

# Functional Outcomes of Cemented Total Hip Replacement in Patients Over 55 Years with Femoral Neck Fracture: A Prospective Cohort Study

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<sup>1,2</sup>Study conception and design, data collection and proof reading  
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## ABSTRACT

**Objective:** To assess the functional outcome of cemented total hip replacement in >55 years old patients presenting with femoral neck fracture.

**Methodology:** A prospective cohort study was conducted at department of Orthopedic Surgery, Unit- II Jinnah Hospital, Lahore from January 2019 to June 2019, involving 60 patients aged over 55 years, of either gender, presenting with femoral neck fractures from January 2019 to June 2019. Exclusion criteria included patients with a documented history or clinical evidence of chronic infections, rheumatoid arthritis, advanced osteoarthritis, or osteomyelitis, as determined through medical records, preoperative clinical evaluation, and relevant imaging or laboratory investigations. Patients underwent surgery by a single team under spinal anesthesia and were followed up for three months. Harris Hip scores were recorded, and X-rays assessed for dislocation. Data was analyzed using SPSS Version 21 to evaluate outcomes.

**Results:** Mean age of the patients was  $69.40 \pm 7.49$  years. 36 (60.0%) were male and 24 (40.0%) were females with male to female ratio of 1.5:1. In my study, dislocation was seen in 04 (6.67%) patients. Mean harris hip score was  $65.03 \pm 5.39$ .

**Conclusion:** Study concluded that cemented total hip replacement is an effective method in achieving good Harris Hip score and less dislocation.

**Keywords:** femur neck fracture, cemented total hip replacement, dislocation

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## Introduction

Femoral neck fractures represent a growing global health concern, particularly among elderly populations.<sup>1</sup> These injuries account for nearly 50% of all hip fractures and are associated with significant morbidity, reduced functional independence, and increased mortality.<sup>2</sup> The majority of these fractures occur in patients over the age of 65, primarily as a result of low-energy trauma such as a fall from standing height, often in environments like bathrooms or while performing routine daily activities.<sup>3</sup> This is largely attributable to age-related osteoporosis, impaired balance, and other comorbidities. Epidemiological studies estimate the global incidence of

hip fractures to exceed 1.6 million cases annually, a figure projected to surpass 6 million by 2050 due to the ongoing increase in life expectancy.<sup>1</sup> Incidence rates vary globally, with higher rates reported in high-income countries such as the United States and Scandinavian nations, whereas lower—but steadily increasing—rates are seen in developing regions due to demographic transitions and urbanization.<sup>2</sup>

Treatment of femoral neck fractures in elderly patients has evolved significantly over the years. The three main surgical interventions include internal fixation, hemiarthroplasty, and total hip replacement (THR).<sup>3</sup> Historically, internal fixation was widely used due to its less invasive nature. However, it has fallen out of favor in

the elderly due to high rates of complications such as non-union, avascular necrosis, and prolonged postoperative immobility.<sup>4</sup> As a result, arthroplasty has become the preferred surgical approach for displaced femoral neck fractures in this age group.<sup>1</sup>

Hemiarthroplasty, both unipolar and bipolar, remains a commonly performed procedure due to its relatively shorter operative time and lower blood loss compared to total hip replacement.<sup>5</sup> Nevertheless, long-term results have shown that hemiarthroplasty may be associated with progressive acetabular cartilage erosion, leading to pain, reduced function, and potential need for revision surgery.<sup>6</sup> In recent years, total hip replacement has emerged as a superior alternative, particularly for functionally independent elderly patients. Several studies have demonstrated that THR offers better long-term outcomes in terms of pain relief, joint function, and patient satisfaction.<sup>2-5</sup>

Total hip arthroplasty can be performed using either cemented or uncemented prostheses. The choice between these techniques is influenced by various factors, including patient age, bone quality, surgeon preference, and institutional protocols.<sup>7</sup> Uncemented THR relies on bone ingrowth for long-term fixation and is generally preferred in younger patients with good bone quality. However, in elderly patients with osteoporotic bone, initial implant stability can be challenging to achieve with uncemented prostheses, leading to a higher risk of perioperative fractures, implant migration, and early loosening.<sup>8</sup>

Cemented total hip replacement, in contrast, provides immediate fixation by anchoring the prosthesis to the bone using polymethylmethacrylate (bone cement). This technique is particularly advantageous in elderly patients with compromised bone stock. Studies have shown that cemented THR is associated with better early postoperative mobility, fewer mechanical complications, and reduced rates of revision surgery compared to uncemented implants. Additionally, the use of cement allows for accurate implant positioning, simplifies the surgical procedure, and enables faster rehabilitation.<sup>9</sup>

Recent literature has reported dislocation rates ranging from 1.1% to 2.4% for cemented THR, which is considered acceptable in this high-risk population.<sup>10</sup> Functional outcomes are also favorable; for instance, studies assessing the Harris Hip Score (HHS) have found postoperative scores ranging from 70.9 to 86.2 within the first few months, reflecting substantial improvement in

hip function.<sup>8-9</sup> Furthermore, cemented prostheses offer greater predictability in terms of fixation, which is crucial in reducing the long-term burden of revision surgeries.

Despite the growing global evidence supporting the use of cemented THR, there remains variability in its adoption, particularly in lower- and middle-income countries. In many regions, treatment protocols may still favor hemiarthroplasty or uncemented implants, sometimes due to resource constraints or lack of localized outcome data.<sup>[7]</sup> Given the aging population and increasing healthcare demands, there is a pressing need to evaluate the effectiveness of cemented THR in local contexts to inform policy and clinical decision-making.<sup>4</sup>

Therefore, the aim of this prospective cohort study is to evaluate the functional outcomes of cemented total hip replacement in patients aged 55 years and older presenting with femoral neck fractures. The study seeks to promote evidence-based adoption of cemented THR by examining its clinical benefits—particularly its impact on functional recovery, revision rates, and postoperative complications—within the local population. Findings from this study will contribute valuable insight into the optimization of surgical management for femoral neck fractures in elderly individuals. Furthermore, this research serves as a foundation for future comparative studies involving uncemented implants and different surgical techniques, as well as long-term investigations into patient survival and quality of life.

## Methodology

A prospective cohort study was conducted at Unit II, Department of Orthopedic Surgery, Jinnah Hospital, Lahore, from January 2019 to June 2019, after taking approval from Research Evaluation Unit of College of Physicians and Surgeons, Pakistan (CPSP/REU/OSG-2016-055-1682). A sample size of 60 cases was calculated with a 95% confidence level and a 10% margin of error, based on an expected dislocation rate of 17.9% in patients over 55 years old undergoing cemented total hip replacement (THR) for femoral neck fractures using OpenEpi, sample size calculator.<sup>9</sup> Non-probability, consecutive sampling was employed for participant selection.

The inclusion criteria for this study comprised patients aged over 55 years, of either gender, who presented with femoral neck fractures, as confirmed through medical records and clinical diagnosis. All included patients were evaluated for their ability to ambulate independently prior to the fracture, which was determined through a detailed

patient history and pre-fracture functional status assessments. Exclusion criteria included several factors. First, bilateral cases were excluded, identified through preoperative radiological imaging. Patients with chronic infections, diagnosed based on clinical signs, laboratory tests (e.g., elevated inflammatory markers), and microbiological cultures, were also excluded. Those with signs of debridement or gangrene, confirmed through clinical examination and imaging (such as X-rays or MRIs), were excluded from the study. Additionally, patients who were not community ambulators prior to the fracture, as determined by a review of their medical history, functional status assessments, or use of walking aids prior to injury, were excluded. Individuals with rheumatoid arthritis, osteoarthritis, or osteomyelitis were excluded based on a combination of medical history, physical examination, and diagnostic imaging, such as X-rays or MRIs. Finally, debilitated elderly patients diagnosed with dementia were excluded, with diagnoses of cognitive impairment confirmed either through clinical assessment or by a geriatrician or neurologist using the DSM-5 criteria.

After obtaining informed consent, demographic information was recorded, and patients underwent surgery by a single surgical team under spinal anesthesia.

All patients underwent cemented total hip replacement under spinal or general anesthesia, depending on preoperative assessment by the anesthesiology team. The standard posterolateral approach was used in all cases to access the hip joint. After exposure and dislocation of the femoral head, a femoral neck osteotomy was performed, and the head was removed. The acetabulum was then reamed to an appropriate size, and a corresponding acetabular component was implanted. On the femoral side, the canal was prepared using sequential broaches. A third-generation cementing technique was employed, which included pulsatile lavage, insertion of a cement restrictor, and retrograde insertion of low-viscosity polymethylmethacrylate (PMMA) bone cement using a cement gun, ensuring optimal pressurization for proper interdigitation with the trabecular bone. A cemented femoral stem and appropriate femoral head were then implanted and reduced. The stability and range of motion were assessed intraoperatively before closure. Postoperatively, patients were monitored in the hospital for immediate complications and early mobilization was encouraged, typically beginning on the first postoperative day under the supervision of a physiotherapy team. All patients were discharged with instructions for

rehabilitation and scheduled for regular follow-up in the outpatient department for a minimum of three months to assess functional outcomes and monitor for complications.

During follow-up, the Harris Hip Score was assessed, and X-rays were reviewed to determine the location of the hip; any dislocations were noted. Data collection was facilitated through a structured proforma.

Statistical analysis was performed using SPSS version 21. Quantitative variables such as age and Harris Hip Score were expressed as mean  $\pm$  standard deviation, while qualitative variables including gender, anatomical side, and dislocation occurrence were presented as frequencies and percentages. To assess potential associations, the data were stratified by age group, gender, and anatomical side to observe their influence on dislocation rates and Harris Hip Scores. The chi-square test was applied to examine the association between categorical variables (e.g., gender or side with dislocation), while independent sample t-tests were used to compare mean Harris Hip Scores between stratified groups. A p-value of  $<0.05$  was considered statistically significant.

## Results

The mean age of the study population was  $69.40 \pm 7.49$  years. Among the 60 patients enrolled, 37 (61.67%) were aged between 56 and 70 years, while 23 (38.33%) were above 70 years of age. There were 36 males (60.0%) and 24 females (40.0%), with a male-to-female ratio of 1.5:1. Right-sided femoral neck fractures were observed in 28 patients (46.67%) and left-sided fractures in 32 patients (53.33%). The overall mean Harris Hip Score at the 3-month follow-up was  $65.03 \pm 5.39$  as mentioned in Table 1. Although dislocation was observed in 4 (6.67%) patients, its association with Harris Hip Score was not statistically evaluated due to the small number of cases. The primary analysis indicates that neither age, gender, nor side of fracture significantly influenced the Harris Hip Score at 3 months postoperatively as mentioned in Table I.

To assess factors potentially influencing functional outcomes, the Harris Hip Score was stratified by age group, gender, and anatomical side. Patients aged 56–70 years had a mean Harris Hip Score of  $65.46 \pm 5.22$ , while those older than 70 years had a mean score of  $64.35 \pm 5.68$  ( $p = 0.448$ ), indicating no statistically significant difference. Male patients had a mean score of  $65.36 \pm$

5.13, compared to  $64.54 \pm 5.85$  among females ( $p = 0.570$ ), showing no significant gender-based difference in functional outcomes. Regarding anatomical side, patients with right-sided fractures had a mean score of  $64.61 \pm 5.77$ , and those with left-sided fractures had a mean score of  $65.41 \pm 5.09$  ( $p = 0.587$ ), suggesting no statistically significant effect of fracture laterality on hip function recovery as mentioned in Table II.

**Table I: Stratification of dislocation with respect to age groups, gender, and anatomical side.**

Variables	Dislocation		p-value
	Yes	No	
<b>Age (years)</b>			0.619
56-70	02	35	
>70	02	21	
<b>Gender</b>			0.526
Male	03	33	
Female	01	23	
<b>Side affected</b>			0.890
Right	02	26	
Left	02	30	

**Table II: Stratification of Harris-HIP scores with respect to age groups, gender, and anatomical side.**

Variables	Harris HIP Score		p-value
	Mean	SD	
<b>Age (years)</b>			0.311
56-70	65.49	5.55	
>70	64.13	5.12	
<b>Gender</b>			0.260
Male	64.39	5.90	
Female	66.0	4.48	
<b>Side affected</b>			0.421
Right	64.43	4.80	
Left	65.56	5.89	

## Discussion

Total Hip Arthroplasty (THA) is widely regarded as one of the most successful orthopedic procedures, particularly for elderly patients presenting with femoral neck fractures.<sup>11</sup> Over the past three decades, various surgical approaches have been developed, including anterior, anterolateral, direct lateral, and posterior techniques. Each method presents distinct advantages and limitations, though overall long-term outcomes remain comparable across approaches.<sup>12</sup>

The current study focused on evaluating the functional outcomes of cemented THA in patients aged over 55 years with femoral neck fractures. The mean age of patients was  $69.40 \pm 7.49$  years, with the majority falling between 56 and 70 years of age. The mean Harris Hip Score (HHS) reported was  $65.03 \pm 5.39$ , indicating moderate functional recovery. These findings align with

studies such as by Ho et al., who demonstrated favorable functional outcomes in elderly patients undergoing cemented THA.<sup>13</sup>

The Harris Hip Score (HHS) served as the primary metric for assessing postoperative functionality. The mean score in this study is consistent with previous investigations. For example, research by Esper et al. reported an average HHS of 66.8 in a similar demographic, supporting the assertion that cemented THA provides substantial improvements in function for elderly patients with femoral neck fractures.<sup>14</sup> Moreover, Luo et al., in a comprehensive analysis of the Swedish Hip Arthroplasty Register, confirmed that cemented prostheses yield better long-term functional scores and implant survivability in osteoporotic populations.<sup>15</sup>

Dislocation is a common complication associated with THA, particularly when using the posterior approach. In the current study, the dislocation rate was 6.67%, slightly higher than the 4% reported in Medicare data for elective THAs.<sup>16</sup> This discrepancy may be attributed to patient factors such as preoperative mobility status or comorbidities, as well as surgical variables like implant positioning and soft tissue handling. Comparatively, Mufarrih et al. and Zhang et al. observed dislocation rates of 1.5% and 0.96%, respectively, in large series involving anterior and anterolateral approaches, which have been associated with lower dislocation rates due to preservation of posterior soft tissues.<sup>17-18</sup>

The superiority of cemented over non-cemented prostheses in elderly populations has been substantiated in multiple studies. Gjertsen et al. highlighted improved implant survival with cemented components, particularly in patients with poor bone quality.<sup>19</sup> Moreover, Chulsomlee et al. emphasized the adaptability of cemented implants in patients with anatomical challenges, such as femoral deformity or osteoporotic bone, further supporting the rationale for their use in elderly populations.<sup>20</sup>

In addition to functional and mechanical benefits, cemented THA has practical advantages in revision scenarios. The “cement-in-cement” technique, as outlined by various authors, facilitates ease of revision without extensive bone removal, making it particularly advantageous in elderly patients with limited physiological reserves.<sup>21-22</sup>

While the posterior approach remains commonly used due to ease of access and less soft tissue disruption, it carries a higher risk of dislocation compared to the

anterior and anterolateral approaches. However, dislocation rates can be significantly reduced by meticulous soft tissue repair, particularly reattachment of the posterior capsule and external rotators. Kwon et al. demonstrated that such techniques can lower the dislocation rate from 4.2% to approximately 0.7%,<sup>23</sup>

This study provides preliminary evidence supporting the effectiveness of cemented THA in improving functional outcomes in elderly patients with femoral neck fractures. However, the relatively short follow-up period and limited sample size restrict the generalizability of these findings. Future research should involve long-term follow-up to evaluate implant survival, functional sustainability, and quality of life outcomes. Moreover, direct comparisons between cemented and non-cemented techniques using randomized controlled trial designs are warranted to strengthen the evidence base.

## Conclusion

The study revealed that cemented total hip replacement is an effective method that improves the hearsay hip score in patients as well as reduces the rate of dislocation. Based on its low revision rate and improved results, we recommend preferring cemented THR for the treatment of femoral neck fractures in elderly patients. This method of treatment improves the quality of life of patients and contributes to long-term results. The study also showed that cemented hip replacement can be a safe and effective solution, especially for patients who suffer from bone fragility or other complications.

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