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## Original Research Article

## Comparison of outcomes in patients undergoing hemiarthroplasty of the hip joint by posterior versus lateral approach

Malwinder Singh<sup>1\*</sup>, Pankaj Mahindra<sup>2</sup>, Rajnish Garg<sup>2</sup>, Harpal Singh Selhi<sup>2</sup><sup>1</sup>Dept. of Orthopedics, Max Super Speciality Hospital, Bathinda, Punjab, India<sup>2</sup>Dept. of Orthopedics, Dayanand Medical College & Hospital, Ludhiana, Punjab, India

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## ABSTRACT

**Aim and objective:** To evaluate the functional outcome in the immediate post-operative period as well as at 4 weeks, 8 weeks, 3 months and 6 months in patients undergoing Hemiarthroplasty using the posterior and lateral approaches and to statistically establish the difference in the mean outcome between the two approaches, if any.

**Background:** Hip fractures are expected to rise from 1.6 million in 2000 to 6.26 million by 2050, posing serious health hazards, especially for the elderly. In elderly persons, low-energy falls resulting from reduced bone density cause the majority of femoral neck fractures; in younger patients, high-energy trauma is usually the cause. Hemiarthroplasty and total hip arthroplasty are the two surgical management options available. The former is recommended due to its speedier recovery time and less traumatic procedure; this is especially important for older patients. The purpose of this research is to evaluate the functional results of hemiarthroplasty patients treated using posterior versus lateral surgical techniques.

**Materials and Methods:** Total 83 patients undergoing Hemiarthroplasty of the hip joint in Dayanand Medical College & Hospital, Ludhiana from 1<sup>st</sup> January 2021 through 31<sup>st</sup> March 2022 were evaluated for peri-operative blood loss, operating time, length of hospital stay, as well as evaluated using the HHS in the immediate post-operative period and then at 4 weeks, 8 weeks, 3 months & 6 months and for incidence of complications, to compare the outcome in patients operated using the posterior and lateral approaches.

**Results:** 83 patients were analyzed at final follow-up and majority of the study population was elderly with 90.36% of the patients aged 60 years or above. The study population was almost equally divided between 43 female patients (51.80%) and 40 male patients (48.19%). 32 patients were operated using the lateral approach and 52 patients with the posterior approach. Posterior approach was fared marginally better in terms of intra-operative blood loss, operating time, start of weight bearing, HHS and functional outcome at the final follow-up. Lateral approach was found to be slightly in terms of duration of hospital stay. The difference between both the approaches was not statistically significant for any of the above parameters.

**Conclusion:** Our study found no statistically significant difference between the lateral or posterior approaches for Hemiarthroplasty based on the functional outcomes or incidence of complications, with neither of the approaches providing a clear advantage over the other. As a result, it is recommended that the choice of the surgical approach should rather be based on expert opinion based on surgeon preference and experience.

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## 1. Introduction

Hip fractures are a common source of morbidity around the world, especially among the older age group. Globally,

\* Corresponding author.

E-mail address: [malwinder25@gmail.com](mailto:malwinder25@gmail.com) (M. Singh).

an estimated 1.6 million hip fractures occurred in the year 2000, accounting for approximately 20% of all fractures in people aged 50 and older.<sup>1</sup> The number is estimated to rise to about 6.26 million per year by the year 2050.<sup>2</sup> The epidemiological data varies by country, but hip fractures are expected to affect approximately 18% of women and 6% of men worldwide. Although age-standardised incidence is gradually declining in many countries, this is far outweighed by population ageing.<sup>3</sup>

In the elderly, femoral neck fractures are associated with low energy falls<sup>4</sup> mostly owing to decreased bone density in the older age group, especially elderly females.<sup>5</sup> In younger patients, the cause of a femoral neck fracture is usually secondary to high-energy trauma, such as a fall from a considerable height or a road traffic accident.

Patients suffering from a hip fracture, especially elderly patients, are at a high risk of death, health complications and reduced quality of life. Despite the high frequency of the injury, the way in which surgical management of displaced femoral neck fractures in elderly patients needs to be done remains uncertain.<sup>6</sup> Options include hemiarthroplasty, which involves replacing the femoral head with prosthesis, or total hip arthroplasty, which involves replacement of both the femoral head and the acetabulum with prostheses.<sup>7</sup>

Hemiarthroplasty requires different considerations than total hip arthroplasty. In the latter, clear exposure of both the femur and the acetabulum is required, necessitating a relatively extensive exposure. Because patients are generally older and more vulnerable to anaesthetics and surgical procedures, hemiarthroplasty requires a quick but effective operation with the least amount of trauma and physiological upset. Many surgical approaches to the hip have been described.<sup>8</sup>

The aim of the present study was to compare between the functional outcome in patients operated for Hemiarthroplasty with the lateral and posterior approaches.

## 2. Materials and Methods

It was a prospective study, conducted on patients admitted in the department of Orthopaedics, Dayanand Medical College & Hospital and Ludhiana during the time period from 1<sup>st</sup> January 2021 through 31<sup>st</sup> March 2022 who underwent Hemiarthroplasty. Collection of data was as per the standard performa with informed consent obtained from patients.

The variables studied were age of the patients, sex, employment status, mode of injury, ASA grade, Garden type of the fracture, time lag between the injury and the surgery, surgical approach used (whether posterior or lateral), type of implant used (whether cemented or uncemented), duration of the surgery, intra-operative blood loss, time of start of full weight bearing (with support and without support) from the day of the surgery, the Harris Hip Score (HHS) noted periodically at <5 days, 4 weeks, 8 weeks, 3 months and 6 months from the date of surgery (and the functional outcome

grade inferred from the final Harris Hip Score) and the incidence of complications (Refer Cases 1 - 3 added as an illustration).

### 2.1. Inclusion criteria

In this study all patients which diagnosed as having fracture of neck of Femur and getting operated for Hemiarthroplasty using the posterior or lateral approach, Patients who had given consent to undergo the procedure and are willing for follow-up, Patients who could be followed-up up to 6 months duration were included.

### 2.2. Exclusion criteria

In this study patient with Revision surgery, Contralateral Hip surgery, Pathological fractures, Hemiarthroplasty done using approaches other than the posterior and lateral approach were excluded.

### 2.3. Methodology

The trauma patients reporting to the casualty diagnosed with fracture of neck of Femur were be initially managed as per the ATLS protocol. After appropriate initial management and imaging and other routine investigations, the patients were operated for Hemiarthroplasty as a permanent fixation method. Physiotherapy like full weight bearing walking with walker of the affected side and quadriceps exercises were started as early as possible post-operatively. Patients were initiated into the study after obtaining necessary informed consent and serial follow up of the patients was made at 4 weeks, 6 weeks, 3 months, 6 months and the data was recorded in a standard Performa. Data was compiled and was subjected to appropriate statistical analysis.

## 3. Results

32 patients were operated using the lateral approach and 52 patients were operated with the posterior approach. A total of 83 patients were analyzed (Table 1) at the final follow-up and the majority of the study population was elderly with 90.36% of the patients aged 60 years or above. 43 patients (51.80%) were female and 40 patients (48.19%) were male. The mean age of patients operated with lateral approach was 70.74 years (SD 10.51) and of patients operated with posterior approach was 73.54 years (SD 10.25). Domestic fall or fall on level ground was the mode of injury in an overwhelming number of patients (79 patients; 95.18% of the total patients). Fractures of 28 patients (33.73%) belonged to Garden type 3 and fractures of 55 patients (66.26%) belonged to Garden type 4. Patients who had better initial ASA grades had better functional outcomes and this difference was observed to be approaching statistical significance. Cemented bipolar implants were used in 72 patients (86.74%), while uncemented bipolar implants were

used in 11 patients (13.25%). Group of patients with the incidence of any complication had statistically significant poorer functional outcomes compared with patients in whom no complication was observed during the course of our follow-up.

Posterior approach was found to be marginally better than lateral approach in terms of intra-operative blood loss, operating time, start of weight bearing (with and without support), HHS as periodically noted during the follow up and functional outcome at the final follow up, but the difference was not statistically significant. Lateral approach was found to be slightly better than posterior approach in terms of duration of hospital stay, but the difference was not statistically significant. There was no statistically significant difference for the incidence of complications between the two approaches. The only cases of foot drop and hip dislocation were seen in patients operated with the posterior approach. Functional outcome was slightly better among patients in whom uncemented implant was used, but the difference was not statistically significant (Tables 1, 2, 3, 4 and 5).

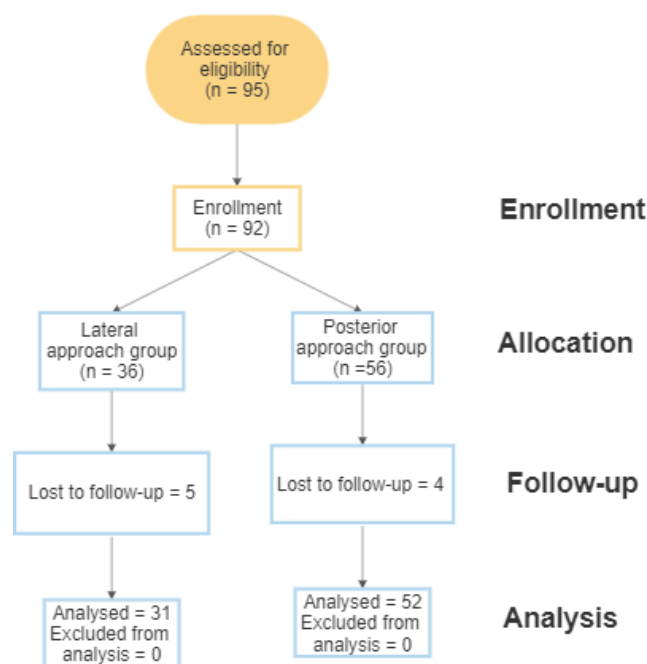


Diagram 1: Study protocol

## 4. Case illustrations

### 4.1. Case number 1

Patient with good functional outcome (Figures 1, 2 and 3)

1. Serial number: 9
2. Age/Sex: 63 year old, female

3. Mode of injury: Sustained fracture of right side neck of Femur due to a fall on level ground
4. Approach used: Posterior
5. Implant type: Cemented
6. Duration of surgery: 115 minutes
7. Intra-operative blood loss: 500 ml
8. Final outcome: Good

### 4.2. Case number 2

Patient with good functional outcome (Figures 4 and 5)

1. Serial number: 42
2. Age/Sex: 69 year old, female
3. Mode of injury: Sustained fracture of left side neck of Femur due to a fall on level ground
4. Approach used: Posterior
5. Implant type: Cemented
6. Duration of surgery: 135 minutes
7. Intra-operative blood loss: 400 ml
8. Final outcome: Good

### 4.3. Case number 3

Patient with good functional outcome (Figures 6, 7 and 8)

1. Serial number: 1
2. Age/Sex: 82 year old, male
3. Mode of injury: Sustained fracture of right side neck of Femur due to a fall on level ground
4. Approach used: Lateral
5. Implant type: Cemented
6. Duration of surgery: 120 minutes
7. Intra-operative blood loss: 500 ml
8. Final outcome: Good

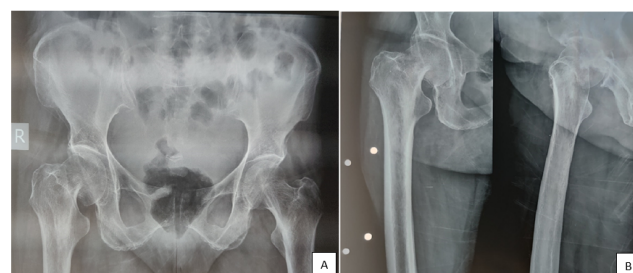


Figure 1: A): pre-operative PBH AP view, B): Pre-operative AP and lateral view of hip with thigh

## 5. Discussion

It was a prospective study in which we enrolled 92 patients who had sustained a fracture neck of the femur and were operated for Hemiarthroplasty of the Hip. The patients were then followed up on and after attrition a total of

**Table 1:** Baseline characteristic of both the groups

		Lateral approach		Posterior approach		P-value
Age (Mean±SD)		70.74	10.51	73.54	10.25	
Gender (n%)	Female (n%)	14	45.20%	29	55.80%	
	Male	17	54.80%	33	44.20%	
Garden type (n%)	3	9	29.00%	19	36.50%	
	4	22	71.00%	33	63.50%	
Implant used (n%)	Cemented	26	83.90%	46	88.50%	
	Uncemented	5	16.10%	6	11.50%	
Anaesthesia administered (n%)	CSE	3	9.70%	3	5.80%	
	SA	28	90.30%	49	94.20%	
Start of full weight bearing (days) (Mean±SD)	With support	2.19	1.11	1.85	0.87	0.117
	Without support	38.77	10.73	37.67	8.65	0.512
Complications (n%)	Foot drop	0	0.00%	1	1.90%	0.7
	Hip dislocation	0	0.00%	1	1.90%	
	Infection	4	12.90%	5	9.60%	
	Nil	27	87.10%	45	86.50%	
Time lag between injury and surgery (days) (Mean±SD)		4.03	7.26	4.87	12.75	0.74
Duration of surgery (minutes) (Mean±SD)		123.06	13.89	122.31	15.23	0.822
Intraoperative blood loss (ml) (Mean±SD)		420.97	77.82	406.73	68.62	0.386
Duration of hospital stay (days)(Mean±SD)		8.13	1.43	8.35	1.47	0.512

**Table 2:** Mean Harris Hip score at follow-up in patients operated with lateral and posterior approach

	Lateral approach		Posterior approach		P-value
	Mean	SD	Mean	SD	
HHS (5 days)	27.81	2.75	27.48	4.09	0.512
HHS (4 weeks)	41.32	4.89	42.92	5.20	0.170
HHS (8 weeks)	55.97	8.11	55.40	7.96	0.757
HHS (3 months)	66.13	7.76	67.65	7.27	0.370
HHS (6 months)	75.06	6.86	76.37	4.85	0.316

**Table 3:** Difference of mean harris hip score from the previous baseline value as observed during follow up in patients operated with lateral and posterior approach

	Lateral approach		Posterior approach		P-value
	Mean	SD	Mean	SD	
Difference HHS (4 weeks)	47.26	8.16	48.88	6.62	0.324
Difference HHS (8 weeks)	33.74	8.66	33.44	6.82	0.862
Difference HHS (3 months)	19.10	9.37	20.96	8.30	0.348
Difference HHS (6 months)	8.94	7.04	8.71	6.73	0.886

**Table 4:** Correlation of approach used with functional outcome

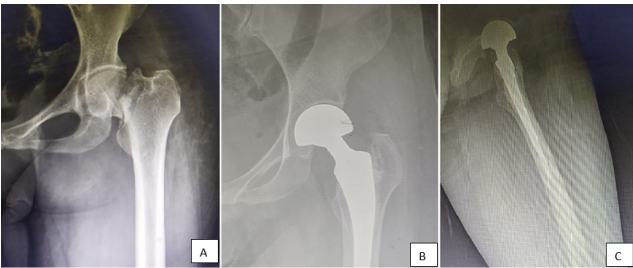
Approach used	Functional outcome						Total	P value
	Good	Fair	Poor					
Lateral	5	16.12%	23	74.19%	3	9.67%	31	0.554
Posterior	13	25.0%	36	69.23%	3	5.77%	52	
Total	18	21.68%	59	71.08%	6	7.22%	83	

**Table 5:** Association between functional outcome and study parameters

		Functional outcome						Total	P value
		Good		Fair		Poor			
Approach used	Lateral	5	16.12%	23	74.19%	3	9.67%	31	0.554
	Posterior	13	25.00%	36	69.23%	3	5.77%	52	
Age	<60	3	37.50%	5	62.50%	Nil	-	8	0.596
	61-70	4	13.33%	24	80%	2	6.66%	30	
	71-80	5	19.20%	19	73.77%	2	7.69%	26	
	>80	6	31.57%	11	57.87%	2	10.52%	19	
Sex	Female	9	20.93%	30	69.76%	4	9.30%	43	0.75
	Male	9	22.50%	29	72.50%	2	5.00%	40	
Mode of injury	Domestic fall	18	22.78%	55	69.62%	6	7.59%	79	0.425
	RTA	0	-	4	100%	0	-	4	
Garden type	III (3)	8	28.57%	18	64.28%	2	7.14%	28	0.549
	IV (4)	10	18.18%	41	74.54%	4	7.27%	55	
ASA grade	2	3	10.34%	26	89.65%	0	-	29	0.084
	3	13	28.88%	27	60.00%	5	11.11%	45	
	4	2	22.22%	6	66.66%	1	11.11%	9	
Cemented (Mean ±SD)	Cemented	15	20.83%	51	70.83%	6	8.33%	72	0.576
Uncemented (Mean ± SD)	Uncemented	3	27.27%	8	72.72%	0	-	11	
Complications	Foot drop	0	-	0	-	1	100%	1	0.008
	Dislocation	0	-	1	100%	0	-	1	
	Infection	2	22.22%	5	55.55%	2	22.22%	9	
	Nil	16	22.22%	53	73.61%	3	4.10%	72	

**Figure 2:** Post-operative AP view of hip with thigh at 1 day after surgery**Figure 3:** Assessment of functional outcome and range of motion at final follow-up





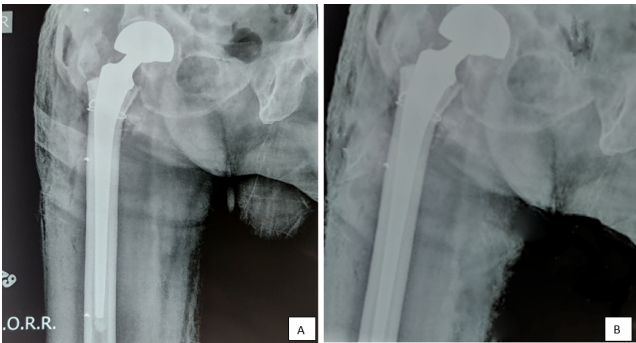
**Figure 4:** A): Pre-operative AP view of hip with thigh, B): Post-operative AP view of hip with thigh at 1 day after surgery, C): Post-operative X-ray of hip with thigh at 6 months after surgery



**Figure 5:** Assessment of functional outcome and range of motion at final follow-up



**Figure 6:** A): Pre-operative PBH AP view, B): Pre-operative AP and lateral view of hip with thigh



**Figure 7:** A): Post-operative AP view of hip with thigh at 2 days after surgery, B): Post-operative ap view of hip with thigh at 6 motnhs after Surgery



**Figure 8:** Assessment of functional outcome and range of motion at final follow-up

83 patients were analyzed in accordance with the study protocol. (Diagram 1).

Out of 83, 43 (51.80%) were female and 40 (48.19%) were male patients. The age of the patients ranged from 43 to 99 years, with the average age being 72.49 years. The study by Prasad et al.,<sup>9</sup> had 80 patients out of which 32 were males and 48 were females with age ranging between 50 to 80 years of age and with a mean age of 64.30 years for the lateral approach group and 65.85 years for the posterior approach group. Hongisto et al.,<sup>10</sup> included 393 patients

with fragility femoral neck fracture, who were aged 65 years or more with a mean of

82.8 years of age. Parker et al.,<sup>11</sup> performed their study on 216 patients who had undergone a cemented Hemiarthroplasty. The patients were aged between 61 and 100 years and the mean age was 84.3 years for lateral approach and 83.6 years for posterior approach. Higher incidence of fractures of neck of femur among elderly patients is attributable to lower BMD, thinning of superolateral femur neck cortex and comparatively increasing risk of fall.<sup>12</sup>

Of the 83 patients included in our study, 79 patients (95.18%) had sustained the injury due to fall on level ground and only 4 (4.81%) reported the injury due to a road traffic accident, thereby confirming fall as the major etiology for fracture of neck of femur in the elderly, due to both increased skeletal fragility and an increased tendency to fall with age (Table 5).<sup>13–15</sup>

### 5.1. Outcomes

Gender of the patient was found to be having no bearing on the final functional outcome ( $p$ -value = 0.75) and occurrence of good functional outcomes were in the same range in both groups.

There was a trend of more incidence of poorer outcomes with increasing age of the patients, although the difference was still statistically insignificant ( $p$  value = 0.596).

There was no significant difference in the outcomes when correlated with the degree of displacement of the fracture based on the Garden type. The occurrence of Fair to good and poor functional outcomes was similar whether the fracture was Garden type 3 or Garden type 4 ( $p$ -value = 0.549).

Patients with better ASA grades to start with understandably had better occurrence of fair to good functional outcomes, no patient with an ASA grade of 2 had a poor functional outcome at final follow up. Patients with an ASA grade 3 had more percentage of good functional outcomes as compared with those with ASA grade 4 at final follow up. The difference was observed to be approaching statistical significance ( $p$  value = 0.084).

Patients in whom there was incidence of complications (infection, foot drop, dislocation etc.) during the course of our follow-up, functional outcome was poorer compared to those in whom no complication was seen. The difference was statistically quite significant ( $p$ -value = 0.008) and could be attributable to guarded weight bearing and a general decline in well-being of the patient owing to the said complications (Table 1).

In view of the main aim of our study to assess the functional outcome of the patients operated with Hemiarthroplasty and to compare between the lateral and posterior approaches, we periodically noted the Harris Hip scores of the patients at <5 days after the surgery and then at

4 weeks, 8 weeks, 3 months and 6 months. We categorized the patients based on their HHS obtained at the final follow-up at 6 months as Excellent (HHS >90), Good (HHS 80–89), Reasonable/Fair (HHS 70–79) and Poor (HHS <70). In lateral approach group outcome was good in 16.12% and overall functional outcome was fair to good in 90.32% patients. In posterior approach group outcome was good in 25% patients and overall functional outcome was fair to good in 94.23% patients (Tables 2 and 4).

Although the functional outcome was found to be slightly better in patients operated with posterior approach, it was statistically insignificant ( $p$ -value = 0.554). We also calculated the difference of the observed value of HHS from the previous baseline value and compared between the two groups, the difference between the two groups was found to be statistically insignificant as well. ( $p$ -values were 0.324, 0.862, 0.384, 0.886 at 4 weeks, 8 weeks, 3 months and 6 months respectively) (Table 3).

Prasad et al.,<sup>11</sup> compared the two groups based on HHS noted at 3 months, 6 months and 1 year and found only a marginal difference between the two groups but it was insignificant and within the limits of error ( $p$ -value at final follow-up was 0.094).

In Hongisto et al's study,<sup>10</sup> both groups were compared on the basis of level of mobility 1 year after the procedure and although the patients operated with the lateral approach fared better than the posterior approach group, the difference was statistically insignificant ( $p$ -value = 0.406).

Parker et al.,<sup>11</sup> found no notable differences between the two groups in terms of mean mobility scores noted at 2, 3, 6, 9 months and 1 year of post-operative follow-up ( $p$ -values  $\geq$  0.4).

The intra-operative blood loss was found to be slightly less in patients operated with posterior approach but the difference was insignificant ( $p$ -value = 0.386). Similarly, duration of surgery was lesser in posterior approach group, but the difference was slightly insignificant. ( $p$ -value = 0.822). Parker et al.,<sup>11</sup> observed that number of patients who required transfusion post-operatively as well as mean units of blood transfused were statistically similar in both posterior and lateral approaches. ( $P$ -value = 0.3). Similarly, no significant differences were detected between the two groups for the need for blood transfusion by Hongisto et al.,<sup>10</sup> and Prasad et al.,<sup>9</sup>

Earlier studies have suggested no significant difference between approaches when it comes to overall incidence of complications, but also that posterior approach carries a higher risk of dislocation.<sup>14</sup> In our study, although the incidence of infection was more in lateral approach (12.9% versus 9.6%), the only cases of foot drop and hip dislocation were observed in the posterior approach group. The  $p$ -value (0.709) calculated for difference between both groups for the overall incidence on complications was which was statistically insignificant.

Parker et al.,<sup>11</sup> compared the two approaches for the incidence of deep and superficial wound infection, foot drop, dislocation as well as the need for revision surgery and for all of these parameters the difference was found to be insignificant. De Vries et al.,<sup>16</sup> observed although more dislocations were reported with posterior approach, statistical significance was not achieved. (p value = 0.11)

The main aim of Biber et al.,<sup>17</sup> was to study the incidence of complications between the two approaches and they found that although there was no significant difference in the overall incidence of early surgical complications between the two approaches, dislocation was the most common complication after the posterior approach.

Ozan et al (2016), found no statistically significant difference in incidence of dislocation, infections and mortality between the two groups.<sup>12</sup> However, Hongisto et al.,<sup>10</sup> noted that the incidence of dislocations in the posterior approach was significant (p-value = 0.036) when compared with the lateral approach.

The duration of hospital stay was comparatively lesser in patients operated with lateral approach (mean 8.13 days) than posterior approach group (mean 8.35 days). The difference was statistically insignificant (p-value = 0.512). Parker et al.,<sup>11</sup> compared the length of the hospital stay and the difference between the two approaches was found to be clinically insignificant (mean difference 1.8 days, p-value = 0.40)

Barring a few studies to the contrary, existing literature is largely of the consensus that patients undergoing cemented hemiarthroplasty have improved short-term patient reported outcomes and lower peri- prosthetic fracture risk,<sup>18</sup> but at the expense of increased surgical time and blood loss.

In our study we noted slightly better functional outcome rate in patients who had uncemented HA, but below the level of significance (p-value = 0.576). This could be attributable to the overwhelming use of cemented implants in the patients included in the study (86.74% cemented,

13.25 % uncemented), which is a limitation of our study in assessing the difference between the two groups (Table 5) (Cases 1 – 3).

Similar to our study, a high quality study by Figved et al on 220 patients showed that mean HHS was marginally better in the uncemented group and the mean surgery time and mean intra-operative blood loss was also less. The rates of complications and mortality were similar between the two groups.<sup>15</sup>

Taylor et al., observed that implant-related complication rates were significantly lower in the cemented implant group, as well as improved function and mobility. These trends became significant in specific functional scores at various postoperative time points.<sup>19</sup>

## 6. Conclusion

The current study found no statistically significant differences in functional outcomes or complications

between the two approaches. Neither the lateral nor the posterior approaches appear to provide a clear advantage in terms of functional outcome or post-operative complications. As a result, a recommendation for a specific surgical approach should be an expert opinion based on surgeon preference and experience, rather than based on empirical data alone.

## 7. Ethical Approval

Approval by research and ethical committee Dayanand Medical College & Hospital, Ludhiana.

## 8. Conflict of Interest

None.

## 9. Source of Funding

None.

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## Author's biography

**Malwinder Singh**, Senior Resident  <https://orcid.org/0009-0005-5204-8107>

**Pankaj Mahindra**, Professor  <https://orcid.org/0009-0001-4317-2692>

**Rajnish Garg**, Professor and Head  <https://orcid.org/0009-0008-6045-2208>

**Harpal Singh Selhi**, Consultant  <https://orcid.org/0009-0006-8592-5011>

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