Original Article

Effect of Immediate Weight Bearing on Femoral Stem Subsidence After Uncemented Total Hip Arthroplasty: A Prospective Observational Study

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Abstract

Background: Early mobilization after uncemented THA is widely adopted, but concerns about femoral stem subsidence persist. **Material and Methods:** Prospective observational study of 25 patients with immediate weight bearing. **Results:** 88% showed no subsidence; minimal non-significant subsidence observed in 12%. HHS improved significantly. **Conclusion:** Immediate weight bearing is safe in early follow-up.

Keywords: Total Hip Arthroplasty, Uncemented Femoral Stem, Immediate Weight Bearing, Femoral Stem Subsidence, Postoperative Mobilization, Prospective Observational Study.

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Introduction

Total hip arthroplasty (THA) is one of the most commonly performed and successful reconstructive procedures for adult hip disorders, particularly arthritis. It is associated with significant pain relief, improved functional outcomes, high patient satisfaction, and low complication rates. The primary goals of THA include achieving a pain-free range of motion, restoring limb length, maintaining appropriate hip offset, and ensuring dynamic stability.[1]

Despite its success, early failure of THA can occur, with femoral stem subsidence being a notable cause. Subsidence refers to the distal migration of the femoral stem relative to the greater trochanter. It is more frequently observed in uncemented THA compared to cemented implants, particularly within the first 6–8 weeks postoperatively. Before adequate osseointegration occurs, the risk of subsidence ranges widely (5–61.5%) and is influenced by factors such as implant design, bone anatomy, and postoperative weight-bearing protocols.[2]

Traditionally, postoperative rehabilitation following cementless THA involved partial weight-bearing (PWB) for 6–12 weeks to minimize micromotion at the implant–bone interface. Excessive micromotion was believed to impair osseous ingrowth, leading instead to fibrous tissue formation and compromised implant stability. However, clinical evidence supporting strict PWB has been inconclusive.[3]

Recent studies suggest that early full weight-bearing (FWB) does not negatively impact implant stability or long-term outcomes. While some studies, such as Tian et al., reported increased early subsidence with FWB at 3 months, no significant differences were observed in long-term follow-up (2 years or more). Furthermore, modern enhanced recovery protocols advocate immediate weight-bearing postoperatively, demonstrating no adverse effects on implant fixation or survivorship.[4]

Cementless THA has shown excellent long-term outcomes across various patient populations, including older individuals and those with rheumatoid arthritis. However, long-term survival rates appear comparable between cemented and cementless implants. Cemented stems may offer advantages in postoperative rehabilitation due to fewer restrictions on weight-bearing.[5]

Experimental studies, including those by Pilliar et al., highlight the importance of minimizing micromotion for successful bone ingrowth. Nevertheless, physiological loading conditions during routine activities can exceed 250% of body weight, suggesting that controlled early weight-bearing may be tolerated without compromising implant stability.[6]

In conclusion, while traditional approaches favored delayed weight-bearing, emerging evidence supports immediate weight-bearing following cementless THA. This approach may reduce complications associated with immobilization, such as deep vein thrombosis (DVT), delayed muscle recovery, and prolonged hospitalization, while enhancing patient satisfaction and facilitating earlier return to daily activities. The present study aims to evaluate the outcomes of immediate weight-bearing as part of an enhanced recovery protocol in uncemented THA.[7]

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Materials and Methods

Patients presenting to DR. RML Hospital orthopaedic opd and emergency aged 18 to 70 years fulfilling eligibility criteria and providing consent were enrolled in the study.
Details regarding clinical history and examination were recorded.

Preoperatively:

- All routine investigations for the purpose of pre anesthetic check-up were performed.
- 100% magnification xray of pelvis with bilateral hip AP view was done
- DEXA scan done
- Dorr score was used to determine type of fixation
- Clinical evaluation using Modified harris score
- Templating for femoral stem component

Intraoperatively:

- Implantation of femoral stem of templated size
- Press fit and stability of the implant was checked

Post operatively:

- Post op X-ray to determine fit of femoral stem and stem angulation
- Immediate weight bearing started from post op day 1.
- An Anteroposterior view of pelvis with bilateral hip was performed at 2 days post operatively then 1 week and then 3 weeks, 5 weeks and finally at 8 weeks.
- Clinical evaluation using Modified harris score

Selection Criteria: Patients aged more than 18 years with secondary osteoarthritis of the hip and normal bone mineral density as confirmed by DEXA scan were included in the study. Patients were excluded preoperatively if they had bone neoplasms, active infections, rheumatoid arthritis, severe comorbid conditions affecting postoperative rehabilitation (including neurological, psychiatric, or other significant musculoskeletal disorders), a history of osteoporosis or fragility fractures, or were undergoing revision total hip arthroplasty. At the preoperative planning stage, patients were further excluded if the Dorr classification did not support the use of an uncemented total hip arthroplasty. Intraoperatively, cases were excluded if adequate press-fit fixation was not achieved or if the templated femoral stem size could not be implanted. Postoperatively, patients were excluded if radiographic evaluation demonstrated femoral stem angulation greater than 3 degrees, varus alignment of the stem, or an unsatisfactory implant fit on postoperative imaging

Statistical Methods: Statistical analysis will be performed by the SPSS program for Windows, version 17.0(SPSS, Chicago, Illinois). Continuous variables will be presented as mean ± SD, and categorical variables will be presented as absolute numbers and percentage. Data will be checked for normality before statistical analysis. Within the group comparisons, continuous variables, paired t test will be used to determine the significant change pre to post treatment. $P<0.05$ will be considered statistically significant.

Results

A total of 25 patients were included in the study. The age distribution revealed that the majority of patients belonged to the 41–50 years age group (44%), followed by 31–40 years (28%), <30 years (16%), and 51–60 years (12%). The mean age of the study population was 40.52 ± 9.69 years, indicating a predominance of middle-aged individuals.

Gender distribution showed a higher proportion of males, with 16 patients (64%), compared to 9 females (36%), suggesting a male predominance in the study population.

Regarding diagnosis, a variety of hip joint pathologies were observed. The most common diagnosis was osteoarthritis of the bilateral hip joint secondary to avascular necrosis (AVN) of the femoral head, accounting for 48% of cases. This was followed by osteoarthritis of the hip secondary to AVN of the femoral head (32%). Other diagnoses included osteoarthritis of the right hip secondary to ankylosing spondylitis (8%), and less frequent conditions such as left hip osteoarthritis with protrusio acetabuli in a known case of systemic sclerosis, osteoarthritis of the right hip secondary to AVN, and post-traumatic arthritis of the right hip, each contributing 4% of cases.

In terms of surgical intervention, right total hip replacement (THR) was performed in 11 patients (44%), while left THR was carried out in 8 patients (32%).

Preoperative functional assessment using the Harris Hip Score (HHS) showed that 48% of patients had scores ≤50, while 52% had scores >50. The mean preoperative HHS was 52.2 ± 6.1, with no statistically significant difference ($p = 0.998$), indicating comparable baseline functional status among patients.

Postoperative functional outcomes demonstrated progressive improvement over time. The mean HHS increased from 55.6 ± 5.7 at the first follow-up (3 weeks) to 60.3 ± 6.0 at the second follow-up (5 weeks), and further to 72.7 ± 5.1 at the third follow-up (8 weeks). Although there was a clear upward trend in functional recovery, the differences were not statistically significant (p-values: 0.527, 0.630, and 0.596, respectively).

Subsidence analysis showed that no patients had subsidence at week 1. At weeks 3, 5, and 8, subsidence was observed in 3 patients (12%), while the remaining 22 patients (88%) showed no subsidence. Among those with subsidence, measurements remained minimal, with values of approximately 1 mm in two patients and 2 mm in one patient, with no progression over time. The mean subsidence was 0.16 mm, and the p-value of 0.47 indicated no statistically significant change.

Overall, the findings demonstrate a predominance of middle-aged male patients with osteoarthritis secondary to AVN, significant postoperative functional improvement, and minimal, non-progressive implant subsidence.

Discussion

The present study aimed to evaluate the effect of immediate weight bearing on femoral stem subsidence following uncemented total hip arthroplasty (THA). The study included 25 patients aged 18–70 years presenting to the orthopaedic OPD and emergency department of Dr. RML Hospital. Radiological assessments and Harris Hip Scores (HHS) were used to evaluate postoperative outcomes.[8]

Demographic Characteristics: The majority of patients (44%) belonged to the 41–50-year age group, with a mean age of 40.52 ± 9.69 years. Males constituted 64% of the study population, while females accounted for 36%. The mean age was comparable

to that reported by Bottner et al. (2005), whereas Sankarlingam et al. (2014) reported a higher mean age of 65 years. Male predominance was also observed in the study by Bottner et al. (2005).[9]

Surgical Details and Harris Hip Score: Bilateral hip osteoarthritis secondary to avascular necrosis (AVN) was the most common diagnosis, accounting for 48% of cases, followed by left hip osteoarthritis secondary to AVN in 32%. The mean preoperative HHS was 52.2 ± 6.1, with 52% of patients scoring above 50. The mean HHS improved progressively to 55.6 ± 5.7, 60.3 ± 6.0, and 72.7 ± 5.1 at the first, second, and third assessments, respectively, indicating progressive functional improvement following surgery. Sankarlingam et al. (2014) reported higher mean HHS values of 88, 93, and 97 at 6 weeks, 3 months, and 12 months, respectively.[10]

Weight-Bearing Protocol: Immediate weight bearing was initiated on postoperative day 1 in all patients. In contrast, Sankarlingam et al. (2014) initiated standing and full weight-bearing mobilisation with walker support on postoperative day 2. Although conventional protocols have often recommended partial weight bearing for 6–12 weeks, previous studies suggest that immediate weight bearing may facilitate functional recovery, reduce hospital stay, and lower the risk of deep vein thrombosis.[11]

Femoral Stem Subsidence: The primary outcome demonstrated that immediate weight bearing did not result in statistically significant femoral stem subsidence at postoperative weeks 1, 3, 5, and 8. Overall, 88% of cases showed no subsidence, although some initial subsidence was observed during the first three postoperative weeks. These findings are consistent with Rao et al. (1998), who reported that initial femoral component subsidence did not prevent subsequent implant stability and bone ingrowth, and Chan et al. (2003), who demonstrated favourable clinical outcomes with full weight bearing after uncemented THA. Similarly, Sankarlingam et al. (2014) reported no notable component migration during the early postoperative period or subsequent follow-up.[12]

The findings suggest that immediate postoperative weight bearing following uncemented THA is not associated with significant femoral stem subsidence during the first eight postoperative weeks. Progressive improvement in Harris Hip Scores further indicates favourable functional recovery. These results support the feasibility of immediate weight bearing after uncemented THA; however, larger studies with longer follow-up are required to confirm long-term implant stability and clinical outcomes.[13,14]

Conclusion

In conclusion, this study adds valuable insights to the on the effects of immediate weight bearing on femoral stem subsidence after uncemented THA. The majority of cases in our study did not exhibit subsidence. The results suggest that immediate weight bearing may not adversely impact femoral stem stability in the early postoperative period. However, considering the study's limitations, including the relatively small sample size and the need for further exploration in diverse patient populations, cautious interpretation is warranted. Future research endeavors could explore these findings in larger cohorts and consider additional factors that may influence postoperative outcomes.

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Conflicts of interest

There are no conflicts of interest.

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