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Functional outcomes of total hip replacement by a posterior surgical approach

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Abstract

Background: 10% of people have osteoarthritis, which mostly affects hips (5%), like other joints, are weight-bearing joints. Usually, increasing pain, stiffness, and deteriorating gait need a total hip arthroplasty (THA). There are numerous surgical techniques for the hip that have been discussed. Because the posterior approach involves less extensive tissue dissection, resulting in speedier surgeries and less blood loss, it is generally easier to do.

Methods: The results of the uncemented THR by posterior approach were recorded in a prospective study conducted from September 2020 to March 2023 on 25 individuals with osteoarthritis that is unilateral, ages 25 to 60, at Bangabandhu Sheikh Mujib Medical University (Department of Orthopaedic Surgery) and various private hospitals in Dhaka, Bangladesh.

The purpose of the study was to ascertain the functional outcome of individuals who had posterior total hip arthroplasty.

Results: A total of 25 patients with unilateral osteoarthritis had a posterior approach total hip arthroplasty without cementation; c10 of the patients were female and 15 (60%) were male. (40%). Patients ranged in age from 25 to 60, with a mean age of 42.5. The right side was primarily impacted. At the follow-up following THA by the PA, the VAS, HHS, and WOMAC ratings all showed significant improvement (all $p < 0.05$). Before surgery, the patient's VAS score was 9.2, but after a year, it had improved to 1.3, with a significant p value of less than 0.001.

Conclusion: Significant functional results were observed by patients who underwent total hip arthroplasty using the posterior approach.

Keywords: Osteoarthritis, Total hip Replacement (THR), surgical approach, Moore posterior approach (PA) and functional outcome

Introduction

According to Hoaglund ^[1], Osteoarthritis affects 10% of the population and mostly affects weight-bearing joints, such as the hips (5%), among other joints. The degeneration of articular cartilage in the hip joint is a feature of hip osteoarthritis. It could be secondary (arising from childhood hip issues, trauma, osteonecrosis, previous joint infection, or another illness) or main (idiopathic). There is no known cure for hip osteoarthritis, a degenerative condition. For 2.5% of people between the ages of 40 and 84, a total hip arthroplasty (THA) is usually necessary due to increasing pain, stiffness, and poor gait. With a complete hip replacement (THA), prosthetic implants (cup, head, and stem) are used to replace the femoral head and acetabulum. There are numerous surgical techniques for the hip that have been discussed. Currently, the two primary THA procedures are the posterior and direct lateral approaches ^[2, 3]. The posterior approach places a curved incision at the center of the greater trochanter's posterior part. In the same direction as the incision, the fascia-lata is incised and the gluteus maximus fibers are bluntly dissected. The short external rotators are then reflected, revealing the rear of the hip joint capsule, after their femoral insertion. The capsule can be removed or incised, though most surgeons choose to leave it in place. Because it involves less extensive tissue dissection and produces shorter operations with less blood loss, the posterior approach is generally regarded as being easy to do.

It permits adequate femoral exposure, which may reduce the chance of a femur fracture during the surgical procedure.

It is commonly believed that the posterior method is easier to perform and requires less extensive tissue dissection, which speeds up surgeries and reduces blood loss. It lowers the risk of a femur fracture during surgery by enabling enough femoral exposure. The major goal was to determine the functional outcome of patients using a posterior technique following total hip arthroplasty.

Materials and Methods

The results of uncemented THR by posterior approach were recorded in a prospective study conducted from September 2020 to March 2023 on 25 patients with unilateral osteoarthritis, ages 25 to 60, at the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University and various private hospitals in Dhaka, Bangladesh. The day before the procedure, as well as one, three, six, and twelve months later, an assessment of the outcomes was conducted. The patient and patient party received an explanation of the study's purpose, methodology, risks, and benefits. The BSMMU department of orthopaedic surgery provided ethical approval for the confidentiality of the record.

Inclusion criteria

- Aged between 25 and 60 yrs
- Diagnosed with mild hip dysplasia (center-edge angle > 20°) or unilateral primary hip osteoarthritis (OA), depending on the cause of the subsequent OA.
- Planned for primary cementless complete hip replacement.

Exclusion criteria

- Any hip, knee, or ankle total joint arthroplasty or major lower limb surgery that resulted in chronic pain.
- Symptoms related to the ankle, knee, or hip, with a full joint replacement anticipated within a year.
- BMI greater than 35
- Any physical impairment that makes it difficult for the patient to walk unassisted
- Any neurological issue, such as cerebral thrombosis or Parkinson's disease, severe dementia (OMC 18), or chronic heart failure or chronic obstructive pulmonary disease that limits physical function are considered serious medical illnesses.

*OMC = Orientation–Memory–Concentration Test.

Surgical Technique

All of the surgical treatments included in the study proved to be suitable for participants with primary osteoarthritis, and follow-up care for each patient was provided by the Department of Orthopaedic Surgery at Bangabandhu Sheikh Mujib Medical University. Preoperative templating was carried out using the trauma card software. During the surgery, the patients were positioned in a lateral decubitus position. They were all given the exact same cementless components: 32- or 36-mm metal heads and bi-metric stems with Exceed ABT Ringloc-x shells. With the aid of templates, the femoral offset and equal leg length were restored. Lewinnek *et al.* (1978) state that the surgeons attempted to place the cup between 5 and 15 degrees of anteversion and 30 and 50 degrees of inclination.

All patients got pre- and postoperative antibiotics as well as thromboprophylaxis during their hospital stay.

Posterior Approach

Following the posterior approach (PA), the greater trochanter's posterior region was incised [8] and the fascia was then penetrated. The gluteus maximus muscle was then carefully dissected with a blunt instrument. A hip capsule incision was done, and the external rotator muscles were severed (Hoppenfeld *et al.*, 2009). Internal rotation and flexion techniques were used to dislocate the hip. During the wound closure procedure, the hip capsule was repaired and the external rotator muscles were rejoined using a thick absorbable suture (coated VICRYL, size 2).

Rehabilitation

All patients' limbs were placed with a pillow between their legs at an angle of around 15 degrees abduction. Internal rotation, adduction, and flexion were not permitted. It was prescribed that each patient get out of bed and take a seat on the couch's edge. At the first POD, isometric hamstring and quadriceps exercises Exercises to strengthen the ankle and toes and to move them actively as soon as the pain allows; in every instance, the second POD should check the dressing and drain off before checking the X-ray. After the third POD, patients were permitted to walk for a minimum of ten to twenty minutes, twice a day, if their pain permitted. At the 5–7th POD, patients were typically released. At the 14th POD, stitches were taken out.

After being discharged, each patient received customized physical therapy and practiced walking with the assistance of two crutches. Hip flexion was limited by 90 degrees for the first four weeks, and strong internal and external rotation was strictly prohibited.



Fig 1: Pre-op X-ray

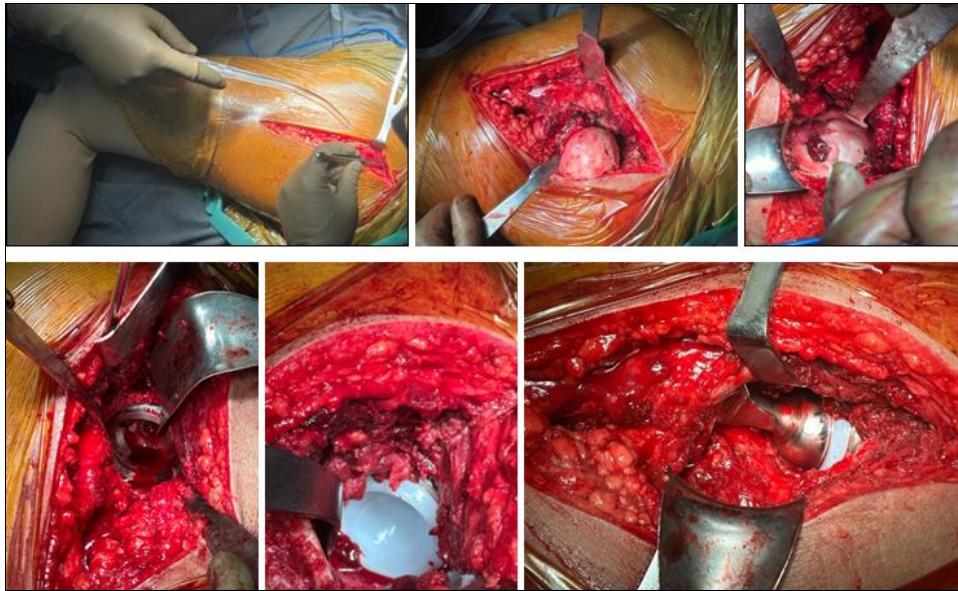


Fig 2: Operative Picture



Fig 3: Post-op Xray

Recommendations at Discharge

- To perform knee quadriceps exercises and hip abduction and extension exercises for a minimum of three months.
- Avoiding squatting (hip flexion & It; 90 degree) and using a high chair and table for prayer.
- It is recommended that patients use a walker to assist with their walking for four to six weeks before progressively increasing their weight bearing until they have the strength and confidence to walk unassisted. After six to eight weeks, patients with sedentary occupations can resume their jobs.

Statistical Analysis

With SPSS (version 12.0 for Windows), an independent biometrician (F.K.) conducted all of the numbers and graphics analyses. The continuous endpoints were represented by medians, minima, and maxima, whereas the categorical endpoints were represented by absolute and relative frequencies. As a result, the graphical representation of continuous data was created using nonparametric box whisker plots. The representation of intraindividual comparisons in

continuous endpoints at different assessment dates was based on the distribution of intraindividual differences. The significance of these intraindividual comparisons at continuous endpoints was assessed using the Sign test. When comparing subsamples, the Fisher test was utilized for categorical endpoints and the two sample Wilcoxon test for continuous endpoints (which served as the primary clinical endpoint).

The significance test findings were summarized using p-values

A two-sided Wilcoxon test p-value, which was obtained from a descriptive comparison of the primary clinical endpoint (an increase in HHS after 12 weeks) between the posterior and lateral treatment groups, thus served as the foundation for the analysis of the investigation's main research hypothesis (as suggested by the trial's statistical analysis plan). Because statistical outliers could not be completely ruled out during the development of the trial's statistical analysis plan, the confirmatory analysis diverged from the t-test assumption introduced into the sample size calculation and instead

concentrated on the application of the two sample Wilcoxon test. Compared to its two sample t-test analog, the latter exhibits a steadily declining statistical power but is more reliable.

The two-sample t-test was thought to have a clear advantage over it, albeit showing progressively less statistical power overall due to its more dependable handling of possible outliers. A p-value of less than 0.05 denotes localized statistical significance because these investigations were exploratory in nature. If additional significance tests are carried out as part of a follow-up exploratory study, the resulting p-values will not be multiplicity-adjusted.

Functional independence and health-related quality of life assessment

A self-administered, disease-specific, validated outcome measure called the Western Ontario and McMaster Universities (WOMAC) questionnaire was used to assess pain, stiffness, and impairment of physical function in patients with osteoarthritis of the knee and hip [11-12]. Each patient received the questionnaire both prior to surgery and during the most recent follow-up. The WOMAC questionnaire provides a single domain score or a total score (0-100); lower scores are associated with less pain and stiffness and more function.

Functional evaluation

Every patient had preoperative and postoperative assessments using the Harris Hip Score (HHS) and Visual Analog Scale (VAS) [19]. The Hip Disability Score (HHS), which is specific to a given condition, is used to measure hip disability [14].

It evaluates domains including pain, function, deformity, and motion with scores ranging from 0 to 100. Below 70 was considered poor, between 70 and 79 acceptable, between 80 and 89 decent, and between 90 and 100 exceptional [10]. The recovery rate (RR) was calculated using the formula [RR = (postoperative value -preoperative value)/postoperative value x 100] in order to assess the level of HHS improvement. [15]. The VAS was employed to assess pain perception in a subjective manner.

At the most recent follow-up, a VAS score of three or above indicated the existence of persistent discomfort [16]. The study excluded THAs with known causes of pain (such as infections, stiffness or loosening, instability, fracture, neurovascular damage, or comorbidities) and was restricted to determining the existence of residual discomfort.

Results

Table 1 presents the demographic data for the twenty-five patients who had lateral approach uncemented total hip arthroplasty. Of these patients, 15 (or 60%) were men and 10 were women. The patients were between the ages of 25 and 60, with a mean age of 42.5. The right side was primarily damaged.

Three months after surgery, patients having a straight lateral approach had a median total range of motion of 210° (150°–260°), while the posterior group had a median range of motion of 190° (145°–255°) (Wilcoxon p = 0.105).

The discrepancies between the HHS, VAS, and WOMAC scores prior to surgery and at follow-up are displayed in Table 2/3. At the follow-up for the PA, the VAS, HHS, and WOMAC scores all showed significant improvement (all p < 0.05). In the PA, we discovered decreased WOMAC, VAS, and HHS scores. At the 12-month follow-up, a preoperative VAS score of 9.2 had improved to 1.3, with a significant p value of less than 0.001.

Table 3 shows the WOMAC sub-scores for pain, stiffness, and activities of daily living. Following posterior approach surgery, every patient experienced excellent pain management, reduced stiffness, and a return to normal activities (all p <0.001).

Table 1: Patient demographics

Posterior approach	
Study population, n	25
Age, mean (range)	42.5 (25–60)
Female, n	10 (40%)
Male	15 (60%)
Side	
Right	16 (64%)
Left	09 (36%)
Diagnosis	
Osteonecrosis	10
Osteoarthritis	15

Table 2: Shows the distributions of the total HHS scores before and after direct lateral THA at one, three, six, and twelve months. The medians of the corresponding intraindividual change distributions (post-preoperative) and the pertinent p-values from the Wilcoxon test of two samples at each assessment period are also shown. (VAS) Pain score at the 12-month follow-up and during operation.

Total HHS Score

Approach	Preoperative	1 month	3 months	6 Months	12 months
Posterior	43 (29-64)	50 (44-59)	63 (58-77)	83 (68-89)	93 (80-96)
P-Value	0.307	0.05	0.031	0.025	0.012

Change In Total HHS Score (Post – Preoperative)

Approach	1 months	6 months	12 Months
Posterior	7 (-5 ;15)	40 (20; 48)	50 (25; 58)
P-Value	0.041	0.03	0.012

VAS pain Score

	Posterior
Preop 12 moth’s follow-up	9.2
p-value	1.3
	< 0.001

Table 3 Shows the WOMAC sub-scores for pain, stiffness, and daily activities along with their median, lowest, and maximum values. The scores go from 0% to 100%, with 100% denoting the highest rating that can be achieved. The table displays the scores prior to the procedure as well as one, six, and twelve months following the posterior and direct lateral approaches.

Womac Sub Scores [0 – 100%]	Approach	Preoperative	1 months	6 months	12 months
Pain	Posterior	40 (0-100)	73 (24-100)	80 (36-100)	94(34-100)
	P-Value	0.383	0.053	< 0.001	< 0.001
Stiffness	Posterior	38 (0-80)	70 (25-95)	80 (35-100)	92 (30-100)
	P-Value	0.313	0.053	< 0.001	< 0.001
Daily Activity	Posterior	35 (0-67)	75 (14-92)	84 (25-95)	94 (45-97)
	P-Value	0.479	0.050	< 0.001	< 0.001

The two-sample Wilcoxon test, which was utilized to compare the results between the two procedures at each assessment period, was used to determine the p-values in the table.

Discussion

The posterior approach is the most often used surgical technique for total hip arthroplasty (THA) globally. Twenty-five patients had cementless THA using a posterior technique. The majority of the patients were male, and their mean age ranged from 25 to 60 years. The results of a prior investigation by Witzleb W-C *et al.* showed that the right side was primarily affected. In ^[14] The variations in WOMAC, VAS, and HHS scores before and after surgery were noted in our study. At the follow-up for the posterior approach, the VAS, HHS, and WOMAC ratings all showed substantial improvements (all $p < 0.05$).

The posterior method demonstrated increased preoperative and postoperative HHS in our group. With good to exceptional clinical results obtained in patients employing the posterior approach, the HHS significantly improved following surgery. Furthermore, following initial THA, the posterior approach's improvement in HHS exceeded Singh *et al.*'s lowest clinically meaningful difference. Using a posterior approach, Ji *et al.* ^[28] reported comparable mean postoperative HHSs and similar results.

Prior to surgery, the posterior approach VAS score was 9.2, but it improved to 1.3 at the 12-month follow-up, with a significant p value of less than 0.001. like Putananon C. *et al.* [24]. At follow-up, we saw that the patients' remaining discomfort had decreased. Improved outcomes for the individuals were confirmed by additional examination of the lingering discomfort.

This study examined WOMAC sub-scores for pain, stiffness, and activities of daily life. Consistent with the results of a previous study by Mariconda M *et al.* ^[20], all patients who underwent surgery via the posterior route had satisfactory postoperative pain status, stiffness, and return to daily activities (all $p < 0.001$).

According to HHS, VAS, and WOMAC scores, patients who had THA utilizing the posterior approach reported better functional outcomes and less pain persisting at the 1-year follow-up, which is consistent with other research. This study's limited sample size is the primary limitation.

Conclusion

Following total hip replacement surgery using the posterior approach, improvements were observed in functional outcomes, reduced postoperative muscle damage, residual pain, stiffness, and assessments of daily activity.

Conflict of Interest

Not available

Financial Support

Not available

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