showed considerable improvement, decreasing from a preoperative mean of 53.65 (SD=16.74) to a follow-up mean of 9.30 (SD=12.02). The WOMAC subscale scores revealed improvement across all three categories. The pain subscale decreased from a preoperative mean of 10.92 (SD=4.03) to a follow-up mean of 1.76 (SD=2.32), the function subscale decreased from 30.91 (SD=11.69) to 4.08 (SD=8.45), and the stiffness subscale decreased from 5.04 (SD=1.55) to 1.31 (SD=1.63). Lastly, the EQ-VAS score, which assesses the patients' self-rated health, improved from a preoperative mean of 51.37 (SD=17.97) to a follow-up mean of 71.48 (SD=20.91) at 12 months after surgery. Figure 1 demonstrates the functional outcomes of the study patients. In our study, 98 (81.67%) had an excellent functional outcome, 14 (11.67%) had a good functional outcome, and 8 (6.67%) experienced a fair functional outcome. Table 4 displays the complications experienced by the study patients. The complications observed included superficial infection in 6 patients (5.0%), deep infection in 1 patient (0.8%), femoral nerve palsy in 9 patients (7.5%), trochanteric nonunion in 4 patients (3.3%), periprosthetic fracture in 4 patients (3.3%), and hip dislocation in 7 patients (5.8%).

Table 1: Demographic characteristics of the study patients, (n=120).

Characteristics		N	%
Age (In years)	Mean ± SD	65.3±9.8	
	Range	40-83	
Sex	Male	57	47.5
	Female	63	52.5
BMI (kg/m^2)	Mean ± SD	28.4±3.8	
Comorbidities	Coronary heart disease	21	17.5
	Arterial hypertension	45	37.5
	Diabetes mellitus	11	9.2
	None	43	35.8
ASA grade	1	34	28.3
	2	77	64.2
	3	8	6.7
	4	1	0.8

Table 2: Comparison of preoperative and follow-up measures of health status and gait speed in study patients, (n=120).

Parameters	Preoperative	Follow up 12 months
PCS	38.6±10.5	42.9±12.1
MCS	56.2±6.7	55.8±7.5
Physical function	39.6±9.8	45.2±10.4
Mental health	52.4±6.3	53.7±7.8
Gait speed	0.95±0.22	0.94±0.2

Table 3: PROM scores before and after operation, (n=120).

PROM scores	Preoperative	Follow up 12 months
HHS	56.48±11.33	93.25±13.61
WOMAC total score	53.65±16.74	9.30±12.02
WOMAC subscale pain	10.92±4.03	1.76±2.32
WOMAC subscale function	30.91±11.69	4.08±8.45
WOMAC subscale stiffness	5.04±1.55	1.31±1.63
EQ-VAS	51.37±17.97	71.48±20.91

Table 4: Complication following operation in the study patients, (n=120).

Complications	N	%
Superficial infection	6	5.0
Deep infection	1	0.8
Femoral nerve palsy	9	7.5
Trochanteric nonunion	4	3.3
Periprosthetic fracture	4	3.3
Hip dislocation	7	5.8

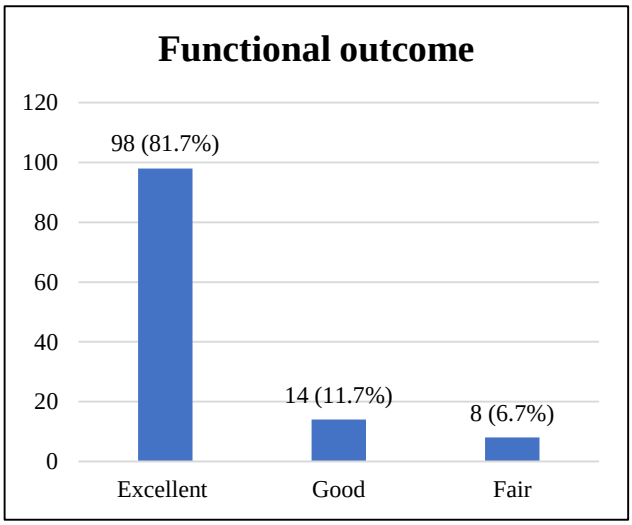

Figure 1: Functional outcome of patients undergoing THR surgery using HHS, (n=120).

DISCUSSION

The present study aimed to evaluate the functional outcomes and PROMs after THR surgery in a cohort of 120 patients. The demographic characteristics of the study population are consistent with those reported in other studies evaluating THR outcomes. The mean age of 65.3 years and the distribution of sexes (52.5% male and 47.5% females) are similar to those reported by Marahatta et al and Khan et al.[15,16] The mean BMI of 28.4 (SD±3.8) kg/m^2 aligns with the findings of Wang et al.[17] Improvements in PCS and MCS scores were observed in our study, which is

consistent with the findings of other studies. Fortin et al.[18] also reported significant improvements in PCS scores and a slight decline in MCS scores after THR. Our findings suggest that THR has a more substantial impact on physical health than mental health which is similar to the study of Wang et al and Ng et al.[17,19] Our study revealed a significant improvement in the HHS, which is consistent with the findings of the study of Leiss et al and Siwach et al.[22,1] Both studies reported considerable improvements in HHSs postoperatively, indicating the efficacy of THR in improving hip function. The improvements in WOMAC total score and subscales (pain, function, and stiffness) observed in our study are in line with those reported by Leiss et al.[19] These improvements indicate that THR effectively alleviates pain, improves function, and reduces stiffness in patients with hip osteoarthritis. The EQ-VAS score improvement found in our study is also consistent with the findings of the study of Leiss et al.[19] This study reported significant improvements in EQ-VAS scores at 12 months postoperatively, suggesting that patients perceive an enhancement in their overall health after THR. The complications observed included superficial infection in 6 patients (5.0%), deep infection in 1 patient (0.8%), femoral nerve palsy in 9 patients (7.5%), trochanteric nonunion in 4 patients (3.3%), periprosthetic fracture in 4 patients (3.3%), and hip dislocation in 7 patients (5.8%). In the study of Siwach et al similar complications were seen.[21] In terms of functional outcomes, our study reported that 81.67% of patients had an excellent functional outcome, 11.67% had a good outcome, and 6.67% had a fair outcome. These results are comparable to other studies.[15,22,23] All these studies reported high rates of excellent and good functional outcomes following THR, supporting the effectiveness of the procedure in improving patients' functionality.

Limitations

In our study, there was small sample size and absence of control for comparison. Study population was selected from one center in Dhaka city, so may not represent wider population. The study was conducted at a short period of time.

CONCLUSION

The findings of our study demonstrate significant improvements in functional outcomes and PROMs following THR surgery. These improvements indicate that THR is an effective treatment for patients with hip osteoarthritis, leading to enhanced physical health, reduced pain, improved function, and better self-perceived health. Further study with larger population is recommended to have a better understanding about the functional outcome of THR.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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