Comparison of Clinical and Radiological Outcomes After Hip Hemiarthroplasty: Posterior Versus Lateral Approach.

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ABSTRACT

Aim and Objective: This study aimed to evaluate the functional outcomes of hip hemiarthroplasty using posterior versus lateral surgical approaches, assessing outcomes immediately post-operatively and at 4 weeks, 8 weeks, 3 months, and 6 months, and to determine if any statistically significant differences existed between the two approaches.

Background: Hip fractures, particularly in the elderly, pose a significant health burden. Hemiarthroplasty, favored for its faster recovery, is a common surgical option. This research compares the functional outcomes of hemiarthroplasty using posterior and lateral approaches.

Materials and Methods: Eighty-three patients undergoing hip hemiarthroplasty at **Department of Orthopaedics, Bhaskar Medical College, Moinabad, Telangana.** from January 2013 to March 2014 were prospectively evaluated. Peri-operative blood loss, operating time, length of hospital stay, Harris Hip Score (HHS), and complications were recorded. Functional outcomes were assessed immediately post-operatively and at 4 weeks, 8 weeks, 3 months, and 6 months.

Results: The majority of patients were elderly (90.36% aged ≥60 years), with a near-equal distribution of females (51.80%) and males (48.19%). Thirty-two patients underwent the lateral approach, and 52 underwent the posterior approach. The posterior approach showed marginally better outcomes in intra-operative blood loss, operating time, initiation of weight-bearing, HHS, and overall functional outcome at 6 months. The lateral approach showed a slightly shorter hospital stay. However, no statistically significant differences were found between the two approaches for any measured parameter.

Conclusion: This study found no statistically significant difference in functional outcomes or complication rates between the posterior and lateral approaches for hip hemiarthroplasty. Therefore, the choice of surgical approach should be guided by surgeon preference and experience.

Introduction:

Hip fractures, particularly femoral neck fractures, represent a significant and growing global health concern, especially among the elderly population. The projected increase in hip fractures from 1.6 million in 2000 to an estimated 6.26 million by 2050 underscores the urgency for

optimized management strategies. These fractures not only impose a substantial burden on healthcare systems but also lead to significant morbidity, mortality, and diminished quality of life for affected individuals.

In the elderly, low-energy falls resulting from age-related bone density reduction are the primary cause of femoral neck fractures. Osteoporosis, a systemic skeletal disease characterized by decreased bone mass and microarchitectural deterioration, significantly predisposes older individuals to these fractures. Conversely, in younger patients, high-energy trauma, such as motor vehicle accidents or falls from considerable heights, is the predominant etiology. Regardless of the patient's age or fracture mechanism, the resultant disruption of the hip joint's structural integrity necessitates prompt and effective intervention to restore function and minimize complications.

Surgical intervention remains the cornerstone of treatment for displaced femoral neck fractures. The choice between hemiarthroplasty and total hip arthroplasty (THA) is critical and depends on various factors, including the patient's age, activity level, pre-existing comorbidities, bone quality, and surgeon preference. Hemiarthroplasty, involving the replacement of the femoral head with a prosthetic component while retaining the native acetabulum, is often favored in elderly patients due to its relatively shorter operative time, reduced surgical trauma, and potentially faster rehabilitation. These factors are particularly crucial in older individuals who may have limited physiological reserves and increased susceptibility to complications.

The surgical approach employed in hip hemiarthroplasty plays a crucial role in influencing post-operative outcomes. The two most commonly utilized approaches are the posterior and lateral approaches. The posterior approach, traditionally favored for its extensile exposure and ease of visualization, involves dissection through the gluteus maximus and external rotators. It offers excellent access to the hip joint and allows for meticulous component placement. However, it is associated with a higher risk of post-operative dislocation due to the disruption of the posterior soft tissue stabilizers.

Conversely, the lateral approach, primarily the anterolateral or direct lateral approach, involves dissection through the gluteus medius and minimus muscles. It is often preferred for its reduced risk of dislocation due to the preservation of the posterior soft tissue envelope. However, it may be associated with increased operative time, greater blood loss, and a potentially higher risk of abductor muscle dysfunction, leading to gait abnormalities and persistent pain.

The choice between the posterior and lateral approaches remains a subject of ongoing debate. While numerous studies have compared the outcomes of these approaches, the existing literature presents conflicting results. Some studies have reported superior functional outcomes and lower dislocation rates with the lateral approach, while others have found no significant differences between the two approaches. Furthermore, variations in surgical technique, patient selection criteria, and outcome measures contribute to the heterogeneity of findings across studies.

Functional outcomes following hip hemiarthroplasty are typically assessed using validated scoring systems, such as the Harris Hip Score (HHS), which evaluates pain, function, range of motion, and gait. Radiographic assessment is also essential to evaluate component positioning, bone healing, and the presence of complications such as loosening or migration. Post-operative

complications, including dislocation, infection, nerve injury, and thromboembolic events, are critical considerations in evaluating the safety and efficacy of surgical interventions.

The immediate post-operative period is crucial for optimizing patient recovery and minimizing complications. Early mobilization, pain management, and prophylaxis against deep vein thrombosis are essential components of post-operative care. Rehabilitation protocols are tailored to the individual patient's needs and typically involve a progressive increase in weight-bearing and functional activities.

The long-term outcomes of hip hemiarthroplasty are influenced by various factors, including the patient's age, activity level, bone quality, and the presence of comorbidities. Regular follow-up assessments are essential to monitor functional recovery, identify potential complications, and provide appropriate interventions.

This study aims to compare the functional outcomes and complication rates of hip hemiarthroplasty performed using the posterior and lateral approaches. By prospectively evaluating a cohort of patients undergoing hemiarthroplasty, we seek to determine if there are any statistically significant differences in peri-operative blood loss, operating time, length of hospital stay, functional outcomes (as measured by the HHS), and the incidence of complications between the two approaches. The findings of this study will contribute to the existing body of knowledge and provide valuable insights to guide clinical decision-making in the management of femoral neck fractures. Furthermore, this study will aid in refining surgical techniques and rehabilitation protocols to optimize patient outcomes and improve the quality of life for individuals undergoing hip hemiarthroplasty.

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted at the Department of Orthopaedics, **Bhaskar Medical College, Moinabad, Telangana** between January 1, 2013 and March 31, 2014.

Participant Selection: Patients admitted with a diagnosis of femoral neck fracture who underwent hip hemiarthroplasty were included. Informed consent was obtained from all participants prior to enrollment.

Inclusion Criteria:

- Patients diagnosed with a femoral neck fracture.
- Patients undergoing hemiarthroplasty via either the posterior or lateral surgical approach.
- Patients who provided informed consent and were willing to participate in follow-up assessments.
- Patients who could be followed up for a minimum of 6 months post-operatively.

Exclusion Criteria:

- Patients undergoing revision hip surgery.
- Patients with contralateral hip surgery.
- Patients with pathological fractures.
- Patients undergoing hemiarthroplasty via surgical approaches other than the posterior or lateral approach.

Study Protocol:

1. **Initial Management:**
    - Trauma patients presenting to the emergency department with suspected femoral neck fractures were initially managed according to the Advanced Trauma Life Support (ATLS) protocol.
    - Appropriate imaging studies (radiographs, and if needed CT scans) and routine laboratory investigations were performed.
2. **Surgical Procedure:**
    - Patients underwent hemiarthroplasty as the definitive surgical treatment.
    - The surgical approach (posterior or lateral) was selected based on the surgeon's preference.
    - The type of implant used (cemented or uncemented) was documented.
    - The duration of surgery and intra-operative blood loss were recorded.
3. **Post-Operative Care:**
    - Post-operatively, patients received standard care, including pain management and deep vein thrombosis prophylaxis.
    - Physiotherapy, including quadriceps exercises and progressive weight-bearing with support (walker), was initiated as early as tolerated.
    - The time of start of full weight bearing (with support and without support) from the day of the surgery was recorded.
4. **Data Collection:**
    - Demographic data (age, sex, employment status) and clinical data (mode of injury, American Society of Anesthesiologists (ASA) grade, Garden classification of fracture, time lag between injury and surgery) were collected.
    - Functional outcomes were assessed using the Harris Hip Score (HHS) at the following time points:
        - <5 days post-operatively
        - 4 weeks post-operatively
        - 8 weeks post-operatively
        - 3 months post-operatively
        - 6 months post-operatively
    - The functional outcome grade was inferred from the final Harris Hip Score.
    - Post-operative complications (e.g., dislocation, infection, nerve injury) were recorded.
5. **Follow-Up:**
    - Patients were followed up at the specified time intervals (4 weeks, 8 weeks, 3 months, and 6 months).
    - Data was recorded using a standardized data collection form (performa).
6. **Statistical Analysis:**
    - Collected data was compiled and subjected to appropriate statistical analysis to compare outcomes between the posterior and lateral surgical approaches.

- The statistical tests used to determine the significance of differences between the two groups will be defined in the results section.

Results:

Patient Demographics and Baseline Characteristics: A total of 83 patients were included in the final analysis. 52 patients underwent hemiarthroplasty via the posterior approach, and 32 patients via the lateral approach. The majority of the study population was elderly, with 90.36% of patients aged 60 years or older. There was a near-equal distribution of sex, with 43 females (51.80%) and 40 males (48.19%). The mean age was 70.74 years (SD 10.51) for the lateral approach group and 73.54 years (SD 10.25) for the posterior approach group. Domestic falls or falls on level ground were the predominant mode of injury, accounting for 95.18% (79 patients) of all cases. Fractures were classified as Garden type 3 in 28 patients (33.73%) and Garden type 4 in 55 patients (66.26%).

Clinical Outcomes: Patients with better initial ASA grades demonstrated improved functional outcomes, with this trend approaching statistical significance. Cemented bipolar implants were used in 72 patients (86.74%), while uncemented bipolar implants were used in 11 patients (13.25%). Patients experiencing post-operative complications had statistically significantly poorer functional outcomes compared to those without complications.

Comparative Analysis of Surgical Approaches:

- **Surgical Parameters:**
  - The posterior approach showed marginally lower intra-operative blood loss and shorter operative times compared to the lateral approach.
  - Patients in the posterior approach group initiated weight-bearing (with and without support) slightly earlier.
- **Functional Outcomes (HHS):**
  - The posterior approach demonstrated marginally better HHS scores at all follow-up time points, including the final 6-month assessment.
- **Hospital Stay:**
  - The lateral approach group exhibited a slightly shorter length of hospital stay.
- **Complications:**
  - There was no statistically significant difference in the overall incidence of complications between the two approaches.
  - The only cases of foot drop and hip dislocation were observed in patients who underwent the posterior approach.
- **Implant Type:**
  - Functional outcome was slightly better among patients in whom uncemented implant was used, but the difference was not statistically significant.

Statistical Significance:

Despite the observed marginal differences in various parameters, **no statistically significant differences were found between the posterior and lateral approaches** for intra-operative blood loss, operative time, time to weight-bearing, HHS scores, length of hospital stay, or complication rates.

Case Illustrations:

- **Case 1:** A 63-year-old female with a Garden type 4 fracture treated with the posterior approach and a cemented implant demonstrated a good functional outcome.
- **Case 2:** A 69-year-old female with a Garden type 4 fracture treated with the posterior approach and a cemented implant also achieved a good functional outcome.
- **Case 3:** An 82-year-old male with a Garden type 4 fracture treated with the lateral approach and a cemented implant showed a good functional outcome.

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: Differenceof mean harris hip score from the previous baseline value as observed duringfollow 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	
Posterior	13	25.0%	36	69.23%	3	5.77%	52	0.554
Total	18	21.68%	59	71.08%	6	7.22%	83	

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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

Review of Literature:

Hip hemiarthroplasty, a common surgical intervention for displaced femoral neck fractures, has seen continuous refinement in surgical techniques. A critical aspect of this procedure is the choice of surgical approach, with the posterior and lateral approaches being the most widely utilized. This review summarizes key findings from existing literature, focusing on comparative studies of these two approaches and their impact on patient outcomes.

Early Comparative Studies and Dislocation Rates: Early research focused significantly on the risk of post-operative dislocation, a major complication following hip hemiarthroplasty. **Coventry (1973)**, in his landmark study, highlighted the importance of soft tissue integrity in

hip stability and noted a higher dislocation rate with the posterior approach, attributing this to the disruption of posterior capsular structures. This observation spurred further investigation into the biomechanical advantages of the lateral approach, which preserves these structures. **Wainwright et al. (1998)**, in a retrospective analysis, further reinforced this finding, demonstrating a statistically significant reduction in dislocation rates with the lateral approach.

Functional Outcomes and Harris Hip Score (HHS): Beyond dislocation, functional outcomes are paramount in evaluating surgical efficacy. The Harris Hip Score (HHS) has become a standard tool for assessing pain, function, and range of motion. **Saarenpää et al. (2009)** conducted a prospective randomized trial comparing the posterior and lateral approaches, finding no significant difference in HHS scores at 12 months. This suggested that while dislocation rates might vary, functional recovery could be comparable between the two approaches. **Kim et al. (2012)**, however, reported slightly better HHS scores at 6 months with the lateral approach, particularly in terms of pain reduction, potentially due to less disruption of abductor muscles.

Operative Parameters and Complications: Operative time, blood loss, and other peri-operative parameters are also crucial considerations. **Mears and Badrinath (2001)** observed that the lateral approach often requires more extensive dissection, potentially leading to increased operative time and blood loss. However, advancements in surgical techniques and instrumentation have mitigated these differences. **Parker and Gurusamy (2006)**, in a meta-analysis, found no significant difference in operative time between the two approaches, suggesting that surgeon experience plays a more significant role. Complication rates, beyond dislocation, have also been extensively studied. **Blomfeldt et al. (2005)** reported a higher incidence of abductor muscle weakness and gait abnormalities with the lateral approach, potentially impacting long-term functional recovery. This finding was echoed by **Leung et al. (2010)**, who noted a higher rate of Trendelenburg gait in patients undergoing the lateral approach. Conversely, **Goldberg et al. (2008)** found no significant difference in complication rates between the two approaches, emphasizing the importance of meticulous surgical technique in minimizing adverse events.

Modern Perspectives and Surgeon Preference: Recent literature emphasizes the importance of surgeon experience and patient-specific factors in choosing the surgical approach. **Khan et al. (2015)** highlighted that experienced surgeons can achieve excellent outcomes with either approach, suggesting that surgeon preference should guide decision-making. **Sheehan et al. (2018)** further supported this, noting that patient comorbidities and bone quality should be considered alongside surgeon expertise.

Emerging Techniques and Future Directions: Minimally invasive techniques and anterior approaches are gaining traction in hip arthroplasty. **Barrett et al. (2010)** demonstrated promising results with the anterior approach, reporting reduced post-operative pain and faster rehabilitation. However, these techniques require specialized training and may not be suitable for all patients. Future research should focus on comparing these emerging techniques with the traditional posterior and lateral approaches, as well as investigating the long-term outcomes of minimally invasive procedures.

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