

## A COMPARATIVE STUDY OF FUNCTIONAL OUTCOME AND COMPLICATIONS OF POSTERIOR AND LATERAL APPROACHES FOR HEMIARTHROPLASTY IN DISPLACED FEMORAL NECK FRACTURES

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### Abstract

**Background:** Hemiarthroplasty has been accepted worldwide as the optimal surgical treatment in elderly patients with neck or femur fractures, but there is significant disagreement regarding the optimal surgical approach for the procedure. We evaluated the functional outcome in elderly patients treated with hemiarthroplasty for femoral neck fracture, Moore's posterior and lateral Modified Hardinge approaches. **Materials and Methods:** We prospectively evaluated 52 patients who underwent cemented bipolar hemiarthroplasty for neck of femur fracture with either a modified Hardinge approach (Group 1; n = 25; 15 males, 10 females) or Moore's approach (Group 2; n = 27; 12 males, 15 females). Patients in both groups were compared, and postoperative functional results were evaluated using the Harris hip score (HHS) and 4-item Barthel index at 10 days, 6 weeks, 3 months and 6 months. **Result:** Mean HHS scores and 4-item Barthel index assessment were comparable in Groups 1 and 2, during clinical assessment at 10 days, 6 weeks, 3 months and 6 months ( $p > 0.05$ ). Moore's approach used smaller incisions ( $p = 0.03$ ) and less surgical time ( $P = 0.05$ ) than the modified Hardinge group. After a dorsal approach, 25.9 % of the patients suffered one or more early complications, and in the lateral group, this proportion was 12 %, which was not significantly different ( $P = 0.20$ ). **Conclusion:** Hemiarthroplasty with bipolar prosthesis through either Moore's approach or a modified Hardinge approach in the elderly produces good functional outcomes. Moore's approach consumed less surgical time and patients were mobilised early, while the modified Hardinge approach had fewer overall complications.

## INTRODUCTION

Fracture neck of the femur is one of the most devastating complications of osteoporosis and has profound healthcare implications regarding patient care. There is considerable morbidity associated with it, and it also has economic implications regarding healthcare expenditure. The population of elderly patients with femoral neck fractures comprises several subpopulations, ranging from the lucid, relatively healthy, active and independently living patient with a long-life expectancy to the institutionalised, cognitively impaired and bedridden patient with a substantially shorter life expectancy. The preferred method for the elderly is hemiarthroplasty, unipolar or bipolar, according to an

international survey. Unfortunately, there was significant disagreement regarding the optimal surgical approach to managing active elderly patients between 60 and 80 years of age.<sup>[1]</sup> There are different approaches to hemiarthroplasty. The standard approaches are Moores (dorsal/posterior), Hardinge/Modified Hardinge (lateral), Watson-Jones (anterolateral) and Smith-Peterson (anterior). They all seem to have several advantages, and every modification leads to new problems.<sup>[2]</sup> Most studies comparing surgical approaches include only total hip arthroplasty and are not necessarily valid for hemiarthroplasty.

Hemiarthroplasty is most commonly performed through a posterior or a direct lateral approach, but its impact on the invention's outcome has not yet been quantified. 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 from being drawn. The dislocation rate is a common discriminative endpoint used to determine the clinical effectiveness between the lateral and posterior approaches.<sup>[3]</sup> This has to be considered a limitation since all types of complications should be evaluated when investigating surgical techniques. Intuitively, patients are more satisfied with surgery and experience better quality of life if they do not experience a post-operative dislocation. Available literature comparing these approaches in total hip arthroplasty suggests more dislocation rates in the posterior approach cohort and abductor insufficiency in lateral approach patients.<sup>[4]</sup> The present study was undertaken to evaluate patient-related outcomes and other parameters related to surgery in patients undergoing hemiarthroplasty via Modified Hardinge of Moore's approach.

## MATERIALS AND METHODS

The study design was a longitudinal study in a single institution, Pushpagiri Institute of Medical Sciences, from February 2015 to May 2016. The study was conducted on all patients above 60 years with neck of femur fracture undergoing bipolar cemented hemiarthroplasty

After institutional ethics committee approval with reference number PIMSRC/E1/388A/9/2015, a consecutive series of patients with a fractured neck of femur were randomly allocated into two groups depending on the day of admission. In the Lateral group, the intervention consisted of a Modified Hardinge approach to the hip with implantation of a bipolar endoprosthesis and in the Posterior group, a Moore Southern approach was chosen to implant the same type of endoprosthesis.

The lateral approach was done through the modified Hardinge approach. The patient was positioned in the lateral decubitus position. The approach entailed a longitudinal skin incision centred over the greater trochanter. The fascia lata was incised in line with the skin incision. A one-third anterior, two-third posterior split was made in the gluteus medius muscle down to the bone in a C-shaped incision, sparing some tendinous tissue at the greater trochanter for reattachment. The limb was kept in flexion and external rotation in a sterile bag, and the femoral head was retrieved with the help of a corkscrew. After delivering the head and sizing it, femur neck cut was made, and femur was prepared in the usual fashion. After implantation, the tendinous tissue was re-attached at the greater trochanter, and the wound was closed in layers. Careful attention was taken when closing the gluteus medius to prevent post-operative abductor insufficiency.

The posterior approach utilised the technique popularised by Moore. The patient was positioned in

the lateral decubitus position. A skin incision extended along the posterior aspect of the greater trochanter, curving towards the posterior superior iliac spine. The fascia overlying the gluteus maximus was incised in line with the skin incision. The gluteus maximus was bluntly dissected down to the short external rotators. The sciatic nerve was protected with soft tissue retraction without formal exploration. The short external rotators and piriformis were detached close to their femoral insertion, leaving one centimetre of the muscle tissue at the greater trochanter for re-attachment. The capsule was incised, and after flexing the knee to 90 degrees and internally rotating the femur, the head was delivered with a corkscrew followed by femoral neck osteotomy. Femoral canal was prepared, and prosthesis implantation was carried out. After implantation, the posterior capsule was re-attached to the greater trochanter together with the short external rotators and the wound was closed in layers.

Standard antibiotic prophylaxis was used for both groups, and the same post-operative protocols were utilised for mobilisation. Follow-up evaluations were done at 10 days, 6 weeks, 3 months and 6 months, and data was collected. The data included four four-item Barthel index with the scoring system as described by Granger<sup>5</sup> with a minimum score of 5 and a maximum of 50, focusing on lower extremity motor function and Harris Hip Score<sup>6</sup> to assess the hip function. An anterior-posterior pelvis and lateral hip radiograph were taken during the follow-up appointment to assess implant positioning. A one-way ANOVA was used to compare 10 days, 6 weeks, 3 months, and 6 months outcome measures (Harris Hip Score, 4-item Barthel index). All continuous data satisfied the normality assumption; thus, only parametric analysis was performed. Continuous outcome data between groups were analysed with a 2-sample t-test. Continuous variables will be expressed as mean and standard deviation. Comparison was done by independent t-test or ANOVA. A probability of value < 0.05 was considered significant for all statistical evaluations.

## RESULTS

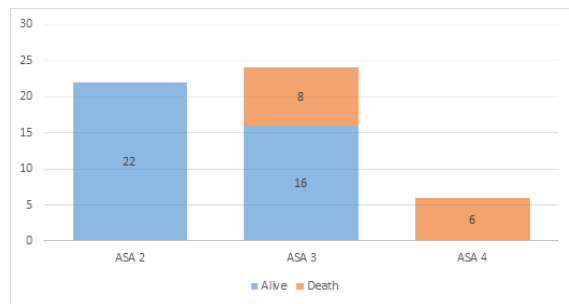
A total of 52 patients, 27 males and 25 females, underwent hemiarthroplasty for displaced neck of femur fracture at Pushpagiri Institute of Medical Science, Thiruvalla, between February 2015 and May 2016. 27 patients were treated with a posterior approach and 25 patients with a lateral approach. There were 14 deaths, seven in each group, during the follow-up of 6 months. The rest of the patients were available till the end of the study period, and none were lost during follow-up. 55.55% of the males underwent the modified Hardinge approach, whereas 60% of the females underwent the posterior Moore's approach. Of the total 52 patients, the right side was involved in 32 patients (61.54%), while the left side was involved in 20 patients (38.46%). Out of the

females, 72% of them had the left side involved, but in males, only 48% had the left side involved.

The average incision length was 18.88 cm (SD 1.9) in the lateral group, while the posterior group had a mean of 17.77cm (SD 1.6). It was found to be statistically significant, with a p-value of 0.036.

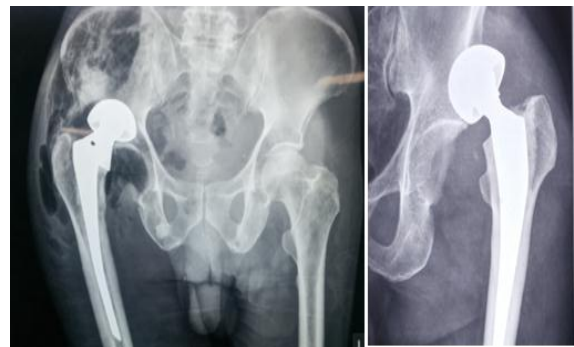
The mean duration for the lateral procedure was 98.20 minutes (SD 13.29), while the mean time required for the posterior group was 75.37 minutes (SD 11.76). This was found to be statistically significant with a p-value less than 0.05. The mean Hb drop (difference in pre-operative Hb value and POD 1 Hb value) in the lateral group was 1.36 (SD 0.6), and in the posterior group was 1.61 (SD 0.57). The Hb drop was seen more in the posterior group but was not statistically significant (p=0.09) compared to the lateral group.

Weight-bearing mobilisation with walker support was encouraged as soon as tolerated by the patient. The time taken for ambulation with support in the lateral group was 5.4 days (SD3.8), and the mean in the posterior was 2.4 days (SD1.5). This was found to be statistically significant at a p-value of 0.005. The mortality among the group at 6 months was 14, 7 in the posterior and 7 in the lateral groups. The mortality correlated with ASA grade as there was 100% mortality in ASA grade 4, 33% in ASA grade 3 and none in ASA grade 2.



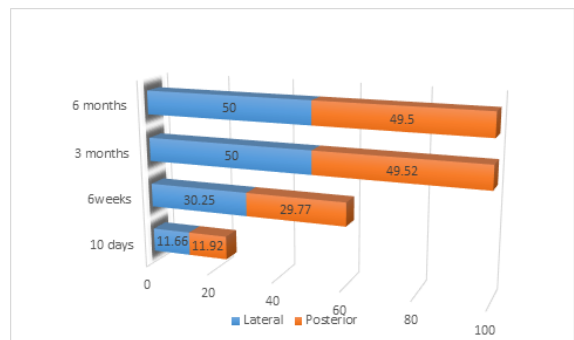
**Figure 1: Death registered in the study population among different ASA Grades.**

A total of 3 patients had superficial infection, two in the posterior group and one in the lateral group. One patient in the posterior group had a deep infection, leading to a dislocation of the prosthesis. Another patient from the posterior group who sustained a fall during the immediate postoperative period had a dislocation, which was reduced successfully. At the end of the study period, 2 patients in the lateral group had Trendelenberg gait.

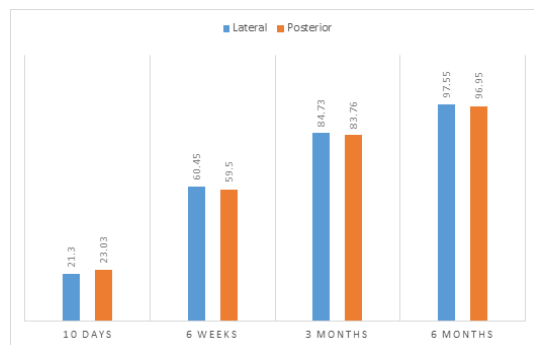


**Figure 2: Dislocation due to (a) infection and (b) trauma**

The 4-item Barthel index is comparable between the groups during all the follow-ups. At 10 days, the average Barthel index in the posterior group (11.92) was better in the posterior group compared to 11.66 for the lateral group (p= 0.815). By 6 weeks, the lateral group showed a better index with a mean of 30.25 compared to 29.77 in the posterior group (p=0.821). By the third month, the lower motor function improved significantly in both groups, reaching the max of 50 in the lateral group and a mean of 49.52 in the posterior group (p=0.342). By the end of 6 months, both the groups had similar outcomes, with a mean value of 49.5 in the posterior group and 50 in the lateral group (p=0.343). During the period between day 10 and 6 weeks, the lateral group had comparatively better progress, with a mean difference of 18.59 compared to 17.85 for the posterior group. Between 6 weeks and 3 months, both the groups showed similar improvement, with an average improvement of 19.75 points in each group.



**Figure 3: 4-item Barthel's index.**



**Figure 4: Harris Hip Score.**

At the end of 10 days, the Harris Hip Score for the posterior group was better at 23.03 compared to the lateral group, with a mean score of 21.3. By six weeks, the lateral group (60.45) showed better function than the posterior group (59.5). There was an improvement of 39.15 points in the lateral group compared to 36.47 points in the posterior group. By

3 months, both groups showed approximately 24 improvement points and had good outcomes. Towards the end of the study, almost all patients had excellent outcome in both groups. The functional outcome did not show any statistically significant difference between the groups during any of the follow-ups.

**Table 1: Perioperative parameters and outcome measures.**

	Lateral	Posterior	p value
Incision Length; cm (Mean ± SD)	18.88 ± 1.9	17.77 ± 1.6	0.036*
Duration of surgery; min (Mean ± SD)	98.2 ± 13.29	75.37 ± 11.76	0.050*
Mobilization, days;(Mean ± SD)	5.4 ± 3.8	2.4 ± 1.5	0.005*
Hb drop (Mean ± SD)	1.36 ± 0.6	1.61 ± 0.57	0.090
Mortality n (%)	7 (25.9 %)	7 (28%)	0.556
Dislocation n (%)	0	2 (8%)	0.265
Trendelenberg Gait n (%)	2 (7.4%)	0	0.265
Nerve palsy n (%)	0	1 (4%)	0.519
Superficial infection n (%)	1 (3.7%)	2 (8%)	0.529
Deep infection n (%)	0	1 (4%)	0.519
Harris Hip Score (Mean)			
10 days	21.37	23.03	0.096
6weeks	60.45	59.5	0.334
3months	84.73	83.76	0.667
6months	97.55	96.95	0.592
4 item Barthels index (Mean)			
10 days	12.17	11.92	0.815
6weeks	30.25	29.77	0.821
3 months	50	49.52	0.342
6 months	50	49.50	0.343

\* Statistically significant.

## DISCUSSION

Fracture neck of femur treatment in the elderly is still one of the challenging problems for Orthopaedic surgeons around the world. Clinical studies have demonstrated the importance of associated comorbidities. Many options are available to treat fracture neck of the femur in the elderly population. The most common being hemiarthroplasty. The present study assessed whether choosing a lateral or posterior surgical approach during hemiarthroplasty would alter the functional outcomes in neck of femur fractures.

The age distribution of the 52 patients in the study group was similar to previously published literature by Arwade et al,<sup>[7]</sup> Bavadekar and Manelkar.<sup>[8]</sup> Although published literature (Choudhari and Mohite 1987) shows neck of femur fracture is more common in females,<sup>[9]</sup> our series showed a slightly more male preponderance with 52%.

The average incision length was 18.88 cm (SD 1.9) in the lateral group and 17.77cm (SD 1.6) in the posterior group and was found to be statistically significant with a p-value of 0.036. The only literature that mentions the comparison on the length of incision was done by W.C Witzleb et al,<sup>[10]</sup> which was done in Total Hip Arthroplasty for osteoarthritis patients. Literature on the length of incision in neck of femur fracture hemiarthroplasty was not available for comparison. The mean duration of surgery in the lateral group was 98.20 minutes (SD 13.29), and for the posterior group was 75.37 minutes (SD 11.76). It was found to be statistically significant with a p-value

less than 0.05. This was found to be comparatively longer duration than the conventional studies.

A total of 13 patients received blood transfusion postoperatively, 24% of the patients in the lateral group and 25.9% in the posterior group. (p-value 0.56) which was comparable to previous studies (Desai SJ, Wood KS et al.).<sup>[11]</sup>

Our study observed that the time taken for ambulation with walker support in the lateral group was 5.4 days (SD3.8), and in the posterior was 2.4 days (SD1.5). This was found to be statistically significant at a p-value of 0.005. The post-operative infection rate was similar to published literature in our series, with 3 superficial infections in both groups included and one deep infection with dislocation in the posterior group, eventually leading to the patient's death.

We had two dislocations post-operatively, both in the posterior group, one after a history of fall and one after deep infection. Although there were no dislocations in the lateral group, two patients had a persistent Trendelenberg gait at the end of 6 months. These findings are similar to the study published by Zehir S et al,<sup>[12]</sup> which evaluated the functional status and postoperative complications of bipolar hemiarthroplasty patients with femoral neck fractures operated using anterior and posterior approaches. They had more dislocations and infection in the posterior approach group. Similar findings were reported by Bush et al,<sup>[13]</sup> who had a 4.5% (P < .0033) dislocation rate in the posterior group. A comparison of the posterior and lateral approach by Svenoy S et al,<sup>[14]</sup> reported an 8-fold increase in dislocation rate

with the posterior approach and advised against its continued use. Roland Biber et al,<sup>[15]</sup> analysed a cohort including 704 consecutive patients who received HA for femoral neck fracture. After a dorsal approach, 10.5 % of the patients suffered one or more early complications. Following a transgluteal approach, this proportion was 9.7 %, which was not significantly different. The predominant complication after a dorsal approach was dislocation. As measured by Harris Hip Score and 4-item Barthel's index, functional outcome failed to show any significant difference between the groups except for a difference at day 10, more in the posterior group. By six weeks, the lateral group improved better than the posterior group in both functional outcome measures. Towards the end of the study, almost all patients had excellent outcomes in both groups. Parker et al,<sup>[15]</sup> published a study in patients treated with hemiarthroplasty after a fracture neck of femur. Patients were randomly assigned to the Direct lateral or posterior approach, and the author found no difference in functional outcome or complications. Firat Ozan et al,<sup>[15]</sup> 84 retrospectively evaluated 233 patients who underwent cement-less bipolar HA for proximal femoral fracture with either a Hardinge approach or a Moore approach. For both groups, the mortality rate of patients with ASA scores of 3-4 was non-significantly higher than that of patients with ASA scores of 1-2. Mortality increased significantly with the increasing number of comorbidities. The finding was similar to our series in which the mortality at 6 months was 100% in the ASA 4 patients, 33% for the ASA3 group and zero for the ASA 2 group at 6 months. There were 14 deaths during the study period. Two patients expired before the first follow-up. The number of deaths during each follow-up was at 8, 2, 2 during 6 weeks, 3 months, 6 months follow up, respectively. It was noted that, out of the 11 patients who could not be mobilised in the initial 10 days, 9 patients (81.8%) suffered death within 6 months. This points out the importance of having an immediate post-operative mobilisation protocol in the algorithm of hemiarthroplasty management.

## CONCLUSION

This study has been unable to demonstrate a difference in the functional outcomes of patients treated with the posterior approach when compared to the lateral approach. Dislocation was seen only in the posterior group in this study, but the complications arising from both procedures were within acceptable limits and were not statistically significant. Regardless of the approach used, fracture

neck of femur patients have been found to have comparatively higher morbidity and mortality.

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