



A COMPARATIVE STUDY OF PRIMARY TOTAL HIP ARTHROPLASTY BY DIRECT LATERAL OR POSTERIOR APPROACHES WITH RESPECT TO FUNCTIONAL OUTCOME

Orthopaedics

Dr. Faiyaz Khan	Assistant Professor, Department of Orthopaedics Jagannath Gupta Institute of Medical Sciences And Hospital, Kolkata
Dr. Nirmal Kumar Dey*	Head of The Department (HOD), Department of Orthopaedics, Jagannath Gupta Institute Of Medical Sciences And Hospital, Kolkata. *Corresponding Author
Dr. Debarshi Jana	Young Scientist (Associate Professor), Institute of Post-graduate Medical Education And Research, A.j.c. Bose Road, Kolkata-700020, West Bengal, India

ABSTRACT

Introduction: Most of the studies focuses on the surgical advantages and disadvantages of the posterior and direct lateral approaches to THA, in addition to identifying the effects of these surgical approaches on global function describing post-operative gait and activities of daily living (ADLs), local function describing muscle strength around the hip and iatrogenic damage of soft tissue around hip. **Aims and Objectives:** To compare functional outcome following primary total hip arthroplasty among geriatric patients between two surgical approaches - direct lateral and posterior approaches. **Material And Methods:** Descriptive follow up study with comparison between two groups of patients operated by direct lateral and posterior approach of THA to be conducted in DEPARTMENT OF ORTHOPAEDICS, JAGANNATH GUPTA INSTITUTE OF MEDICAL SCIENCES AND HOSPITAL, KOLKATA from 18 months. 54 patients were included in this study. **Result:** In Direct lateral Group, 9(33.3%) patients had AVN of femoral head, 13(48.1%) patients had displaced neck of femur fracture and 5(18.5%) patients had osteoarthritis of hip joint. In Posterior Group, 7(25.9%) patients had AVN of femoral head, 7(25.9%) patients had displaced neck of femur fracture and 13(48.1%) patients had osteoarthritis of hip joint. Association of Indication of operation vs group was not statistically significant ($p=0.0606$). **Conclusion:** Month of follow-up was higher in Posterior approach compared to direct lateral approach which was statistically significant.

KEYWORDS

Osteoarthritis, Hip replacement, surgical approach and Posterior.

INTRODUCTION

Most of the studies focuses on the surgical advantages and disadvantages of the posterior and direct lateral approaches to THA, in addition to identifying the effects of these surgical approaches on global function describing post-operative gait and activities of daily living (ADLs), local function describing muscle strength around the hip and iatrogenic damage of soft tissue around hip^{1,2}. Functional outcome can be assessed through gait analysis, strength testing of muscle groups around the hip and imaging of anatomical structures^{3,4}. Objectively, global function encompasses the hip joint as part of the whole body as it fulfills its main purpose in locomotion. The local function of the hip concerns the strength of major muscle groups and ranges of motion (ROM); which are indicative of the health of tissues around the implant. The implant can also be assessed by its positioning in situ, along with the structure of the soft tissue components surrounding the implant. Structural assessment has applications in explaining deficits found in local and global function. Muscle strength importantly gluteus medius plays an essential role in stabilising the joint and preservation of this muscle is important to prevent dislocation and abduction weakness.

It is well documented that the posterior approach (PA) is associated with a higher dislocation rate compared to other approaches. In the PA the gluteus maximus muscle is damaged, as well as tenotomy of the external rotators, potentially resulting in reduced hip extension and external rotation which can cause gait abnormalities, yet these deficits appear to not persist in the long term and may potentially be modifiable by clinical intervention. Posterior approach patients were slower than patients who underwent other approaches but this difference did not last beyond six weeks post-operatively.

The posterior approach is associated with a higher sciatic nerve injury rate, with an incidence of 1.3% and among this only 36% of patients fully recovers. Posterior approach provides excellent exposure of the acetabulum and proximal femur, is extensible and importantly aiding in complicated cases and revisions. Uncemented and cemented fixation of the implant are possible allowing to change between them intraoperatively, does not violate the abductors, thereby minimizing the risk of abductor insufficiency and limping.^{5,6,7}

A major advantage of the direct lateral approach is that the posterior soft tissues of the hip are spared whilst the preserved attachment of gluteus medius to the femur is thought to maintain stability. The dislocation rate for direct lateral THA is almost negligible

approximately 0.4%. The direct lateral approach has been regularly linked to post-operative trendelenburg gait (attributed to disruption of the abductor compartment- gluteus medius and minimus) in approximately 10% of cases when walking and climbing stairs however this often resolves spontaneously. The major disadvantage of lateral approach is early postoperative abductor and internal rotation weakness that can slow rehabilitation, alongside the possibility of persistent abductor weakness and limping if the abductor layer repair fails, or as a consequence of iatrogenic superior gluteal nerve injury. The direct lateral approach has been associated with an intraoperative fracture involving the greater trochanter.

AIMS AND OBJECTIVE

- To compare functional outcome following primary total hip arthroplasty among geriatric patients between two surgical approaches - direct lateral and posterior approaches.

MATERIALS AND METHODS

Study population:

Patients with hip pathology requiring primary total hip arthroplasty attended and admitted in DEPARTMENT OF ORTHOPAEDICS, JAGANNATH GUPTA INSTITUTE OF MEDICAL SCIENCES AND HOSPITAL, KOLKATA during the study period.

Study design:

Descriptive follow up study with comparison between two groups of patients operated by direct lateral and posterior approach of THA.

Period of study: 18 months

Inclusion Criteria-

- Either sex,
- Pathology with destructed hip joint,
- Clinical and radiological diagnosis of hip osteoarthritis resisting to conservative treatment and planned to have a hip replacement,
- Patients who give informed consent and willing for follow up,
- Intra capsular displaced neck of femur fracture.

Exclusion Criteria -

- Patients unfit for surgery,
- History of hip surgery on the hips, major hip dysplasia, neuromuscular disease, pathological fractures,
- Associated comorbid conditions -myocardial infarction in less than 1 year, psychiatric illness, head injury, associated major visceral injury,

4. Patient with existing pain on another joint of the lower limb like severe osteoarthritis of knees.

RESULT AND DISCUSSION

Descriptive follow up study with comparison between two groups of patients operated by direct lateral and posterior approach of THA to be conducted in DEPARTMENT OF ORTHOPAEDICS, JAGANNATH GUPTA INSTITUTE OF MEDICAL SCIENCES AND HOSPITAL, KOLKATA from 18 months. 54 patients were included in this study.

It was found that in Direct lateral Group, 17(63.0%) patients had left Side of operation and 10(37.0%) patients had right Side of operation. In Posterior Group, 12(44.4%) patients had left Side of operation and 15(55.6%) patients had right Side of operation. Association of Side of operation vs group was not statistically significant ($p=0.1723$). In Direct lateral Group, 9(33.3%) patients had AVN of femoral head, 13(48.1%) patients had displaced neck of femur fracture and 5(18.5%) patients had osteoarthritis of hip joint. In Posterior Group, 7(25.9%) patients had AVN of femoral head, 7(25.9%) patients had displaced neck of femur fracture and 13(48.1%) patients had osteoarthritis of hip joint. Association of Indication of operation vs group was not statistically significant ($p=0.0606$).

We found that in Direct lateral Group, 1(3.7%) patients had superficial infection and 1(3.7%) patients had wound hematoma. In Posterior Group, 1(3.7%) patients had superficial infection, 1(3.7%) patients had transient sciatic nerve palsy and 1(3.7%) patients had wound hematoma. Association of Early post-operative complication vs group was not statistically significant ($p=0.7963$). In Direct lateral Group, 8(29.6%) patients had <8m, 17(63.0%) patients had 8-12 m and 2(7.4%) patients had >12. In Posterior Group, 3(11.1%) patients had <8m, 13(48.1%) patients had 8-12 m and 11(40.7%) patients had >12. Association of Surgical approach of THA vs group was not statistically significant ($p=0.0109$).

It was found that in Direct lateral Group, 1(3.7%) patients had dislocation of prosthesis, 2(7.4%) patients had heterotrophic ossification and 2(7.4%) patients had lurching gait. In Posterior Group, 2(7.4%) patients had dislocation of prosthesis. Association of Late postoperative complication vs group was not statistically significant ($p=0.2101$). In Direct lateral Group, 8(29.6%) patients had fair, 14(51.9%) patients had good and 5(18.5%) patients had poor. In Posterior Group, 17(63.0%) patients had excellent, 3(11.1%) patients had fair, 3(11.1%) patients had good and 4(14.8%) patients had poor. Association of Functional outcome and quality of life vs group was statistically significant ($p<0.0001$).

Monzón DG et al⁸ (2014) found that five years postinjury, 57 (61.3%) patients of the original study group were living. In all, 3 (3.2%) patients had postoperative hip dislocations (and 2 patients had dislocation twice) and 2 reoperations were needed within the first postoperative month. There were no hip dislocations or reoperations after the first year. Radiographs obtained on 88% of the surviving patients at 5 years postoperatively showed that all remained unchanged from their immediate postoperative images. Nearly half of the patients were still able to ambulate as they did preoperatively and their mixed-model equation was statistically unchanged.

This study of patients >80 years old with previously good functional status demonstrates that with appropriate surgical (best prosthesis, good operating technique, and regional anesthesia) and geriatric (pre- and postoperative assessments, close follow-up, medication adjustments, and fall-prevention instruction) care, they have few hip dislocations and reoperations, survive postfracture at least as long as their noninjured contemporaries, and continue to function and ambulate as they did prior to their injury.

Güler O et al⁹ (2020) found that there were no statistically significant differences between the LD and S groups in terms of pre- and postoperative height, cup inclination, stem alignment, duration of hospital stay, and follow-up period. The change between pre- and postoperative HHS in the LD and S groups was statistically significant. Post hoc binary comparison analysis was conducted to investigate the difference between the groups. The values of HHS were significantly increased from the preoperative period to the final follow-up. The LD and S groups had comparable functional outcomes one year postoperatively. However, the S group was associated with worse intraoperative outcomes than the LD group.

Our study showed that in Posterior Group, the mean Amount of blood loss (ml) (mean± s.d.) of patients was 405.5556 ± 28.8675 . In Direct lateral Group, the mean Amount of blood loss (ml) (mean± s.d.) of patients was 601.8148 ± 145.5126 . Difference of mean Amount of blood loss (ml) with both Group was statistically significant ($p<0.0001$). In Direct lateral Group, the mean Harris hip score (mean± s.d.) of patients was 77.0000 ± 2.5268 . In Posterior Group, the mean Harris hip score (mean± s.d.) of patients was 87.0741 ± 2.7863 . Difference of mean Harris hip score with both Group was statistically significant ($p<0.0001$).

Rosenlund S et al¹⁰ (2014) found that the posterior approach is associated with an increased risk of revision due to dislocations, and some studies have shown that the lateral approach is associated with reduced patient-reported outcomes, including physical function and pain; however, this has not been investigated in a randomised controlled trial with a twelve-month follow-up. They hypothesized that the lateral approach has an inferior outcome in patient-reported outcome compared with the posterior approach after one year. The trial is a prospective, double blinded, parallel-group controlled trial with balanced randomisation [1: 1]. Patients with hip osteoarthritis scheduled for hip replacement surgery, aged 45–70 years, will be consecutively recruited and randomised into two groups. Group A will receive hip replacement using the posterior approach, and Group B will receive hip replacement using the lateral approach. The primary end-point for assessing the outcome of the two interventions will be twelve months after surgery. Follow-up will also be performed after three and six months. The primary outcome is Hip Disability and Osteoarthritis Outcome Score, subscale of "Physical function Short form" (HOOS-PS) Secondary outcome measures include two other subscales of HOOS ("Pain" and "Hip related Quality of Life"), physical activity level (UCLA activity score), limping (HHS) and general health status (EQ-5D-3L). Explorative outcomes include physical function test, 3D-gait-analysis and muscle strength.

Downing ND et al¹¹ studied the hip abductor strength and Trendelenburg test prospectively in 100 patients in 2001 in Department of Orthopaedics, University Hospital, Queen's Medical Centre, Nottingham, UK found no difference in abductor strength or Trendelenburg test at 12 months post-surgery between PA and direct lateral approach patients.

Edmunds CT1, Boscainos PJ¹² conducted a retrospective analysis of osteoarthritis patients undergoing primary hip arthroplasty in University of Dundee Medical School, Brackenhurst, in UK in 2010. They found posterior approach showed larger improvements in Harris Hip scores but associated with increased incidence of dislocation in the posterior approach group (6.9%).

We found that in Direct lateral Group, the mean Oxford hip score (mean± s.d.) of patients was 29.4815 ± 1.7180 . In Posterior Group, the mean Oxford hip score (mean± s.d.) of patients was 36.9630 ± 2.6236 . Difference of mean Oxford hip score with both Group was statistically significant ($p<0.0001$). In Direct lateral Group, the mean SF-12 score (mean± s.d.) of patients was 53.7778 ± 7.6878 . In Posterior Group, the mean SF-12 score (mean± s.d.) of patients was 58.9630 ± 7.3458 . Difference of mean SF-12 score with both Group was statistically significant ($p=0.0143$).

CONCLUSION

- We found that indication of operation displaced neck of femur fracture was more in Direct lateral approach and osteoarthritis of hip joint was more in Posterior approach though it was not statistically significant.
- Month of follow-up was higher in Posterior approach compared to direct lateral approach which was statistically significant.
- It was found that the mean Operative time was less in Posterior approach compared to direct lateral approach which was statistically significant.
- Amount of blood loss was less in Posterior approach compared to direct lateral approach which was statistically significant.
- Functional outcome and quality of life was higher in Posterior approach compared to direct lateral approach which was statistically significant.
- Harris hip score was higher in Posterior approach compared to direct lateral approach which was statistically significant.
- We found that Oxford hip score was higher in Posterior approach compared to direct lateral approach which was statistically significant.

significant.

- It was found that mean SF-12 score was more in Posterior approach compared to direct lateral approach which was statistically significant.

Table: Association between Indication of operation and Early post-operative complication: Surgical approach of THA

		Direct lateral	Posterior	TOTAL	Chi-square value	P-value
Indication of operation	AVN of femoral head	9 56.3 33.3	7 43.8 25.9	16 100.0 29.6	5.06056	0.0606
	displaced neck of femur fracture	13 65.0 48.1	7 35.0 25.9	20 100.0 37.0		
	osteoarthritis of hip joint	5 27.8 18.5	13 72.2 48.1	18 100.0 33.3		
	TOTAL	27 50.0 100.0	27 50.0 100.0	54 100.0 100.0		
	Row % Col %					
Early post-operative complication	No	25 51.0 92.6	24 49.0 88.9	49 100.0 90.7	1.0204	0.7963
	superficial infection	1 50.0 3.7	1 50.0 3.7	2 100.0 3.7		
	transient sciatic nerve palsy	0 0.0 0.0	1 100.0 3.7	1 100.0 1.9		
	wound hematoma	1 50.0 3.7	1 50.0 3.7	2 100.0 3.7		
	TOTAL	27 50.0 100.0	27 50.0 100.0	54 100.0 100.0		
	Row % Col %					

Table: Distribution of mean Operative time (min) and Harris hip score: Surgical approach of THA

Operative time (min)	Direct lateral	27	84.62 96	6.783 2	75.000 0	90.0000	90.00 00	<0.00 01
	Posterior	27	70.00 00	.0000	70.000 0	70.0000	70.00 00	
Harris hip score	Direct lateral	27	77.00 00	2.526 8	72.000 0	82.0000	76.00 00	<0.00 01
	Posterior	27	87.07 41	2.786 3	80.000 0	90.0000	88.00 00	

REFERENCES

- Hardinge K. The direct lateral approach to the hip. J Bone Joint Surg 1982; 64: 17-9.
- Berstock JR, Blom AW, Beswick AD. A systematic review and meta-analysis of complications following the posterior and lateral surgical approaches to total hip arthroplasty. Ann R Coll Surg Engl 2015; 97: 11-6.
- Weale AE, Newman P, Ferguson IT, Bannister GC. Nerve injury after posterior and direct lateral approaches for hip replacement. J Bone Joint Surg Br 1996; 78: 899-902.
- Madsen MS, Ritter MA, Morris HH, et al. The effect of total hip arthroplasty surgical approach on gait. Journal of orthopaedic research : official publication of the Orthopaedic Research Society. 2004;22(1):44-50.
- Witzleb WC, Stephan L, Krummenauer F et al. Short-term outcome after posterior versus lateral surgical approach for total hip arthroplasty – a randomized clinical trial. Eur J Med Res 2009; 14: 256-263.
- Robinson, R., Robinson, H., Salvati, E. A. Comparison of the transtrochanteric and posterior surgical approaches for total hip replacement. Clin. Orthop. 147:143- 147, 1980.
- Kwon MS, Kuskowski M, Mulhall KJ, et al. Does surgical approach affect total hip arthroplasty dislocation rates? ClinOrthopRelat Res 2006;447:34-38.

- Monzón DG, Iserson KV, Jauregui J, Musso C, Piccaluga F, Buttarro M. Total hip arthroplasty for hip fractures: 5-year follow-up of functional outcomes in the oldest independent old and very old patients. Geriatric orthopaedic surgery & rehabilitation. 2014 Mar;5(1):3-8.
- Güler O, Öztürk S, Özgezmez FT, Çerçi MH. Comparison of Supine and Lateral Decubitus Positions for Total Hip Arthroplasty with the Direct Lateral Approach in Overweight and Obese Patients. BioMed Research International. 2020 Feb 18;2020.
- Rosenlund S, Broeng L, Jensen C, Holsgaard-Larsen A, Overgaard S. The effect of posterior and lateral approach on patient-reported outcome measures and physical function in patients with osteoarthritis, undergoing total hip replacement: a randomised controlled trial protocol. BMC musculoskeletal disorders. 2014 Dec;15(1):1-3.3.
- Downing ND, Clark DI, Hutchinson JW, Colclough K, Howard PW. Hip abductor strength following total hip arthroplasty: a prospective comparison of the posterior and lateral approach in 100 patients. Acta orthopaedicaScandinavica. 2001;72(3):215- 220.
- Edmunds CT, Boscainos PJ. Effect of surgical approach for total hip replacement on hip function using Harris Hip scores and Trendelenburg's test. A retrospective analysis. The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland. 2011;9(3):124-129.