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Functional outcome and dislocation rate of dual mobility versus conventional total hip replacement in patients with femoral neck fracture

 Ashraf Alhusseini

Babylon-Hilla-Iraq University, Faculty of Hammurabi College of Medicine, Department of Surgery, Hilla, Iraq

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Abstract

As a common surgery for femoral neck fractures, total hip replacement (THR) has been performed widely. While standard THR has been predominant for many years, the use of dual mobility replacement (DMR) has also become a suitable alternative that could offer more stability. Even though the utilization of these techniques is increasing, comparative studies evaluating the short-term outcomes of both techniques in femoral neck fractures are rare. The purpose of this study was to compare short-term functional outcomes and dislocation rates in patients taking treatment of femoral neck fracture with dual mobility (DM) and conventional total hip arthroplasty (THA). A retrospective case series of 80 patients was conducted to compare the two groups (Group A: Traditional THR, and Group B: DMR). Clinical information, such as patient age, gender, postoperative Harris Hip Score (HHS), and dislocations were gained from outpatient follow-up records. The range of motion (ROM) was also assessed. There was no statistically significant difference in Harris Hip Scores between the two groups ($p > 0.05$). Dislocation events were rare and similar between groups, with two cases in Group A and none in Group B, showing no significant difference ($p > 0.05$). However, patients in the DMR group demonstrated a significantly better range of motion compared to those in the conventional THR group ($p < 0.05$). Dual mobility and conventional THR offer comparable short-term outcomes in terms of dislocation risk and functional recovery. However, DMR may provide superior range of motion, making it a favorable which types of patients are more suitable.

Keywords: Total hip replacement, neck femur fractures, conventional total hip replacement, dual mobility hip replacement, range of motion, harris hip score

Introduction

Among the most prevalent injuries in the aged population, femoral neck fractures mostly arise from low-energy falls brought on by lower bone density and balance disturbance [1]. Many times requiring surgical intervention to restore mobility and independence, these injuries are a main cause of morbidity and healthcare consumption [1]. Internal fixation, hemiarthroplasty (un polarised or bipolar), and total hip arthroplasty (THA) are treatment approaches for misplaced intracapsular femoral neck fractures [1].

Every one of these approaches has advantages and disadvantages; the best therapeutic strategy is still a topic of discussion especially for older patients with many comorbidities [2]. Because total hip arthroplasty has better results in terms of pain alleviation

and long-term function than hemiarthroplasty [3], it is widely used for displaced femoral neck fractures in senior patients. However, dislocation and polyethylene wear remain challenges for surgeons include prosthesis displacement and polyethylene wear. One of the most common problems following THA is still dislocation—that is, the total disengagement of the femoral head from the acetabular cup [4]. Suboptimal implant placement, inadequate soft tissue tension, muscle weakness, or mechanical impingement between prosthetic components and adjacent bone can all contribute [4].

These complications not only compromise patient survival but also represents a higher demand for revision surgeries with an impact on health resources. Dual mobility (DM) total hip arthroplasty was first proposed in 1975 by (Professor Gilles Bousquet and André Rambert) aiming to solve issues of

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Corresponding Author: Ashraf Alhusseini, Babylon-Hilla-Iraq University, Faculty of Hammurabi College of Medicine, Department of Surgery, Hilla, Iraq
Email: Qaisajam1981@gmail.com

instability and dislocation [5]. The small femoral head system articulates within a large polyethylene liner that articulates against the acetabular shell. This tripolar configuration increases the excursion and the "jump distance" and thus decreases the likelihood of dislocation [6].

Although offering hope, DM implants have introduced new issues such as intraprosthetic dislocation and the problem of iliopsoas tendon impingement; hence, the question of polyethylene wear and the need for cathalamus design to evolve accordingly persist [6,7]. Patients with high risk of instability, including those with neuromuscular diseases, cognitive problems, past hip operations, or in situations of revision arthroplasty, increasingly employ dual mobility implants nowadays [8]. They have also demonstrated growing relevance in primary THA for elderly femoral neck fractures [8].

There is evidence that DM-THA might aid these patients in achieving better outcomes, such as, lower dislocation rates and higher HHS [9]. But patient characteristics, including frailty, may influence the selection of the type of implant, and thus the outcomes, including mortality [10].

The purpose of this study is to analyze the short-term functional results and dislocation rate after dual mobility THA and conventional THA in femoral neck fracture patients regarding the evolving role of dual mobility implants as treatment option in femoral neck fractures. The goal of this novel study is to help inform surgical decisions and optimize patient care by evaluating key clinical parameters such as the Harris Hip score and risk of dislocation.

Material and Methods

This retrospective comparative case-series study evaluated and compared the short-term functional outcomes and dislocation rates between conventional total hip replacement (THR) and dual mobility total hip arthroplasty (DM-THA) in elderly patients with displaced femoral neck fractures. Included and split evenly into two groups were eighty patients overall who underwent unilateral THR. Group A comprised forty patients (23 men and seventeen women) undergoing conventional THR; Group B comprised forty patients (19 men and twenty-one women) undergoing DM-THA. Data were gathered at the Medical City complex in Baghdad, Iraq, more precisely at the Nursing Home Hospital and Ghazi Al-Harriri Hospital, from October 2021 to January 2024. The same orthopaedic surgical team carried out all operations to remove operator variation. These questionnaires can be explained in terms of validation to guide follow-up outpatient clinic appointments

for data collecting. Hip performance comprising pain, function, deformity, and range of motion was evaluated using the Harris Hip Score (HHS). On paper sheets used for follow-up visits, each patient's score was noted. Clinically, patient history, and corroborated by radiographs helped to identify hip dislocation incidents. Patients aged 60–87 years were included with unilateral displaced femoral neck fractures who had a 32 mm femoral head implant comprised inclusion criteria. Patients excluded were those having pathogenic fractures, avascular necrosis, neuromuscular diseases, misaligned prosthesis, or those having revision surgery. All patients had surgery while they were asleep with either spinal or general anaesthesia. A standardised posterolateral approach was employed for both types of arthroplasties. For DM-THA, specialised preparation and insertion techniques were employed, including vacuum-sealed cup implantation and liner/head assembly under direct visualisation. We used SPSS version 26 to look at the data. Quantitative variables were expressed as means and standard deviations, while categorical data were presented as frequencies and percentages. Statistical significance was evaluated using the Chi-square or Fisher's Exact Test, with p-values ≤ 0.05 considered statistically significant.

Ethical approval

The study was approved by the Scientific Research Ethics Committee of Hammurabi College of Medicine, University of Babylon (Ref No.: 2-35, Date: 01/07/2025). Verbal informed consent was obtained from the participants prior to sample collection. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Results

Group A (conventional total hip) has 40 patients (17 females and 23 males), Group B (Dual Mobility Hip) has 40 patients (21 females and 19 males), follow-up period ranged between 12 and 27 months depending on the patient's surgery data, the mean follow-up period was 20 months (range 12–27 months), as shown in table 1.

Measured by the Harris Hip Score (mean ~84 in both groups), the aggregated data reveals that Group A (Conventional THR) and Group B (Dual Mobility THR) had equivalent functional results. Group B (71.78 versus 70.53 years) had a somewhat older population based on their somewhat higher mean age. Significantly, Group B had a superior mean range of motion (4.25) than Group A (3.40), suggesting enhanced flexibility and joint mobility in the dual mobility group. This helps to justify the possible benefit of dual mobility implants in offering improved postoperative joint movement. As in table 2.

Table 1. Gender distribution by group

Gender	Conventional THR (Group A)	Conventional THR (Group A)	Dual Mobility THR (Group B)	Dual Mobility THR (Group B)
	Frequency	Percent	Frequency	Percent
Male	23	57.5%	19	47.5%
Female	17	42.5%	21	52.5%
Total	40	100.0%	40	100.0%

Range of Motion (ROM), Harris Hip Score (HHS)

“There was no statistically significant age difference between the groups. HHS differs not much between groups. There was a notable change in ROM; Group B had greater performance. as seen in table 3.

Range of Motion (ROM), Harris Hip Score (HHS)

With p = 0.37, the two groups' gender distributions reveal no statistically significant difference. This suggests that between

Group A and Group B, gender is not a significant factor in evaluating results between the two treatment approaches. Group A experienced two dislocation incidents (5%) and Group B none; the difference was not statistically significant (p = 0.494). This implies that although dual mobility THR could have a theoretical benefit in lowering dislocation, the observed variation in this group was not sufficient to statistically validate a substantial impact. No cases of deep infection, periprosthetic fracture, implant loosening, or mortality were recorded in either group during the follow-up period. As in table 4.

Table 2. Comparative descriptive statistics of age, harris hip score (HHS), and range of motion (ROM) in groups A (Conventional THR) and B (Dual Mobility THR)

Variable	Group A - Min	Group A - Max	Group A - Mean	Group A - SD	Group B - Min	Group B - Max	Group B - Mean	Group B - SD
Age	60	80	70.53	5.76	60	87	71.78	6.403
(HHS)	70	90	84.25	5.237	70	90	84.48	4.987
(ROM)	3	4	3.4	0.496	3	5	4.25	0.707

Table 3. Statistical comparison between group A (Conventional THR) and Group B (Dual Mobility THR)

Parameter	Group A (Mean ± SD)	Group B (Mean ±SD)	P- value
Age	70.53 ± 5.76	71.78 ± 6.40	0.361
(HHS)	84.25 ± 5.24	84.48 ± 4.99	0.8445
(ROM)	3.40 ± 0.50	4.25 ± 0.71	< 0.0001

Table 4. Statistical comparison of sex and dislocation rates between group A (Conventional THR) and group B (Dual Mobility THR), sex difference between groups, dislocation rate between groups

Parameter	Group A (n=40)	Group B (n=40)	Total (n=80)	P-value
Female	17 (42.5%)	21 (52.5%)	38 (47.5%)	0.37
Male	23 (57.5%)	19 (47.5%)	42 (52.5%)	
Total	40 (100.0%)	40 (100.0%)	80 (100.0%)	
Yes	2 (5.0%)	0 (0.0%)	2 (2.5%)	0.494
No	38 (95.0%)	40 (100.0%)	78 (97.5%)	
Total	40 (100.0%)	40 (100.0%)	80 (100.0%)	

Discussion

The results of this study contribute to the growing body of evidence evaluating the effectiveness of dual mobility total hip arthroplasty (DM-THA) compared to conventional total hip replacement (THR) in elderly patients with displaced femoral neck fractures (FNOF).

While several parameters in our analysis showed no statistically significant differences between the groups, the notable exception was the range of motion (ROM), which was significantly greater in the dual mobility group. Our results show that, with mean scores of 84.25 in Group A and 84.48 in Group B (p = 0.8445), the Harris Hip Score (HHS) outcomes were same across the two groups. This implies that, in terms of pain alleviation and activity levels, this idea has already been explained in the previous sentence. Though HHS variations may not always achieve statistical significance, our findings correlate with the results of Abishek B. S. et al. [11] and Sanjay Agarwala et al.

[12], who reported superior functional ratings and increased range of motion with DM-THA.

Significantly, our study identified a marked improvement in range of motion in the DM-THA group (mean = 4.25) compared to the conventional group (mean = 3.4), with a p-value < 0.0001. This supports the hypothesis that dual mobility implants facilitate greater joint movement postoperatively. Cuthbert et al. [13] also emphasized the superior ROM offered by DM-THA, highlighting its role in reducing pain and promoting mobility.

In terms of age and gender distribution, both were comparable between the groups (p = 0.361 and 0.37 respectively), ruling out demographic bias in outcome comparison. This aligns with prior studies that noted minimal influence of these variables on post-THA recovery when surgical technique and prosthesis type are standardized.

Dislocation, a major concern in THA, was observed in 2 patients in the conventional group and none in the DM-THA

group. Although the difference was not statistically significant, the absence of dislocation in the DM group may hold clinical importance, this trend favors dual mobility, consistent with reports from Singh et al [14], You et al [15], and Mufarrih et al. [16], who found DM-THA associated with reduced dislocation risks. Zain Sadozai et al. [17] advocated routine use of dual mobility cups in eligible FNOF patients, citing fewer revision surgeries and cost offsets. Similarly, Ciriello et al. [18] observed a lower dislocation rate with DM-THA compared to standard bearings, despite a lack of statistical significance, suggesting important clinical relevance. The most important finding of this study is that dual mobility total hip replacement provided significantly better range of motion compared with conventional total hip replacement, while no significant differences were observed in Harris Hip Score or dislocation rates between the two groups.

Emphasizing clinical implications

Explain that DM-THR may be considered when maximizing postoperative ROM is a priority, especially in elderly patients with femoral neck fractures Nugur A, et al. showing similar findings [19]. Future directions: Suggest prospective, multicenter studies with longer follow-up to evaluate implant survival and long-term complications. The limitation of study is the retrospective design limits control over potential confounding variables and selection bias, the short follow-up period may not capture long-term outcomes such as late dislocations or prosthesis failure, the study's single-center setting with a relatively small sample size (n=80) restricts the generalizability of the findings.

Conclusion

Dual mobility implants may offer an advantage in terms of range of motion, without increasing dislocation risk, making them a viable option for elderly patients with femoral neck fractures. Also, this study shows that Harris Hip Scores did not exhibit statistically significant differences between the two groups. The current study reveals a significant difference in range of motion in patients who had dual mobility total hip replacement as compared with patients who had conventional total hip replacement, which shows superior outcomes.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

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