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Comparison of the early functional outcome between lateral and posterior approaches in total hip arthroplasty

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Abstract

Background: The choice of surgical approach for THA remains a contentious issue with regards to restoration of patient function and optimization of clinical outcome. In this study we planned to compare early functional outcome between posterior and lateral approaches using Harris Hip score and Trendelenburg test.

Methods: Patients undergoing THA were assigned to the two groups to be operated by either Lateral or the posterior approach for the procedure of Total Hip Arthroplasty. Function of the hips was assessed at 2 week, 3 & 6 months after surgery using Harris hip score and Trendelenburg Test.

Results: We included 30 patients in our analysis (15 Lateral and 15 posterior). The groups were similar with respect to age ($p=.79$), Gender ($p=.705$). Temporal parameters were similar among the groups at all time points. At 2 weeks, there is negative trendelenburg test in all the patients operated by posterior approach as well as lateral approach. At 3 and 6 Months, there is negative trendelenburg test in all the patients operated by posterior approach, while 13.33% patients operated with lateral approach had positive trendelenburg test. No significant difference was seen in pain at 2 weeks, at 3 months, at 6 months between posterior approach and lateral approach (p value $>.05$).

Conclusion: From this study the functional outcome and Trendelenburg test have statistically no significant difference in both lateral and posterior approach. Good surgical technique and awareness of the anatomy of the nerve supply are key factors in preserving good abductor strength.

Keywords: Total hip arthroplasty, posterior approaches, trendelenburg test

Introduction

Hip osteoarthritis (OA) is a common and progressive joint disease causing pain, reduced physical function and reduced quality of life. Total hip replacement (THR) provides pain reduction and improves physical function and quality of life in most patients with end-stage hip OA^[1, 2].

It is well established that total hip replacement is one of the most frequent and most successful operations in orthopaedic surgery. Thus, the reliability of the procedure is of major socio-economic importance. The operation should be effective in terms of pain relief and should come along with a preferably short hospital stay and fast recovery. The overall function of the hip and patient satisfaction should be high, aiming for a high percentage of patients with a “forgotten joint replacement”-ability to forget artificial joint in everyday life resulting in the greatest possible patient satisfaction, as soon as possible^[3].

Many different surgical approaches to the hip joint have been described. Currently, total hip replacement (THR) is most commonly performed via a posterior or a lateral approach^[4]. Surgical approach has been debated as one of the key factors influencing dislocation. Posterior approach to the hip is one of the most commonly used surgical approaches for Hip Arthroplasty. The posterior approach has the advantage of reduced operative time, No violation of the gluteus medius and minimus, A low frequency of postoperative limp or abductor dysfunction. The disadvantage is a higher posterior dislocation rate and sciatic nerve injury which is close to field^[5]. Numerous authors have reported a reduced rate of dislocation when the posterior capsule and short external rotators have been repaired^[6, 7, 8, 9, 10].

However, despite repair of these tendons, the rates of dislocation after the posterior approach still remain higher than when this operation is performed through other approaches [3].

Lateral approach was first described by Hardinge [11] in 1982. A new surgical approach which takes advantage of the fact that the insertion of the gluteus medius to the greater trochanter is by a strong tendon which is wide in its anterior half. The superior gluteal nerve and artery are at risk if the approach is extended proximally [11].

The advantage of this approach is the lateral approach can be extended and gives good exposure to both the acetabulum and femur, thus being suitable for primary and revision operations [12]. Main disadvantage is abductor muscle insufficiency [13] is a common clinical scenario following a direct lateral approach. Gluteal tendon splitting can lead to a post-operative Trendelenburg gait [11].

The relative merits of these approaches have been widely debated in the orthopaedic community. However, the limited number of studies as well as the limited reporting of their outcome measures prevents definitive conclusions to be drawn [14]. The current emphasis on research has been to examine potential differences in functional outcomes between the Lateral and Posterior approach.

Thus a study design for comparing the two common approaches to the hip joint is necessary with very few such studies done in India especially. The primary aim in our study was to compare early functional outcome between posterior and lateral approaches using Harris Hip score and Trendelenburg test.

Methods

Selection of Cases: All patients attending the Orthopaedics OPD ESIC-PGIMS, Basaidarapur Hospital within time period of November 2018- March 2020 having age more than 20 years and less than 80 years undergoing primary total hip replacement were entitled to be enrolled in this study. Patients having dysplastic hip, neurological disease, bilateral hip involvement, pelvicoacetabular fracture and patients who were medically unfit for major surgery were excluded from this study.

15 cases each were assigned to the two groups to be operated by either Lateral or the posterior approach for the procedure of Total Hip Arthroplasty. After pre-operative investigation and evaluation, the patients found fit for surgery were allocated to either group LA or PA using odd and even number system.

Intra-Operative Procedure

The patient's surgical site was prepared by shaving the front and back of abdomen and lower limbs below the umbilicus observing complete aseptic precautions.

Group PA: Hip Arthroplasty by the Posterior approach. (Southern-Moore approach)

Group LA: Hip Arthroplasty by Lateral approach. (Hardinge)

Surgical Technique Used During This Study

Position and exposure

All patients were positioned laterally on the table with the hip to be operated facing towards the ceiling. The hip joint and proximal femur were exposed either through posterior or lateral approach.

Posterior Approach to the Hip

Patient was positioned in the true lateral position after spinal or general anaesthesia, with the affected limb uppermost. The greater trochanter was palpated on the outer aspect of the thigh. A routine 10-cm to 15-cm curved incision based on the posterolateral tip of the greater trochanter was made. The part of the incision that runs from this point to the posterior aspect of the trochanter was in line with the fibres of the gluteus maximus. Incision was curved across the buttock, cutting over the posterior aspect of the trochanter, and continue down along the shaft of the femur. The fascia lata on the lateral aspect of the femur was incised to uncover the vastus lateralis. The fascial incision was lengthened superiorly in line with the skin incision, and fibres of the gluteus maximus was split by blunt dissection. The fibres of the split gluteus maximus was retracted with the deep fascia of the thigh. Underneath was the posterolateral aspect of the hip joint, still covered by the short external rotator muscles, which were attached to the upper part of the posterolateral aspect of the femur. Hip was internally rotated to put the short external rotator muscles on a stretch (making them more prominent) and to pull the operative field farther from the sciatic nerve. Stay sutures were inserted into the piriformis and obturator internus tendons just before they insert into the greater trochanter. Muscles were detached close to their femoral insertion and were reflected backwards, laying them over the sciatic nerve to protect it during the rest of the procedure. The hip joint capsule was incised with a longitudinal or T-shaped incision. Then standard acetabular preparation followed by Reaming of acetabulum and insertion of implant as per standard arthroplasty technique followed by the femoral preparation as per standard arthroplasty technique and cemented or uncemented Total Arthroplasty was done. After insertion of the implant, the hip will be reduced and the wound will thereafter be closed in layers over a suction drain.



Fig 1: Posterior Approach of total Hip Arthroplasty.

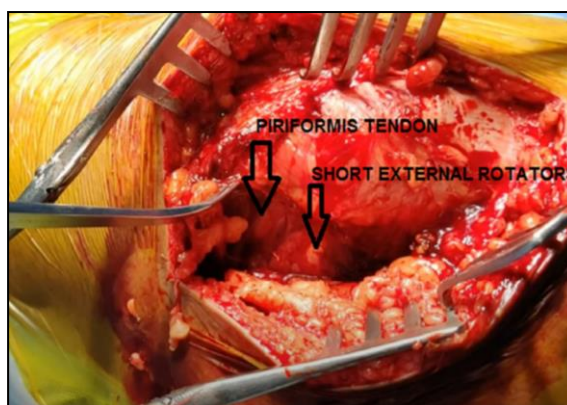


Fig 2: Short external rotators and piriformis tendon exposed

Lateral Approach to the Hip

Intermuscular plane is made by splitting the gluteus medius muscle distal to innervation (superior gluteal nerve) and splitting vastus lateralis muscle lateral to innervation (femoral nerve). The patient is positioned laterally and incision begins around 5 cm above to the tip of greater trochanter (GT) and extend distally. The incision is centred over tip of GT and extends distally along the line of the femur to about 8cm. Then superficial dissection is done by splitting fascia lata muscle and then retract it anteriorly so that tendon of gluteus medius muscle get exposed. Then detach fibres of gluteus medius muscle that are attached to fascia lata muscle by using sharp dissection Then deep dissection is done by splitting fibres of gluteus medius longitudinally starts from centre of GT. During this approach, utmost care was taken to extend the incision more than 3-5 cm proximal to GT in order to prevent injury to superior gluteal nerve. Then extend the incision inferiorly through the fibres of vastus lateralis muscle and develop anterior flap and expose anterior joint capsule.

Intraoperatively the per-operative stability of the hip was assessed by the following two methods.

1. Stability of the hip- the degree of internal rotation of hip (after component placement) at which the hip dislocates while keeping other two variables for hip dislocation constant at 90 degree of flexion and 10 degree of adduction in each patient in both the arms of the study.
2. After the hip is reduced following component placement during surgery, the Ranawat's sign was used to assess both the combined anteversion of the components as well as the inclination of the acetabular component as described by Blumenfeld.⁶⁰

Post-Operative Management

Periodic assessment of vital signs, suction drain collection and any soakage of dressing was checked. Depending on the intra-operative blood loss and collection in suction drain, on an average one to two units of whole blood were transfused. On first post-operative day, radiographs were done bedside only, to check the position of the implant. Isometric quadriceps and gluteal exercises were started from 2nd post-operative day. The suction drains were removed after 48 hours. All patients were immobilised with an abduction splint for 48 hours and thereafter an abduction pillow was given. Intravenous antibiotics were continued for 72 hours post-operative.

All wounds were routinely inspected on fourth day and at the time of suture removal on fourteenth day unless there was a specific indication e.g. fever. All these patients were kept in the ward at least till the time of suture removal and then discharged.

Advice given to patients on discharge, Not to squat or sit cross legged. Not to use low level chairs. Not to lie on the operative site. To continue using abduction pillow for 6 weeks. Partial weight bearing was started on 2nd post-op day and gradually increased as tolerated by the patient. Full weight bearing was generally started after 6 weeks.

All patients assessed by Clinical and radiological assessment by same methods which were used pre-operatively and comparison was done. Function of the hips was assessed at 2 week, 3 & 6 months after surgery using Harris hip score and Trendelenburg Test.

Statistical Analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean \pm SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Independent t test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups.
2. Qualitative variables were compared using Chi-Square test/Fisher's exact test.

A p value of <0.05 was considered statistically significant.

The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Results and observations

A Prospective and Randomized Comparative Single Blinded Study was conducted in ESI-PGIMSR, Basaidarapur, New Delhi from November 2018 to March 2020. 30 patients undergoing primary Total Hip Replacement and age more than 20 years were included in the study. Patients were divided into two groups (posterior approach and lateral approach) by Random Number Table method and results are as follows.

Table 1: Comparison of dislocation between posterior approach and lateral approach

Dislocation	Posterior approach (n=15)	Lateral approach (n=15)	Total	P value	Test performed
At 2 weeks					
Absent	14 (93.33%)	15 (100%)	29 (96.67%)	1	Fisher Exact test
Present	1 (6.67%)	0 (0%)	1 (3.33%)		
Mean \pm Stdev	0.07 \pm 0.26	0 \pm 0	0.03 \pm 0.18	0.317	Mann Whitney test;105
Median(IQR)	0(0-0)	0(0-0)	0(0-0)		
Range	0-1	0-0	0-1		
At 3 months					
Absent	13 (86.67%)	15 (100%)	28 (93.33%)	0.483	Fisher Exact test
Present	2 (13.33%)	0 (0%)	2 (6.67%)		
Mean \pm Stdev	0.27 \pm 0.8	0 \pm 0	0.13 \pm 0.57	0.15	Mann Whitney test;97.5
Median(IQR)	0(0-0)	0(0-0)	0(0-0)		
Range	0-3	0-0	0-3		
At 6 months					
Absent	15 (100%)	15 (100%)	30 (100%)	No p value	-
Mean \pm Stdev	0 \pm 0	0 \pm 0	0 \pm 0	1	Mann Whitney test;112.5
Median(IQR)	0(0-0)	0(0-0)	0(0-0)		
Range	0-0	0-0	0-0		

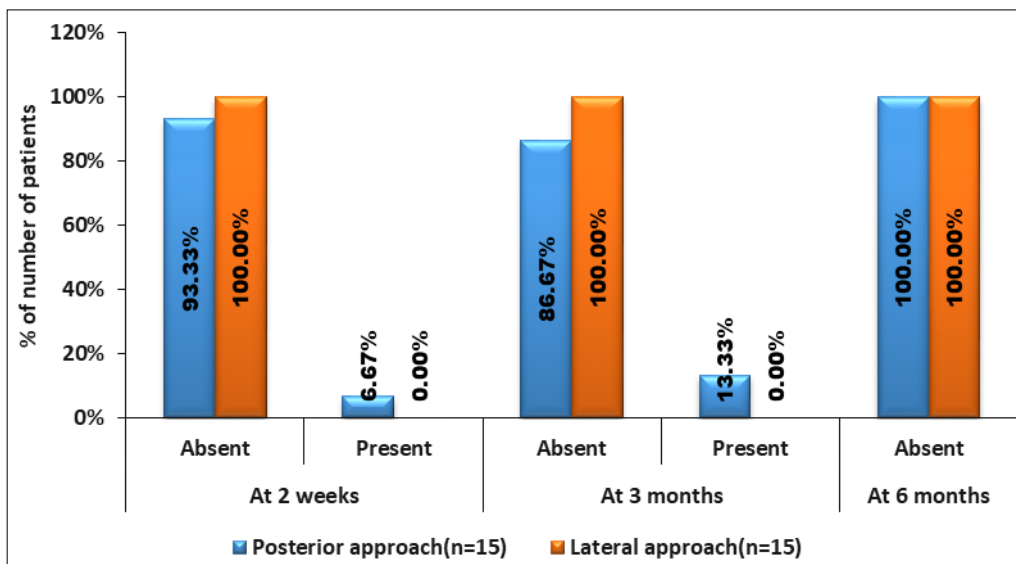


Fig 1: Comparison of dislocation between posterior approach and lateral approach

No significant difference was seen in the distribution of dislocation at 2 weeks between posterior approach and lateral approach. (p value>.05) Dislocation at 2 weeks was absent in majority of patients in posterior approach and lateral approach; 93.33% in posterior approach and 100% in lateral approach and present in 6.67% of patients in posterior approach and 0% of patients in lateral approach with no significant difference between them.

No significant difference was seen in the distribution of dislocation at 3 months between posterior approach and lateral approach. (p value>.05) Dislocation at 3 months was absent in majority of patients in posterior approach and lateral approach; 86.67% in posterior approach and 100% in lateral approach and present in 13.33% of patients in posterior

approach and 0% of patients in lateral approach with no significant difference in distribution between them.

The variable number of times of dislocation was not normally distributed. Thus non-parametric test was used for the comparison. No significant difference was seen in number of times of dislocation at 2 weeks, at 3 months, at 6 months between posterior approach and lateral approach.(p value >.05) Median(IQR) of number of times of dislocation at 2 weeks, at 3 months, at 6 months in posterior approach was 0(0-0), 0(0-0), 0(0-0) and in lateral approach was 0(0-0), 0(0-0), 0(0-0) respectively with no significant difference between them.

It is shown in table 1, figure 1.

Table 2: Comparison of Trendelenburg test between posterior approach and lateral approach.

Trendelenburg test	Posterior approach (n=15)	Lateral approach (n=15)	Total	P value	Test performed
At 2 weeks					
Negative	15 (100%)	15 (100%)	30 (100%)	No p value	-
At 3 months					
Negative	15 (100%)	13 (86.67%)	28 (93.33%)	0.483	Fisher Exact test
Positive	0 (0%)	2 (13.33%)	2 (6.67%)		
At 6 months					
Negative	15 (100%)	13 (86.67%)	28 (93.33%)	0.483	Fisher Exact test
Positive	0 (0%)	2 (13.33%)	2 (6.67%)		

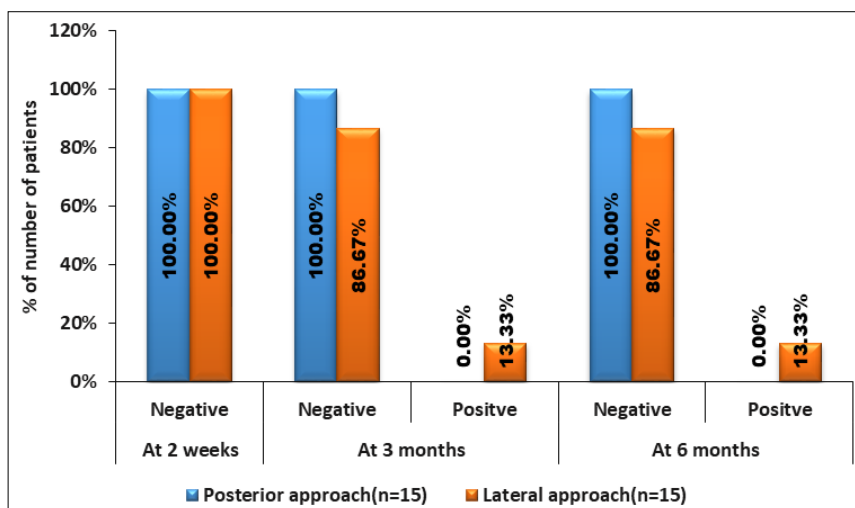


Fig 2: Comparison of Trendelenburg test between posterior approach and lateral approach.

At 2 weeks, trendelenburg test was negative in all the patients. No significant difference was seen in the distribution of trendelenburg test at 3 months between posterior approach and lateral approach. (p value>.05) Trendelenburg test at 3 months was negative in majority of patients in posterior approach and lateral approach; 100% in posterior approach and 86.67% in lateral approach and positive in 0% of patients in posterior approach and 13.33% of patients in lateral approach with no significant difference between them.

No significant difference was seen in the distribution of trendelenburg test at 6 months between posterior approach and lateral approach. (p value>.05) Trendelenburg test at 6 months was negative in majority of patients in posterior approach and lateral approach; 100% in posterior approach and 86.67% in lateral approach and positive in 0% of patients in posterior approach and 13.33% of patients in lateral approach with no significant difference between them. It is shown in table 2, figure 2.

Table 3: Comparison of total Harris hip score between posterior approach and lateral approach.

Total Harris hip score	Posterior approach (n=15)	Lateral approach (n=15)	Total	P value	Test performed
At 2 weeks					
Mean ± Stdev	74.08 ± 13.88	75.24 ± 3.95	74.66 ± 10.05	0.95	Mann Whitney test;111
Median(IQR)	76.55(70.705-80.675)	75.55(73.6-77.95)	76.15(71.35-78.225)		
Range	45.75-93.85	66.45-80.2	45.75-93.85		
At 3 months					
Mean ± Stdev	93.27 ± 9.44	96.9 ± 3.74	95.09 ± 7.29	0.356	Mann Whitney test;90.5
Median(IQR)	97(91.925-99.85)	97.85(96.35-100)	97.42(92.85-99.962)		
Range	68.5-100	85.8-100	68.5-100		
At 6 months					
Mean ± Stdev	98.43 ± 4.55	99.3 ± 1.22	98.87 ± 3.3	0.54	Mann Whitney test;101
Median(IQR)	100(100-100)	100(98.95-100)	100(99.962-100)		
Range	82.5-100	96.8-100	82.5-100		

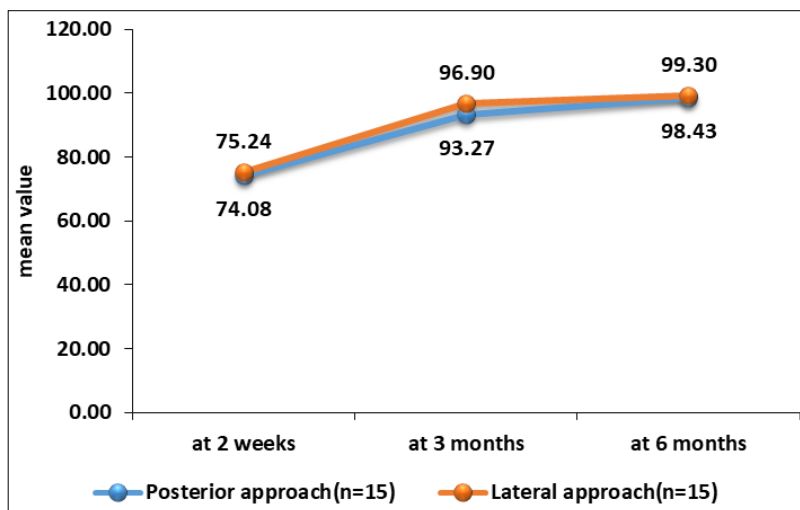


Fig 3: Comparison of trend of total Harris hip score at different time intervals between posterior approach and lateral approach.

The variable total Harris hip score was not normally distributed. Thus non-parametric test was used for the comparison. No significant difference was seen in total Harris hip score at 2 weeks, at 3 months, at 6 months between posterior approach and lateral approach.(p value >.05) Median(IQR) of total Harris hip score at 2 weeks, at 3 months, at 6 months in posterior approach was 76.55(70.705-80.675), 97(91.925-99.85), 100(100-100) and in lateral approach was 75.55(73.6-77.95), 97.85(96.35-100), 100(98.95-100) respectively with no significant difference between them.

It is shown in table 3, figure 3.

Conclusion

It is clear from this study that one can obtain equally good results with total hip arthroplasty using either the lateral approach or the posterior approach. The good results in both groups may be due to the experience of the surgeons who performed their usual approach—an advantage of the ‘randomisation by surgeon’ protocol.

From this study the functional outcome and Trendelenburg

test have statistically no significant difference in both lateral and posterior approach. We believe good surgical technique and awareness of the anatomy of the nerve supply are key factors in preserving good abductor strength.

Further well conducted randomised controlled trials with full reporting of outcomes, blinding of outcome assessors and correct methodology are required to determine the optimum surgical approach for the insertion of a total hip arthroplasty. A future multicenter non inferiority RCT would be valuable to investigate whether there are significant differences in revision rate between total hip arthroplasty with the lateral approach and with the posterior approach.

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