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COMPARISON BETWEEN ANTEROLATERAL VS POSTERIOR APPROACH BIPOLAR HEMI ARTHROPLASTY

Orthopaedics

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ABSTRACT

Background: Displaced femoral neck fractures in elderly patients are frequently managed using bipolar hemiarthroplasty, yet the optimal surgical approach remains widely debated. **Objectives:** This prospective, randomized, comparative study aimed to evaluate and compare the clinical outcomes, postoperative pain levels, functional recovery, and complication rates of the anterolateral versus the posterior approach in bipolar hemiarthroplasty. **Material and Methods :** A prospective, randomized, comparative study conducted at Department of Orthopaedics, at JLN Medical College and Associated Group of Hospitals, Ajmer (Raj) Sixty patients aged 60 years and older with displaced femoral neck fractures were randomized into two equal groups of thirty. Group A (n=30) underwent the anterolateral approach and Group B (n=30) underwent the posterior approach. Evaluated parameters included operative time, intraoperative blood loss, postoperative pain via Visual Analog Scale, functional recovery via Harris Hip Score, quality of life via SF-36, and 6-month complication rates. **Results:** The posterior approach demonstrated a significantly shorter mean operative time (89.27+4.49 min vs 92.37+7.27 min, P = 0.05) and lower blood loss (176+16.10 mL vs 195.33+19.61 mL, P=0.0001) compared to the anterolateral approach. Overall complication rates were comparable (10% in Group A vs 6.67% in Group B). Notably, the posterior group recorded one dislocation (3.33%) while the anterolateral group recorded zero. Both cohorts showed progressive improvement in pain relief, functional recovery (HHS reaching 89.23+3.39 and 88.87+3.51 at 6 months), and quality of life, with no statistically significant differences between the two methods over the 6-month follow-up. **Conclusion:** Both anterolateral and posterior approaches are safe and effective for bipolar hemiarthroplasty, delivering comparable pain relief and functional outcomes. While the posterior approach offers advantages in operative efficiency and blood loss, the anterolateral approach provides superior structural stability by eliminating postoperative dislocations, allowing treatment customization based on patient profile and surgeon preference.

KEYWORDS

Harris Hip Score, Femoral Neck Fractures, Bipolar Hemiarthroplasty

INTRODUCTION :

Hip fractures represent one of the most significant and devastating musculoskeletal injuries encountered in orthopaedic practice, particularly among the elderly population. They constitute a major global public health burden with profound implications for patient morbidity, mortality, functional independence and healthcare expenditure. According to the International Osteoporosis Foundation, hip fractures affect millions of individuals worldwide each year and their incidence is projected to rise substantially over the coming decades owing to the progressive ageing of the global population.[1] Femoral neck fractures constitute a substantial proportion of all hip fractures and are particularly prevalent among elderly individuals, predominantly affecting women in their seventh and eighth decades of life.[2]

The treatment strategy is primarily determined by the patient's age, pre-injury functional status, cognitive function, bone quality, fracture displacement and associated comorbidities. For undisplaced or minimally displaced fractures (Garden types I and II), internal fixation with cannulated screws or a dynamic hip screw remains the preferred treatment modality, as it preserves the native femoral head and biological hip joint mechanics. However, for displaced femoral neck fractures (Garden types III and IV) in elderly patients, arthroplasty, either hemiarthroplasty or total hip arthroplasty, has emerged as the gold standard of care.[3]

The surgical approach influences multiple aspects of the operative procedure and postoperative recovery, including the extent of soft tissue dissection, the degree of muscular damage, the adequacy of surgical exposure, the ease of implant positioning, intraoperative blood loss, operative time, postoperative pain, the risk of dislocation, nerve injury, heterotopic ossification and the pace of functional rehabilitation. Over the decades, numerous surgical approaches to the hip joint have been described, each with its own set of inherent advantages and disadvantages. Among these, the anterolateral (Watson-Jones) approach and the posterior (Moore or Southern) approach are the two most commonly employed surgical approaches for bipolar hemiarthroplasty worldwide.[4]

The posterior approach to the hip joint, originally described by Moore in 1957 and subsequently modified by various surgeons, is one of the most widely utilized surgical approaches for hip arthroplasty globally. This approach accesses the hip joint through the posterior aspect, utilizing the interval between the gluteus maximus and the short external rotators of the hip. The patient is positioned in the lateral decubitus position, and the skin incision is made centred over the greater trochanter, extending proximally along the line of the femoral shaft and curving posteriorly towards the posterior superior iliac spine. Although meticulous posterior capsular repair and reattachment of the external rotators at the conclusion of the procedure have been shown to significantly reduce dislocation rates, the posterior approach historically carries a higher dislocation risk, particularly in the early postoperative period.[5] Additionally, the posterior approach carries a risk of injury to the sciatic nerve, particularly its peroneal division, which lies in close proximity to the surgical field.

The anterolateral approach to the hip joint encompasses a family of related surgical approaches, including the Watson-Jones approach, the modified Hardinge (direct lateral) approach and various minimally invasive anterolateral techniques.[6] In the anterolateral approach, the patient may be positioned in either the lateral decubitus or supine position. The skin incision is made over the anterior aspect of the greater trochanter, and the surgical dissection proceeds through the interval between the tensor fasciae latae anteriorly and the gluteus medius posteriorly. Depending on the specific variant of the anterolateral approach employed, the anterior portion of the gluteus medius and minimus may be partially detached from the greater trochanter or split along their fibre direction to gain access to the anterior hip capsule. An anterior capsulotomy is then performed to expose the hip joint.[7]

OBJECTIVES : The study aim to compare the clinical outcomes of anterolateral versus posterior approaches in bipolar hemiarthroplasty for the treatment of femoral neck fractures. The study objectives are (i) to evaluate postoperative pain levels between the two surgical approaches (ii) to compare the functional recovery and mobility of patients following surgery. (iii) to assess the complication rates, including dislocation and infection, associated with each approach.

MATERIAL AND METHODS : A prospective, randomized,

comparative study conducted at Department of Orthopaedics, at JLN Medical College and Associated Group of Hospitals, Ajmer (Raj,). The inclusion criteria for the study comprised patients aged 60 years and older who had been diagnosed with a displaced femoral neck fracture and were indicated for bipolar hemiarthroplasty. Additionally, eligible participants were required to be medically cleared for surgery and able to provide informed consent. The patients presenting with pathological fractures, those with a history of previous surgery on the affected hip, and individuals with concurrent lower extremity fractures. Patients exhibiting severe cognitive impairment or those who refused to participate in the study were excluded.

Surgical Procedures & Randomization: Patients were randomized using a computer-generated randomization sequence into two groups of 30 patients each: Group A - Anterolateral Approach Hemiarthroplasty (AAH) (n=30) underwent the anterolateral approach (Watson-Jones approach utilizing the interval between the tensor fascia lata and gluteus medius), and Group B - Posterior Approach Hemiarthroplasty (PAH) (n=30) underwent the posterior approach (Moore or Southern approach splitting the gluteus maximus and detaching the short external rotators).

The primary outcome measures assessed in the study included postoperative pain evaluated via the Visual Analog Scale (VAS) at 1 day, 1 week, 1 month, and 3 months post-surgery, alongside functional recovery measured using the Harris Hip Score at 1 month, 3 months, and 6 months. Additionally, complication rates documenting instances of dislocation, infection, limp, and lengthening were recorded within 6 months post-surgery, while intraoperative data captured operative time and blood loss. Patient satisfaction and quality of life were further quantified using the SF-36 questionnaire at 3 and 6 months post-operatively.

Statistical Analysis: Continuous variables were compared using independent t-tests, categorical variables via Chi-square tests, and changes over time using repeated measures ANOVA, with $P < 0.05$ considered statistically significant.

RESULTS :

Table 1 : Demographic Distribution of Patients Undergoing Anterolateral And Posterior Hemiarthroplasty

Demographic Parameter	Group A (AAH) (n=30)	Group B (PAH) (n=30)
Age Range (years)		
60–70	12 (40.00%)	14 (46.67%)
71–80	16 (53.33%)	10 (33.33%)
> 81	2 (6.67%)	6 (20.00%)
Mean Age (years)	72.63+5.12	71.90+7.48
Gender Distribution		
Male	16 (53.33%)	10 (33.33%)
Female	14 (46.67%)	20 (66.67%)
Male : Female Ratio	01:00.9	01:02

Table 2 : Comparison Of Operative Time And Intraoperative Blood Loss Between Group A (AAH) and Group B (PAH)

Operative Parameter	Group A (AAH) Mean ± SD	Group B (PAH) Mean ± SD	P Value
Time of Surgery (min)	92.37 +7.27	89.27+4.49	0.05 (S)
Blood Loss (mL)	195.33+19.61	176+16.10	0.0001 (S)

Table 3: Comparison of Post-Operative Complications Between Group A (AAH) and Group B (PAH)

Post Operative Complications	Group A (AAH) (n=30) Number (%)	Group B (PAH) (n=30) Number (%)
Dislocation	0 (0.00%)	1 (3.33%)
Infection	1 (3.33%)	1 (3.33%)
Limp	1 (3.33%)	1 (3.33%)
Lengthening	1 (3.33%)	1 (3.33%)
Total Complications	3 (10.00%)	2 (6.67%)

Table 4 : Comparison Of Post-Operative Pain (Visual Analog Scale - Vas) Between Group A (AAH) and Group B (PAH)

Time Point	Group A (AAH) Mean ± SD	Group B (PAH) Mean ± SD	P Value
1 Day	7.47+1.25	7.70+1.21	0.4719 (NS)
1 Week	4.80+1.47	5.27+1.55	0.2331 (NS)
1 Month	3.03+1.27	3.00+1.20	0.9254 (NS)
3 Months	0.50+0.68	0.47+0.68	0.8649 (NS)

Table 5 : Comparison of Functional Recovery Measured by Harris Hip Score between Group A (AAH) and Group B (PAH)

Time Point	Group A (AAH) Mean ± SD	Group B (PAH) Mean ± SD	P Value
1 Month	69.23+4.60	69.03+4.70	0.8683 (NS)
3 Months	80.03+4.33	79.33+4.30	0.5323 (NS)
6 Months	89.23+3.39	88.87+3.51	0.6876 (NS)

Table 6 : Comparison of Quality of Life Outcomes Measured by SF-36 between Group A (AAH) and Group B (PAH)

Time Point	Group A (AAH) Mean ± SD	Group B (PAH) Mean ± SD	P Value
3 Months	3.13+0.68	3.13+0.68	1.00 (NS)
6 Months	1.50+0.51	1.50+0.51	> 0.05

DISCUSSION:

The mean age of patients in the present study was 72.63±5.12 years in Group A (AAH) and 71.90±7.48 years in Group B (PAH). In comparison, Palanisamy et al. (2015)[3] reported higher mean ages of 80 and 81 years for their respective study groups. Regarding gender distribution, the present study observed a male predominance in Group A (53.33% males) and a female predominance in Group B (66.67% females). This contrasts slightly with findings by Laffosse et al. (2007)[8], who noted a more balanced distribution with a slight male majority across cohorts, and Palanisamy et al. (2015)[3], who reported a dominant female representation of 75% in both groups. **(Table 1)**

The present study demonstrated a statistically significant difference in operative duration, with Group A requiring a mean time of 92.37±7.27 minutes compared to 89.27±4.49 minutes in Group B ($P = 0.05$). Similarly, mean intraoperative blood loss was significantly higher in Group A at 195.33±19.61 mL versus 176±16.10 mL in Group B ($P=0.0001$). Similarly, Rotem et al. (2023)[9] and Pihlajamäki et al. (2018)[10], both of whom similarly observed that the posterior approach offers advantages regarding shorter operative times and reduced intraoperative blood loss. (**Table 2)**

Postoperative complications in the present study remained low and comparable overall, occurring in 10% of patients in Group A and 6.67% of patients in Group B. When evaluating specific adverse events, Palanisamy et al. (2015)[3] reported comparable complication rates of 6% and 6.03%, whereas Ambulgekar et al. (2023)[11] documented slightly lower figures with 0% in Group A and 5% in Group B. In terms of prosthetic stability, the posterior group in the present study recorded 1 dislocation (3.33%) while the anterolateral group recorded none, supporting theoretical expectations that preserving posterior soft-tissue stabilizers minimizes dislocation risks. **(Table 3)**

Postoperative pain evaluated via the Visual Analog Scale (VAS) showed substantial reduction over time in both study arms. On the first postoperative day, Group A recorded a mean VAS score of 7.47±1.25 and Group B recorded 7.70±1.21, reflecting moderate-to-severe initial surgical pain. By the 3-month mark, pain scores declined sharply to 0.50±0.68 in Group A and 0.47±0.68 in Group B with no statistically significant intergroup differences at any evaluation point **(Table 4)**.

Functional recovery evaluated using the Harris Hip Score (HHS) displayed progressive improvement across the 6-month observation period. In the present study, Group A recorded scores of 69.23±4.60 at 1 month, 80.03±4.33 at 3 months, and 89.23±3.39 at 6 months, while Group B scored 69.03±4.70, 79.33±4.30 and 88.87±3.51 respectively. Previous investigations by Laffosse et al. (2007)[8] and Ambulgekar et al. (2023)[11] reported 1-month HHS values of 88.5±10 and 87.12±10.10 alongside 6-month values of 84.5±12.4 and 85.23±10.05. **(Table 5)**

Quality of life metrics assessed via SF-36 scores demonstrated identical recovery trajectories between the two groups. Mean scores stood at 3.13±0.68 at 3 months and decreased to 1.50±0.51 at 6 months for both Group A and Group B, reflecting significant health-related quality-of-life enhancements over time. **(Table 6)**.

CONCLUSION:

Both the anterolateral and posterior approaches are safe, reliable, and effective methods for performing bipolar hemiarthroplasty in elderly patients with displaced femoral neck fractures,

offering comparable pain relief, functional recovery, and quality of life. While the posterior approach offers advantages in terms of reduced operative time and lower intraoperative blood loss, the anterolateral approach provides the crucial benefit of zero postoperative dislocations due to the preservation of posterior soft-tissue stabilizers. Consequently, the choice of approach should be customized based on surgeon expertise, patient profile, and institutional preferences.

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