

Evaluation of Early Complications of Uncemented Total Hip Arthroplasty for Avascular Necrosis of Femoral Head: A Prospective Study

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Abstract:

Background and Objectives: Avascular necrosis takes place by a compromised supply of blood to the bone. Fractures, dislocations, coagulopathy, long-term steroid usage, long-term alcohol use, congenital causes, and several other conditions can all contribute to it. The hip joint, or femoral head, is most affected. It can be managed in an invasive or conservative manner. For both cemented and uncemented cases of 3rd and 4th stage avascular necrosis, total hip replacement is the preferred course of therapy. The purpose of this study was to evaluate any early clinical complications that could arise from uncemented total hip arthroplasty.

Material and Methods: 30 patients (34 hips) with avascular necrosis of the femoral head who underwent uncemented total hip arthroplasty between the ages of 18 and 45 are included in the study. At the moment of the discharge process, at 4 weeks, 3 months, 6 months, and 1 year, patients had been followed up prospectively, and the Harris Hip score was used to evaluate the results.

Results: The Harris hip score at the last follow-up was 87.852 ± 8.784 (Min. 61 and Max. 98), while the mean preoperative score was 45.088 ± 16.190 (Min. 15 and Max. 76). Mean VAS pain score at the final follow-up visit was 12.529 ± 5.748 (Min. 5 and Max. 25) and mean preoperative VAS pain score was 72.441 ± 13.614 (Min. 65 and Max. 90). Heterotopic ossification and limb length disparities were the most frequent postoperative surgical complications.

Conclusion: Even though a number of joint-preserving techniques have been quite successful in certain patients, total hip replacement is still the gold standard for treating advanced stages of femoral head avascular necrosis, and following conventional surgical protocol can help prevent some complications.

Keywords: Avascular necrosis; Complications; Femoral head; Outcomes; Uncemented total hip arthroplasty.

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Introduction

Munro [1] published the first description of osteonecrosis in 1738. Plemister (1915) reported the microscopic observations in necrotic bone, drawing a comparison between the changes in bone death brought on by an infection (septic necrosis) and those brought on by a disruption in the blood flow (aseptic necrosis).

Chandler first used the phrase "coronary disease of the hip" in 1948, and it quickly gained traction. [2,3] The patient's age, the AVN's stage, and the type of prior treatment received all influence the course of treatment after the diagnosis of AVN is established. [4]

In early stages of AVN, conservative management and joint-preserving procedures can be successful in certain patients. However, total hip arthroplasty (THA) is still the standard of care for patients with

advanced disease and articular collapse, as well as those who have not responded well to conservative management. [4,5] The father of contemporary total hip arthroplasty, Sir John Charnley, made ground-breaking contributions to all facets of THA in 1960, including the idea of low frictional arthroplasty and surgical hip biomechanics change, lubrication, materials, and design.

His invention included a stainless steel femoral component attached with PMMA cement and a Teflon cup. Uncemented total hip arthroplasty uses "press-fit" or "biologic bone in growth" to provide fixation without the use of cement. [6] Often utilized in young patients who have significant physical demands, as these people are more likely to require revision surgery in the future.

Aim and Objectives:

The purpose of this study was to evaluate any early clinical complications that could arise from uncemented total hip arthroplasty.

Material and Methods:

This prospective research involved 30 patients (34 hips) who had uncemented total hip arthroplasty at NSCB Medical College in Jabalpur.

Preoperative evaluations of the cases were conducted, and they were prospectively followed up on at discharge, 4 weeks, 3 months, 6 months, and 1 year later. Six months was the minimum follow-up time.

Inclusion Criteria:

- Patients treated with an uncemented total hip arthroplasty at the orthopaedic department of N.S.C.B. Medical College & Hospital in Jabalpur (M.P.) who had avascular necrosis of the femoral head
- Patients with AVN of grade 3 and above; patients of both genders in the age range of 18 to 45.
- Patients who are willing to consent to taking part in the research.

Exclusion Criteria:

- Individuals whose co-morbid conditions are not directly linked to avascular necrosis
- Individuals who have had prior surgery on the hip joint in question.
- The patient declines to take part in the research.
- Individuals who did not follow up.

Surgical approach:

The postero-lateral method, which is a variant of the posterior approach outlined by Gibson and Moore, is the one that we have chosen for this study along with a posterior hip dislocation.

Post op care:

- Every patient was kept in a different side room.
- With the use of a triangular pillow splint, the hip is positioned in a neutral rotation and around 15 degrees of abduction.
- From the second post-operative day, gentle isometric exercise was recommended, and patients were permitted to sit on the side of the bed to avoid excessive hip flexion.
- Patients were forced to bear partial weight over the injured limb and were eventually permitted to walk with the assistance of a walker.
- They were advised against sitting cross-legged or in a crouching position.

Assessment of outcomes:

- Using the Harris Hip Score, clinical and functional progress was evaluated. [8]
- Radiological factors, such as acetabular cup alignment (inclination and anteversion) and femoral stem placement (central, valgus, or varus placement), were evaluated on X-ray films (AP and lateral view).
- The patient's complaints, the clinical examination, radiological testing, and laboratory tests were used to evaluate the complications.

Statistical analysis:

To ascertain if the outcomes were statistically significant, the difference in means for values obtained preoperatively and postoperatively was analyzed using the student's paired t-test. A P value of less than 0.05 was deemed significant.

Results and observations:

Thirty patients were included; 26 had unilateral total hip arthroplasty (THA), and 4 had bilateral THA. This meant that 34 hips were operated on. The incision was 12 cm on average, and 150 ml of blood was lost throughout the procedure. The working day lasted 1.5 hours on average. Two firms' implants—company Z and company M—were used.

There was no loss of follow-up or mortality following surgery, and the minimum follow-up length was six months. With a mean age of presentation of 30.28 ± 8.026 years, 13 out of 30 patients (43.3%) with AVN of the femoral head fall into the age category of 21–30 years. With a male to female ratio of 3.2:1, 23 out of 30 patients (76.7%) with AVN of the femoral head were male.

There were 34 hips ($n = 34$) that underwent total hip arthroplasty (THA) with advanced AVN (stages III & IV, Ficat & Arlet); of them, 24 were in stage III (70.6%) and 10 in stage IV (29.4%).

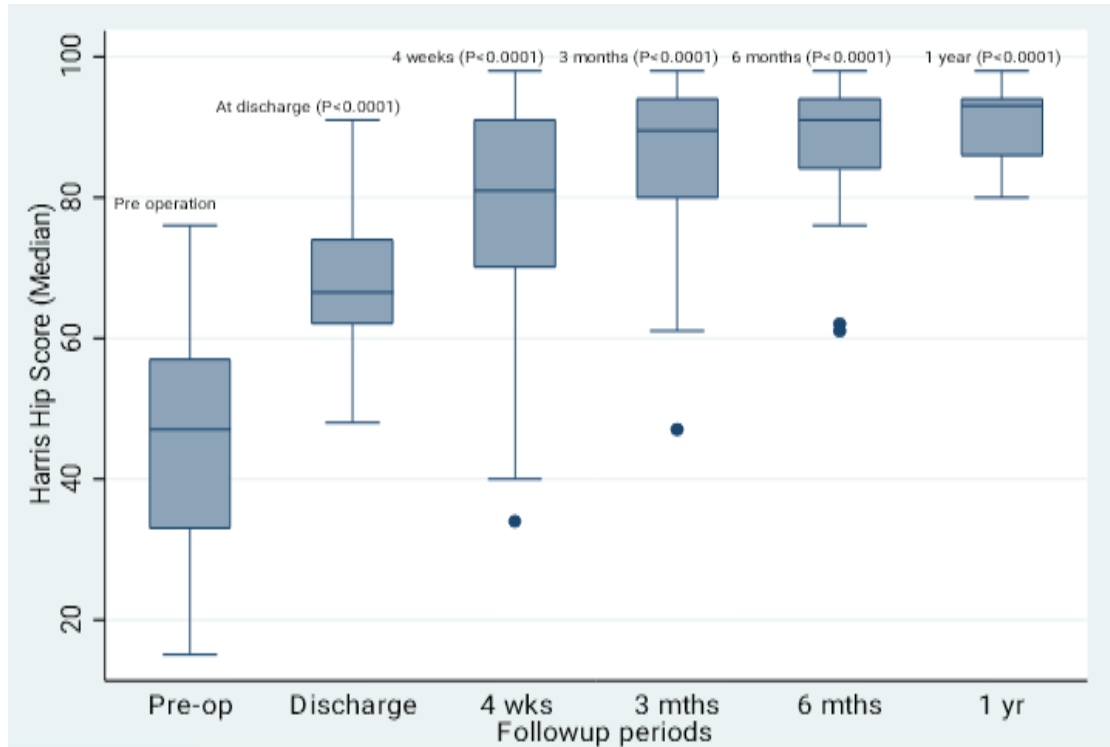
Ten out of thirty instances with AVN of the femoral head were idiopathic (33.3%), with the other five cases being caused by sickle cell disease ($n = 5$, 16.7%), post-traumatic AVN ($n = 9$, 30%), alcoholism ($n = 5$, 16.7%), and steroid use ($n = 1$, 3.3%).

Outcomes:

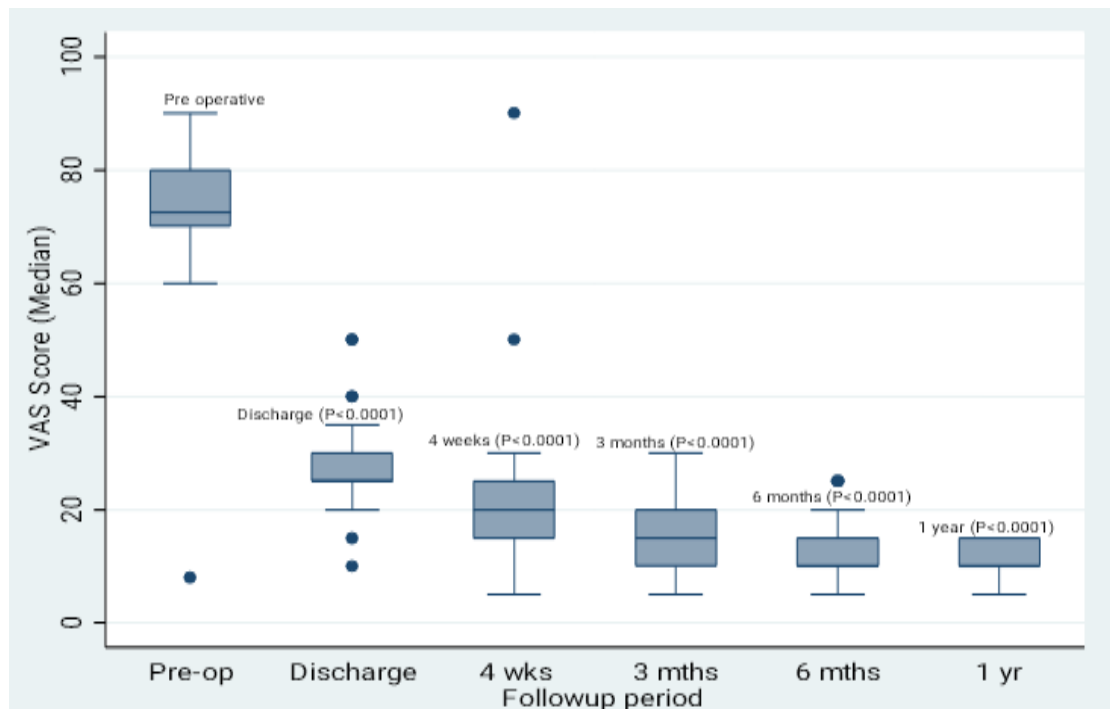
- The mean Harris hip score at the final follow-up was 87.852 ± 8.784 (Min. 61 and Max. 98), while the mean preoperative Harris hip score was 45.088 ± 16.190 (Min. 15 and Max. 76).
- The mean VAS pain score at the final follow-up was 12.529 ± 5.748 (Min. 5 and Max. 25) while the mean preoperative VAS pain score was 72.441 ± 13.614 (Min. 65 and Max. 90).

Radiological parameters:

- Of the 34 cases (97.1%), 33 had a normal acetabular cup inclination*, with an angle of inclination between 30 and 50 degrees.
- One hip (2.9%) showed an angle of inclination less than thirty degrees, or a horizontal inclination*.
- There was no occurrence of severe anteversion or retroversion, and all 34 hips exhibited appropriate anteversion* angles.
- Of the 34 hips, one (2.9%) had the femoral stem positioned valgus, two (8.8%) had it positioned varus, and the remaining 30 hips (n = 30, 88.2%) had it positioned centrally.



Graph 1: Sequential changes in Harris Hip score



Graph 2: Sequential changes in VAS pain score

Images showing early complications of THR:



Figure 1: Dislocation of prosthesis



Figure 2: Heterotopic ossification



Figure 3: Heterotopic ossification



Figure 4: Limb Lengthening

Table 1: Complications encountered in the study

Complications	Frequency	Percentage (%)
Vascular injury	0	0%
Nerve injury (Foot drop)	1	2.9%
Thromboembolism	0	0%
Bladder injury	0	0%
Post-operative infection	1	2.9%
Limb length discrepancy	2	5.9%
Dislocation of Prosthesis	1	2.9%
Heterotopic ossification	2	5.9%
Periprosthetic fractures	1	2.9%
Aseptic loosening	0	0%
Total	8	23.5%

Discussion

For patients with severe stages of femoral head avascular necrosis, total hip arthroplasty is still the recommended course of therapy, even if several

individuals have had some success with joint preservation techniques. This study has demonstrated the remarkable outcomes of an uncemented total hip replacement in cases with

femoral head avascular necrosis in terms of pain alleviation, hip joint mobility, and stability with simple rehabilitation. Even though they are more expensive than cemented ones, uncemented complete hip components are the preferred implants for young people with strong bone density, demanding physical schedules, and a higher likelihood of requiring revision surgery down the road.

Ninety-four percent of THA patients had excellent to fair results; 5.8% of these cases had poor outcomes because to implant malpositioning and subpar surgical procedures. Selecting the right implant size and placing it correctly in situ are crucial; otherwise, the results might be disastrous. There was no discernible correlation between the two implant firms' products and the surgical results or rate of complications. It is best to steer clear of using Charnley's self-retaining retractor while using a posterolateral approach for THA in order to protect the sciatic nerve. Even though heterotopic ossification is an unanticipated complication, it can be minimised via appropriate soft tissue handling during the procedure, shorter recovery times, avoidance of periprosthetic infections, and appropriate draining of the wound after surgery.

Five conventional approaches to the hip were described in detail by Kelmanovich D et al. (2003) [14]: anterior, transtrochanteric, posterolateral, anterior, and anterior Watson-Jones. According to them, the posterolateral approach is the most often utilized method since it is less complicated technically than other methods and does not impede the hip's abductor function. This approach's greater dislocation rate—which has been reported to reach 9.5%—is a drawback.

In a research on total hip replacement performed in Kashmir using an oosterolateral technique, Bhat et al. (2016) [15] examined 86 patients, or 89 hips, from December 2010 to April 2016. Six patients out of 89 were found to have dislocation (6.7%). They came to the conclusion that, despite reduced blood loss, posterolateral approach results in more dislocation. Consequently, it is stressed that surgeons have to select the method with which they are familiar and experienced.

One hip out of every 27 (3.9%) had a vertical inclination of the acetabular cup, according to Kakaria et al. (2005) [16]. This resulted in recurring dislocation of the prosthesis, for which revision surgery was performed. The hips were all positioned correctly on the rest. Out of 97 performed hips, Thomasson et al. (2007) [17] documented 3 patients with an excessive vertical inclination of the acetabular cup (>500), 2 of which had prosthesis displacement and required revision surgery. In one instance, the patient complained of thigh discomfort and had limited hip flexion as a

result of an extreme anteversion of the acetabular cup. In 2014, Asopa et al. [19] reported that the incidence of sciatic nerve damage in initial total hip arthroplasty ranged from 0.9% to 3%. They found that considerable limb lengthening, inappropriate retraction placement, cement-related heat damage, overuse of force, and postoperative hematoma are the causes of intraoperative sciatic nerve injury. The range of limb length discrepancy (1% to 27%) indicated in the study by Desai et al. [20] (2013) is where our study's incidence of LLD falls. They added that lengthening, the most prevalent type of LLD, has been linked to neuritis, gait abnormalities, back pain and sciatica, general dissatisfaction, prosthesis dislocation, early component loosening, and can result in morbidity and necessitate revision surgery.

Conclusion:

Even though there were some difficulties during the trial, we came to the conclusion that they might be avoided with careful patient selection, comprehensive preoperative planning and counseling, experienced surgeons, precise surgical technique, excellent postoperative care, and rehabilitation.

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