

Original Research

Effect of Immediate Unrestricted Weight Bearing After Unilateral Uncemented of Total Hip Replacement

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Abstract:

Background: Total hip arthroplasty (THA) is a highly successful procedure for treating hip arthritis. However, subsidence of the femoral stem remains a concern, particularly in uncemented THA.

Objectives: To evaluate the effects of immediate unrestricted weight-bearing on femoral stem subsidence and functional outcomes in patients undergoing unilateral uncemented THA.

Methods: This prospective study included 20 patients who underwent unilateral uncemented THA. Patients were allowed full weight-bearing immediately after surgery. Femoral stem subsidence was measured radiologically, and functional outcomes were assessed using the Modified Harris Hip Score (MHHS) at preoperative and 6-week postoperative time points.

Results: The mean age of the patients was 50.12 years, and 80% were diagnosed with avascular necrosis (AVN) of the femoral head. The mean postoperative femoral stem subsidence was 0.4mm. The MHHS showed significant improvement from a preoperative mean score of 37.0 ± 8.024 to a postoperative mean score of 82.1 ± 5.281 at 6 weeks.

Conclusion: This study demonstrates that immediate unrestricted weight-bearing after unilateral uncemented THA is safe and effective, with minimal femoral stem subsidence and significant improvements in functional outcomes.

Keywords: Total hip arthroplasty; uncemented; weight-bearing; femoral stem subsidence; functional outcomes

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Introduction

Total hip arthroplasty is the most commonly performed adult reconstructive procedure of hip. By the virtue of post op effects of Total hip arthroplasty (THA) like reduction in pain and improvement in function of patients with arthritis of the hip and therefore a high satisfaction rate and a low incidence of complications.¹ It is regarded as a highly successful procedure with well established mid-to long term clinical outcomes and implant survivorships. The goal of a successful Total hip Arthroplasty (THA) is to provide the patient a full pain free range of motion, equalize limb length discrepancies recreate appropriate offset, to produce a pain-free and dynamically stable THA.²

Even after being such a successful procedure one of the reason of early failure total hip arthroplasty is subsidence of femoral stem. Distalisation of femoral stem with reference to greater trochanter is defined as subsidence. Uncemented type of total hip arthroplasty is more susceptible to subsidence compared to cemented type.³ According to the literature, the

maximum subsidence of the femoral stem occurs within the first 6-8 weeks postoperatively. This timeframe coincides with the period of bony ingrowth, which can take anywhere from 4-12 weeks to up to 3 years. The risk of subsidence of the femoral stem before sufficient osteointegration is reported to range from 5% to 61.5%. Several factors contribute to the subsidence of the femoral component in total hip arthroplasty, including the type of weight-bearing protocol, femoral stem design, and anatomical properties.⁴ Hence, the present study was undertaken to study the effects of immediate unrestricted weight bearing after unilateral uncemented of total hip replacement.

Material and methods

The present prospective study was carried among 20 patients of total hip arthroplasty in the department of Orthopaedics, Rama Medical College and Research Center, Hapur, Uttar Pradesh. The study was carried from October 2022 to October 2023. Prior to the study, ethical clearance was obtained from

institutional ethical committee and written informed consent was obtained from all participating patients. Inclusion criteria comprised of patients aged between 40 – 70 years with osteoarthritis of hip and underwent primary THA. The pre-operative exclusion criteria were established to ensure that patients participating in the study were suitable for the enhanced recovery program. Patients suffering from bone neoplasm, active infection, or rheumatoid arthritis were excluded from the study. Additionally, patients with severe pathology that would affect post-operative participation, such as neurologic, psychiatric, or other confounding pre-existing musculoskeletal disorders, were also excluded. Patients with a history of osteoporosis or fragility fractures were not eligible to participate. Patients undergoing revision total hip arthroplasty were also excluded from the study.

As part of the preoperative evaluation, patients underwent a DEXA (Dual-Energy X-ray Absorptiometry) scan to assess bone density, as well as preoperative radiographs to evaluate the hip joint.

During the pre-operative planning stage, a set of exclusion criteria were applied to determine the suitability of patients for uncemented total hip arthroplasty (THA). Patients who did not meet the Dorr classification criteria indicating suitability for uncemented THA were excluded from the study. Additionally, a thorough preoperative radiological and clinical evaluation was conducted, and the modified Harris Hip Score was calculated to assess the severity of the patient's condition. The study specifically targeted patients aged 40-70 who presented to the outpatient department of Rama Medical College, Hapur, with secondary osteoarthritis.

Subsequently, patients underwent total hip arthroplasty (THA) surgery as part of the study protocol. 20 Patients undergoing total hip arthroplasty (THA) received an enhanced recovery program (ERP) that included preoperative gait training, detailed lectures, and non-steroidal anti-inflammatory drug (NSAID) application before surgery. The operation was performed under spinal anesthesia, and intraoperative measures included topical and intravenous tranexamic acid administration, local-infiltration analgesia, and no drain usage. Patients

were allowed full weight-bearing immediately after surgery.

Post-operatively immediate weight bearing was started. Patients were mobilized for the first time 2-3 hours after surgery, with full weight-bearing. They received physiotherapeutic treatment twice daily during their hospital stay, led by two specially educated fast-track physiotherapists. A standardized treatment protocol for fast-track THA was established, with physiotherapeutic treatment performed in accordance with hip precautions. The exercise circuit focused on strengthening hip and knee muscles, and included a walking course, muscle exercises, and coordination tutorials.

The radiographs were done at 2 days, then after 1 week and later after 3 weeks.

The outcome measures for this study were designed to comprehensively assess the effectiveness of the surgical intervention. The primary outcome was evaluated radiologically, focusing on the subsidence of the femoral stem, which was assessed through antero-posterior radiographs of the pelvis with bilateral hips. In addition to the primary outcome, a secondary outcome measure was employed, utilizing the Modified Harris Hip Score (MHHS). This score was completed by the patients at two specific time frames: pre-operatively and at the 6th week post-operatively.

Data so obtained was analysed using SPSS-20 software and mean \pm standard deviation and median was calculated.

Results

This study consisted of 20 patients, with a male-to-female ratio of 15:5. The mean age of the patients was 50.12 years, with a standard deviation of 10.42 years, and a range of 40-60 years (table 1).

The majority of patients (80%) were diagnosed with avascular necrosis (AVN) of the femoral head (table 2). Postoperatively, the mean femoral stem subsidence was measured to be 0.4mm. The patients' functional outcomes were assessed using the Modified Harris Hip Score (MHHS), which showed a significant improvement from a preoperative mean score of 37.0 ± 8.024 to a postoperative mean score of 82.1 ± 5.281 at 6 weeks (table 3).

Table 1: Demographic details

Gender	Total number of patients=20
Male	15
Female	5
Mean Age	50.12 \pm 10.42 years (range 40-60 years)

Table 2: Diagnosis

Diagnosis	Total number of patients=20
AVN	(16) 80%
Other	(4) 20%

Table 3: Study Parameters

Mean post operative femoral stem subsidence	0.4mm
Mean preoperative modified Harris hip score	37.0 ± 8.024
Mean post operative modified Harris hip score at 6 weeks	82.1 ± 5.281

Discussion

The goals of total hip arthroplasty (THA) are pain reduction, enhanced mobility, stability, and limb length equality. Femoral stem subsidence is one of the early cause of failure following total hip replacement and can negatively impact an otherwise outstanding outcome.

As patients begin weight-bearing, hoop stresses transmitted from the implant to the bone cause further compaction, leading to subsidence until mechanical stability is achieved.⁵ Research suggests that subsidence within the first weeks of weight-bearing enables loading across the entire surface area of the stem, promoting osteointegration and force transmission.⁵⁻⁶ Ström H et al⁷ support this hypothesis, observing early postoperative subsidence followed by implant stabilization.

Radiographic measurement errors of up to 2 mm are considered acceptable.⁸⁻⁹ Clinically, subsidence of up to 3 mm is deemed acceptable.¹⁰⁻¹¹ Another crucial factor for successful osteointegration is the degree of micromotion at the bone-implant interface. Micromotion exceeding 150 µm can lead to the formation of less stable fibrous tissue at the bone-implant interface.^{9,12}

The present study consisted of 20 patients, with a male-to-female ratio of 15:5. The mean age of the patients was 50.12 years, with a standard deviation of 10.42 years, and a range of 40-60 years. The majority of patients (80%) were diagnosed with avascular necrosis (AVN) of the femoral head. Postoperatively, the mean femoral stem subsidence was measured to be 0.4mm. The patients' functional outcomes were assessed using the Modified Harris Hip Score (MHHS), which showed a significant improvement from a preoperative mean score of 37.0 ± 8.024 to a postoperative mean score of 82.1 ± 5.281 at 6 weeks.

Postoperative rehabilitation following cementless total hip arthroplasty (THA) has traditionally involved partial weight-bearing for 6 to 12 weeks after surgery.^{13,14} This approach was based on concerns that early full weight-bearing could increase micromotion of the stem, potentially leading to fibrous ingrowth at the implant-bone interface.⁴

Partial weight-bearing was thought to reduce stress on the implant-bone interface, promoting proper osteointegration and stable implant fixation. However, clinical studies conducted by Radl R et al,¹⁵ Rao RR et al,¹⁶ Woolson ST et al¹⁷ supporting this theory have yielded mixed results. Various studies conducted by Kehlet H¹⁸, Husted H et al¹⁹ have also demonstrated the safety and efficacy of enhanced recovery protocols involving full weight-bearing on

the day of surgery. Tian P et al²⁰ compared partial and full weight-bearing after THA and found increased femoral subsidence in the full weight-bearing group at 3 months, but no difference at 2 years or later. Another study by Hol AM et al²¹ give a moderate to strong evidence for immediate UWB after primary uncemented THA, that is, patients started their rehabilitation as soon as possible after surgery with immediate weight bearing as tolerated.

Meticulous pre operative work up and careful patient selection fit for uncemented THA show promising results as incidence of subsidence in patients in this study is statistically not significant.

Conclusion

In conclusion, the findings of this study demonstrate that meticulous preoperative evaluation and careful patient selection for uncemented total hip arthroplasty (THA) yield promising results. Notably, the incidence of subsidence in this study was statistically insignificant. The results also suggest that full weight-bearing can be safely implemented as part of an enhanced recovery protocol in carefully selected patients undergoing THA. The present study observed minimal mean femoral stem subsidence of 0.4mm postoperatively. Furthermore, the Modified Harris Hip Score (MHHS) showed a significant improvement, increasing from a preoperative mean score of 37.0 to a postoperative mean score of 82.1 at 6 weeks. These results indicate that THA can be an effective treatment option for patients with avascular necrosis (AVN), leading to improved functional outcomes and minimal complications.

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