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ORIGINAL ARTICLE

Functional Outcomes of Dual Mobility Cups in Complex Primary Total Hip Arthroplasty: A Prospective Study of 75 Patients

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ABSTRACT

Background: Total hip arthroplasty (THA) is a common procedure for patients with hip joint disorders; however, dislocation remains a significant complication, especially in complex primary cases. Dual mobility cups (DMCs) have been introduced to enhance stability and reduce dislocation risk.

Objective: To evaluate the functional outcomes and complication rates associated with the use of DMCs in complex primary THA.

Methods: A prospective study was conducted on 75 patients who underwent complex primary THA using DMCs between January 2022 and October 2023. Functional outcomes were assessed using the Harris Hip Score (HHS) and the Parker Mobility Score (PMS) preoperatively and at 6 and 12 months postoperatively. Complications were recorded during the follow-up period. Logistic regression analysis was performed to identify predictors of functional improvement.

Results: The mean preoperative HHS was 42.5 (range 20–60), which improved to 80.2 (range 70–90) at 12 months postoperatively ($p<0.001$). The mean preoperative PMS was 4.2 (range 2–6), increasing to 7.1 (6–9) at 12 months ($p<0.001$). No dislocations occurred during the follow-up period. Complications included one case of superficial wound infection and two instances of periprosthetic fractures, all of which were managed conservatively.

Conclusion: DMCs in complex primary THA provide excellent functional outcomes with a low complication rate, suggesting their efficacy in enhancing joint stability and patient mobility.

Keywords: Dual mobility cup, total hip arthroplasty, functional outcome, dislocation, hip replacement, orthopedic surgery

INTRODUCTION

Total hip arthroplasty (THA) is a widely performed procedure to alleviate pain and improve function in patients with hip joint disorders such as osteoarthritis, hip fractures, and developmental dysplasia. Despite its effectiveness, dislocation remains one of the most common complications, especially in patients with complex primary hip conditions[1]. Complex primary cases include patients with neuromuscular disorders, cognitive impairments, and those with previous hip surgeries, all of which increase the risk of dislocation[2]. To address this issue, dual mobility cups (DMCs) have been introduced as a viable solution. DMCs consist of two articulating components: a femoral head articulating with a polyethylene liner, which in turn articulates with a metal acetabular shell. This design increases the range of motion and enhances joint stability[3].

The use of DMCs has shown promising results in reducing the risk of dislocation in both primary and revision THA[4,5]. Previous studies have demonstrated significant improvements in functional outcomes and reduced complications in patients undergoing THA with DMCs[6,7]. For example, Assi et al. (2021) observed a reduction in dislocation rates in high-risk patients[8]. Similarly, Garabano et al. (2023) reported high functional scores and low complication rates in elderly patients treated with DMCs[9].

However, there is a lack of comprehensive studies focusing on the outcomes and complications specifically related to complex primary THA cases using DMCs. Therefore, the present study aims to evaluate the functional outcomes, complication rates, and potential predictors of success associated with the use of DMCs in complex primary THA.

MATERIALS AND METHODS

Study Design and Participants: This prospective study was conducted at Orthopedics unit MMMTH MTI D.I.khan and Khyber teaching hospital Peshawar between January 2022 and Oct 2023. A total of 75 patients who underwent complex primary THA with DMCs were included. Inclusion criteria included patients aged 50-85 years with complex primary hip conditions, including neuromuscular disorders, cognitive impairments, and previous hip surgeries. Exclusion criteria included active infections, malignancies, and insufficient follow-up data.

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Surgical Technique: All procedures were performed by a single surgical team using a posterior approach. A cemented DMC was implanted in each patient. The femoral component was selected based on preoperative templating, and the acetabular component was positioned to achieve optimal orientation, following standard surgical protocols to minimize variability.

Outcome Measures: Functional outcomes were assessed using the Harris Hip Score (HHS) and the Parker Mobility Score (PMS) preoperatively and at 6 and 12 months postoperatively. The HHS evaluates pain, function, deformity, and range of motion, while the PMS assesses mobility and independence. Complications, including dislocations, infections, fractures, and revisions, were recorded during the follow-up period. Logistic regression analysis was performed to identify predictors of functional improvement.

Statistical Analysis: Data were analyzed using SPSS version 25.0. Descriptive statistics were computed for demographic and clinical variables. Paired t-tests were used to compare preoperative and postoperative scores. A p-value of <0.05 was considered statistically significant. Logistic regression analysis was employed to identify significant predictors of functional improvement.

RESULTS

The study cohort comprised 75 patients, with a mean age of 67.4 years (range 50–85). There were 45 females (60%) and 30 males (40%). The underlying diagnoses included 30 cases of osteoarthritis (40%), 25 of femoral neck fractures (33.3%), 15 of developmental dysplasia of the hip (20%), and 5 of avascular necrosis (6.7%). The mean Charlson Comorbidity Index was 3.2, and the mean American Society of Anesthesiologists (ASA) score was 2.1. (Table 1)

The mean preoperative HHS was 42.5 (range 20–60), which improved to 80.2 (range 70–90) at 12 months postoperatively ($p<0.001$). The mean preoperative PMS was 4.2 (range 2–6), increasing to 7.1 (6–9) at 12 months ($p<0.001$). These improvements were consistent across all subgroups, including

patients with neuromuscular disorders and cognitive impairments. (Table 2)

Table 1: Demographics and Clinical Characteristics

Characteristic	Value
Number of Patients	75
Mean Age (years)	67.4 (50–85)
Gender (Male/Female)	30 (40%) / 45 (60%)
Underlying Diagnosis	
Osteoarthritis	30 (40%)
Femoral Neck Fractures	25 (33.3%)
Developmental Dysplasia of the Hip	15 (20%)
Avascular Necrosis	5 (6.7%)
Mean Charlson Comorbidity Index	3.2
Mean ASA Score	2.1

Table 2: Functional Outcomes

Time Point	Mean HHS (Range)	Mean PMS (Range)
Preoperative	42.5 (20–60)	4.2 (2–6)
6 Months	73.4 (60–85)	6.3 (5–8)
12 Months	80.2 (70–90)	7.1 (6–9)

P-value <0.05

No dislocations occurred during the follow-up period. One patient developed a superficial wound infection, which was treated successfully with antibiotics. Two patients sustained periprosthetic fractures during rehabilitation; both fractures were managed conservatively with immobilization and physical therapy, resulting in full recovery. There were no cases of implant failure or need for revision surgery. (Table 3)

Table 3: Postoperative Complications

Complication	Number of Cases
Superficial Wound Infection	1
Periprosthetic Fractures	2
Dislocations	0
Revision Surgeries	0

Logistic regression analysis was performed to identify predictors of functional improvement (measured by HHS and PMS). The results showed that age (p=0.03), Charlson Comorbidity Index (p=0.02), and preoperative HHS (p=0.01) were significant predictors of postoperative functional improvement.

Table 4: Logistic Regression Analysis

Predictor	p-value	Odds Ratio (95% CI)
Age (years)	0.03	0.95 (0.91–0.99)
Charlson Comorbidity Index	0.02	0.88 (0.77–0.98)
Preoperative HHS	0.01	1.07 (1.03–1.11)

DISCUSSION

The present study demonstrates that the use of dual mobility cups (DMCs) in complex primary total hip arthroplasty (THA) results in excellent functional outcomes, as indicated by significant improvements in the Harris Hip Score (HHS) and Parker Mobility Score (PMS). These findings align with those of previous studies which reported favorable functional outcomes in high-risk patients[10,11]. The absence of dislocations in our cohort is particularly notable, as dislocation remains one of the most common complications in complex primary THA[12,13].

The low complication rate observed in our study further supports the safety and efficacy of DMCs in this patient population. Superficial wound infection and periprosthetic fractures, which are common complications in THA, were managed successfully with conservative treatments[14]. Our findings are consistent with those of Garabano et al. (2023), who also reported low complication rates and high functional scores in elderly patients undergoing THA with DMCs[15].

Age and preoperative HHS were identified as significant predictors of functional improvement in our logistic regression analysis. These results are in line with those of previous studies, which have shown that older age and worse preoperative functional status are associated with poorer postoperative outcomes[16,17].

Despite the promising results, this study has several limitations. The relatively short follow-up period of 12 months may not capture long-term complications or implant wear, which could affect the durability of the DMC[18]. Additionally, the study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings[19].

CONCLUSION

Dual mobility cups in complex primary total hip arthroplasty provide excellent functional outcomes, as demonstrated by significant improvements in both the Harris Hip Score and Parker Mobility Score. The absence of dislocations and low complication rates further support their role in enhancing joint stability and improving patient mobility. Age, preoperative HHS, and Charlson Comorbidity Index were identified as significant predictors of postoperative functional improvement. Although the findings are promising, further multicenter, long-term studies are needed to confirm these results and assess the durability of DMCs in complex primary THA.

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