

Original Research Article

Short-term post-operative evaluation of young to middle age population following primary uncemented total hip arthroplasty

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ABSTRACT

Background: Total hip arthroplasty (THA) is the most commonly performed adult reconstructive procedure. The most common indication is severe osteoarthritis of the hip. THA remains the treatment of choice for restoring in end stage hip arthritis. It aims for immediate and long-lasting effects on pain and function in osteoarthritic hip.

Methods: The study is a prospective observational study conducted on 30 patients enlisted in the inpatient department of orthopaedics at a rural tertiary health care centre (JIIU'S Indian Institute of Medical Sciences and Research, Warudi, Jalna). Only those patients satisfying the inclusion and exclusion criteria were included in the study. All the patients were explained about the surgical procedure, the purpose of the study and informed consent was taken. The patients were followed up at 1, 3 and 6-months post-operatively and the functional outcome was evaluated using Harris hip score and visual analogue scale (VAS).

Results: Among the 30 cases included in the study, subjects were between 22 to 60 years of age. The cases were of either gender, with predominance of male cases. The mean Harris hip score and the mean pain score (VAS) at post-operative 1-month, 3-month and 6-month follow-ups improved significantly compared to their respective values at the pre-operative stage (p value <0.05 for all).

Conclusions: The uncemented total hip replacement in young to middle-aged patients is an effective surgery which provides dramatic pain relief and excellent functional outcomes in majority of the subjects.

Keywords: Total hip arthroplasty, Harris hip score, Visual analogue scale, Hip arthritis, Avascular necrosis

INTRODUCTION

Total hip arthroplasty (THA) is the most commonly performed adult reconstructive hip procedure. It has been the subject of many clinical trials and due to its high success rate, it has been referred to as "operation of the century".¹⁻⁶ In this procedure; the injured, painful, unstable, or dysplastic natural articulating surfaces of the hip joint are replaced with prosthetic components: artificial acetabular cup and femoral head.

It is the gold standard for surgical treatment of end-stage degenerative joint disease of the hip.^{7,8}

During earlier days, hip arthrodesis or resection arthroplasty were the preferred options but since last couple of decades' total hip arthroplasty has emerged as successful option with good functional results.⁹ With the advances in design and materials used for implants the success rate has increased in even high demand patients.

Total hip replacement (THR) may be cemented, uncemented or hybrid.

In a cemented THR, special bone cement (poly methyl methacrylate) is used as a grout between the prosthesis and bone. Bone cement is used to facilitate the transfer of stress

from implant to bone evenly and also hold the prosthesis in position. Long term results of cemented total hip arthroplasty showed loosening which continued to be a basic complication.

Thus, there emerged the concept of biological fixation - uncemented THR; where overall results of press fitting alone were not good enough to consider as a sole method of fixation and advent of porous coated implants, which allow bone to penetrate the surface of the prosthesis and secure it, provide complete fixation and better results.¹⁰

In hybrid THR, only the acetabular component of hip prosthesis is fixed to bone with cement.

Indications for the total hip replacement include: osteoarthritis (most common indication)- primary, and secondary; inflammatory arthritis; osteonecrosis - acute fracture – femur neck and intertrochanteric; non-union femoral neck or trochanteric fractures; pyogenic arthritis or osteomyelitis; congenital dislocation or subluxation; hip fusion and pseudoarthrosis; bone tumours involving proximal femur or acetabulum; hereditary disorders (e.g. achondroplasia); and failed reconstruction – osteotomy, cup arthroplasty, femoral head prosthesis, girdle stone procedure, THR, and resurfacing arthroplasty.¹¹

This study is a prospective study for short-term analysis of functional outcome in patients who underwent primary uncemented THA using the Harris hip score and VAS: to assess the pain, range of motion at hip and ability to perform routine daily activities.

METHODS

Study design

It was a prospective observational study.

Study setting

The study was conducted at the Department of Orthopaedics in a rural tertiary care institute (JIIU's Indian Institute of Medical Sciences and Research Warudi, Jalna).

Study population

The study population included in-patient department of orthopaedics.

Study duration

The duration of the study was for 18 months (October 2022 to March 2024).

Sampling technique

Simple random sampling was used in the study.

Statistical analysis

In the entire study, p values less than 0.05 are considered to be statistically significant. The entire data is statistically analysed using statistical package for social sciences (SPSS version 24.0, IBM Corporation, USA) for Microsoft Windows.

Sample size

The sample size included 30 patients.

We conducted a time-based study and enrolled all the patients admitted during the study duration mentioned with last enrolment done 6 months prior to end of study duration.

The study is a prospective observational study conducted on 30 patients admitted in the IPD of department of orthopaedics from October 2022 to March 2024 at a rural tertiary health care centre. Only those patients satisfying the inclusion and exclusion criteria are included in the study. All the patients are explained about the surgical procedure, the purpose of the study and informed consent is taken. Primary uncemented THA was performed and the patients were followed up at 1, 3 and 6-months postoperatively and the functional outcome and pain experienced was evaluated using Harris hip score and VAS respectively.

Inclusion criteria

Patients with age 18-65 years, patients of AVN of femur head with Ficat and Arlet stage of 3 and 4, Tonnis classification for OA hip grade 3, Kellgren-Lawrence classification for OA hip grade 4, post-traumatic OA hip, and patients with ankylosed hip were included.

Exclusion criteria

Patients with osteoporosis, infection, revision hip arthroplasty, failed primary procedure, soft tissue contracture around the hip, progressive neuropathy, unstable medical illness, and periprosthetic fractures were excluded.

RESULTS

The present study was a hospital based prospective observational study that included a total of 30 cases of AVN of femur head with Ficat and Arlet stage of 3 and 4, aged between 22 to 60 years and those who satisfied inclusion/exclusion criteria. The cases were of either gender, with predominance of male cases (male to female sex ratio being 2.75: 1.00).

It was aimed to analyse the short-term functional outcome of primary uncemented total hip arthroplasty cases, over a period of 18 months.

Following section shows the detailed statistical analysis along with interpretation and graphical representation of the statistical results on the available data.

Table 1: Age distribution of cases studied.

Age group	No. of cases	% of cases
21–30	2	6.7
31–40	15	50.0
41–50	7	23.3
51–60	6	20.0
Total	30	100.0

Out of 30 cases studied, 2 cases (6.7%) had age between 21-30 years, majority of cases i.e. 15 cases (50.0%) had age between 31-40 years, 7 cases (23.3%) had age between 41-50 years and 6 cases (20.0%) had age between 51-60 years in the study group.

The mean±SD of age of cases studied was 41.70±10.34 years and the minimum-maximum age range was 22-60 years (Table 1).

Sex distribution

Out of 30 cases studied, majority of cases i.e. 22 cases (73.3%) were males and 8 cases (26.7%) were females. The male to female sex ratio was 2.75: 1.00 (Figure 1).

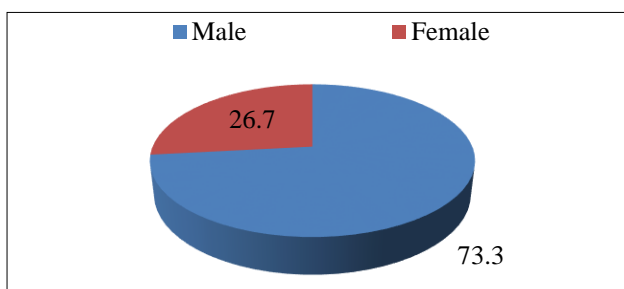


Figure 1: Sex distribution of cases studied.

Distribution of side affected

Out of 30 cases studied, majority of cases i.e. 21 cases (70.0%) had right side affected and 9 cases (30.0%) had left side affected in the study group (Figure 2).

Distribution of grade of AVN

Out of 30 cases studied, 13 cases (43.3%) had grade 3 AVN and majority of cases i.e. 17 cases (56.7%) had grade 4 AVN in the study group (Figure 3).

Distribution of post-operative complaints

Out of 30 cases studied, 9 cases (30.0%) had no complaints at post-op 1-month follow-up, 2 cases (6.7%) had discharge from surgical site and 19 cases (63.3%) were reported to have pain at post-op 1-month follow-up.

Out of 30 cases studied, 19 cases (63.3%) had no complaints at post-op 3-month follow-up, none had discharge from surgical site and 11 cases (36.7%) had pain at post-op 3-month follow-up.

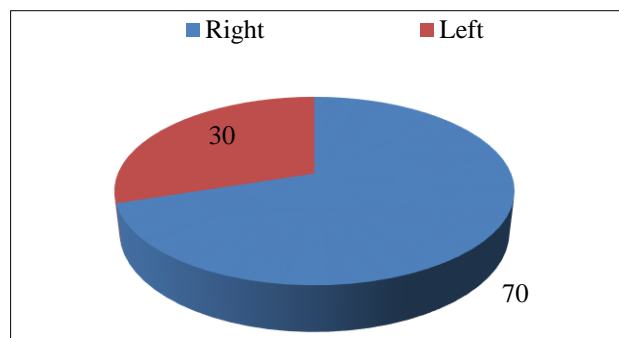


Figure 2: Distribution of side affected among the cases studied.

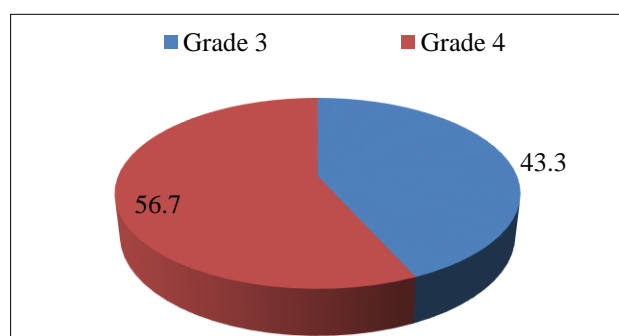


Figure 3: Distribution of grade of AVN among the cases studied.

Out of 30 cases studied, 2 cases were loss to follow-up at the time of post-op 6-month follow-up. Out of 28 cases followed at post-op 6-month follow-up, 26 cases (92.9%) had no complaints at post-op 6-month follow-up, none had discharge from surgical site and 2 cases (7.1%) had pain at post-op 6-month follow-up.

Distribution of post-operative complaints showed statistically significant improvement at post-op 3 month and post-op 6-month follow-ups with reference to complaints status at the post-op 1 month follow-up in the study group (p value <0.05 for both).

Comparison of mean post-operative Harris hip score

The mean±SD of Harris hip score at pre-operative stage, at post-operative 1-month follow-up, at post-operative 3-month follow-up and at post-operative 6-month follow-up was 52.63±10.02, 83.80±7.86, 90.56±6.16 and 95.24±4.25 respectively.

The mean Harris hip score at post-operative 1-month, 3-month and 6-month follow-ups improved significantly compared to mean Harris hip score at pre-operative stage (p value<0.05 for all).

Table 2: Distribution of post-operative complaints among the cases studied.

Follow-up	Post-operative complaints							
	Nil		Discharge from surgical site		Pain		Total	
	N	%	N	%	N	%	N	%
Post-op 1 month	9	30.0	2	6.7	19	63.3	30	100.0
Post-op 3 month	19	63.3	0	0.0	11	36.7	30	100.0
Post-op 6 month	26	92.9	0	0.0	2	7.1	28	100.0

P value (paired comparisons): post-op 1 month versus post-op 3 month=0.001***, post-op 1 month versus post-op 6 month=0.001***, post-op 3 month versus post-op 6 month=0.001***, p value by Wilcoxon’s signed rank test, p value <0.05 is considered to be statistically significant, ***p value <0.001.

Table 3: Comparison of mean post-operative Harris hip score.

Follow-up	Harris hip score	
	Mean	SD
Pre-op (n=30)	52.63	10.02
Post-op 1 month (n=30)	83.80	7.86
Post-op 3 month (n=30)	90.56	6.16
Post-op 6 month (n=28)	95.24	4.25
P value (paired comparisons)		
Pre-op versus post-op 1 month	0.001***	
Pre-op versus post-op 3 month	0.001***	
Pre-op versus post-op 6 month	0.001***	

P value by repeated measures analysis of variance (RMANOVA), p value <0.05 is considered to be statistically significant, ***p value <0.001.

Comparison of improvement in post-operative Harris hip score

Out of 30 cases studied, 29 cases (96.7%) had Harris hip score in poor category, 1 (3.3%) had it in fair category at pre-operative stage.

Out of 30 cases studied, 1 case (3.3%) had Harris hip score in poor category, 4 (13.3%) had it in fair category, 22 cases (73.3%) had it in good category and 3 cases (10.0%) had it in excellent category at post-operative 1-month follow-up.

Out of 30 cases studied, 1 case (3.3%) had Harris hip score in poor category, 1 (3.3%) had it in fair category, 3 cases (10.0%) had it in good category and 25 cases (83.3%) had it in excellent category at post-operative 3-month follow-up.

Out of 28 cases studied, none had Harris hip score in poor category, none had it in fair category, 3 cases (10.7%) had it in good category and 25 cases (89.3%) had it in excellent category at post-operative 6-month follow-up.

Distribution of Harris hip score at post-operative 1-month, 3-month and 6-month follow-ups showed significant improvement compared to the Harris hips score pre-operative stage (p value <0.05 for all).

Comparison of mean post-operative mean pain score (VAS)

The mean±SD of pain score (VAS) at pre-operative stage, post-operative 1-month follow-up, at post-operative 3-month follow-up and post-operative 6-month follow-up was 49.17±18.10, 21.17±10.97, 12.67±6.39 and 2.14±4.18 respectively.

The mean pain score (VAS) at post-operative 1-month, 3-month and 6-month follow-ups improved significantly compared to mean pain score (VAS) at pre-operative stage (p<0.05 for all).

Table 4: Comparison of improvement in the post-operative Harris hip score.

Follow-up	Harris hip score									
	Poor (<70)		Fair (70-79)		Good (80-89)		Excellent (90-100)		Total	
	N	%	N	%	N	%	N	%	N	%
Pre-op (n=30)	29	96.7	1	3.3	0	0.0	0	0.0	30	100.0
Post-op 1 month (n=30)	1	3.3	4	13.3	22	73.3	3	10.0	30	100.0
Post-op 3 month (n=30)	1	3.3	1	3.3	3	10.0	25	83.3	30	100.0
Post-op 6 month (n=28)	0	0.0	0	0.0	3	10.7	25	89.3	28	100.0
P-value (paired comparisons)										
Pre-op versus post-op 1 month	0.001***									
Pre-op versus post-op 3 month	0.001***									
Pre-op versus post-op 6 month	0.001***									

P value by Wilcoxon’s signed rank test, p value<0.05 is considered to be statistically significant, ***p value <0.001.

Table 5: Comparison of mean post-operative pain score (VAS).

Follow-up	Pain score (VAS)	
	Mean	SD
Pre-op (n=30)	49.17	18.10
Post-op 1 month (n=30)	21.17	10.97
Post-op 3 month (n=30)	12.67	6.39
Post-op 6 month (n=28)	2.14	4.18
P value (paired comparisons)		
Pre-op versus post-op 1 month	0.001***	
Pre-op versus post-op 3 month	0.001***	
Pre-op versus post-op 6 month	0.001***	

P value by repeated measures analysis of variance (RMANOVA), p value <0.05 is considered to be statistically significant, ***p value <0.001

Comparison of improvement in post-operative pain score (VAS)

Out of 30 cases studied, 8 cases (26.7%) had severe pain, 16 cases (53.3%) had pain score in moderate category, 6 (20.0%) had it in mild category, none had it in no pain category at pre-operative stage.

Out of 30 cases studied, 3 cases (10.0%) had pain score in moderate category, 26 (86.7%) had it in mild category, 1 case (3.3%) had it in no pain category at post-operative 1 month follow-up.

Out of 30 cases studied, none had pain score in moderate category, 28 (93.3%) had it in mild category, 2 cases (6.7%) had it in no pain category at post-operative 3-month follow-up.

Out of 28 cases studied, none had pain score in moderate category, 6 (21.4%) had it in mild category, 22 cases (78.6%) had it in no pain category at post-operative 6-month follow-up.

Distribution of pain score (VAS) at post-operative 1 month, 3 month and 6-month follow-ups showed significant improvement compared to the pain score (VAS) pre-operative stage (p value <0.05 for all).

Post-op range of motion at the left hip (6-month follow-up) of a 32 year-old female with grade 4 AVN of left hip treated with primary uncemented THA.



Figure 4: (a) Abduction, (b) adduction, (c) internal rotation, (d) flexion, and (e) external rotation.

Table 6: Comparison of improvement in the post-operative pain score (VAS).

Follow-up	Pain score (VAS)									
	Severe pain		Moderate pain		Mild pain		No pain		Total	
	N	%	N	%	N	%	N	%	N	%
Pre-op (n=30)	8	26.7	16	53.3	6	20.0	0	0.0	30	100.0
Post-op 1 month (n=30)	0	0.0	3	10.0	26	86.7	1	3.3	30	100.0
Post-op 3 month (n=30)	0	0.0	0	0.0	28	93.3	2	6.7	30	100.0
Post-op 6 month (n=28)	0	0.0	0	0.0	6	21.4	22	78.6	28	100.0
P value (paired comparisons)										
Pre-op versus post-op 1 month	0.001***									
Pre-op versus post-op 3 month	0.001***									
Pre-op versus post-op 6 month	0.001***									

P value by Wilcoxon’s signed rank test, p value <0.05 is considered to be statistically significant, ***p value <0.001.

DISCUSSION

THA is among the most successful interventions of modern medicine. Pain relief and functional improvement are the basic measures of the outcome of THA.

Recent advancements in THA have concentrated on prolonging its durability, particularly as the number of patients anticipated to need THA rises.

Perioperative pain management protocols and accelerated rehabilitation have improved the ability of patients to recover after the surgery.

Asati et al in their study included 40 patients with 53 hips with whom THR was done.¹² In their study, post-op average HHS pain score increased to 37.95, that improved patients gait and daily activities score to 40.1, with minimum deformity. They concluded that total hip replacement continues to be a remarkable procedure to provide dramatic reduction in debilitating arthritis hip pain, increased mobility and hip function with long lasting effects in patients with advanced hip problems, in both elderly and younger patients. They further concluded that, among the existing hip scoring systems, the Harris hip score (HHS) is appropriate scoring system that allow comparison of multiple parameters like pain, hip range of motion, daily activity, and correction of deformity, to assess the overall outcome of THR and has high validity and reliability.

Wade et al conducted a study on 66 patients with 74 arthritic hips which were operated by single surgeon with uncemented THA.¹³ In their study, total 50 patients (56 hips) were followed up at five-year follow-up. Clinical and radiological evaluation was done during follow-up. Most common etiology was avascular necrosis of hip (56.6%). None of the patients had any major complications. Mean Harris hip score improved from 36 to 92. The activity level was assessed at five-year follow-up with maximum patients in moderate manual labour category. Bony ingrowth with no evidence of loosening was seen consistently both on femoral and acetabular side in all patients on X-ray. No statistically significant association was found between initial alignment of the femoral component and clinical outcome. They concluded that uncemented THA can be used in young patients with excellent to good functional and radiological outcome at midterm follow-up, high satisfaction rate and lower rate of complications.

Prakashappa et al studied 34 hips of 30 patients, with degenerative arthritis were operated with uncemented THR.¹⁴ Functional evaluation with modified Harris hip score showed excellent results in 27 patients and good result in 3 patients. Radiological evaluation at the last follow up showed no signs of loosening or implant failure. Even though the study was not free of complications, they concluded that using uncemented prosthesis in a short duration follow up the overall functional and radiological outcome showed excellent results.

Our study was carried out on 30 subjects, 2 cases (6.7%) had age between 21-30 years, majority of cases i.e. 15 cases (50.0%) had age between 31-40 years, 7 cases (23.3%) had age between 41-50 years and 6 cases (20.0%) had age between 51-60 years in the study group. The mean age of cases studied was 41.70 years.

Out of 30 cases studied, majority of cases i.e. 22 cases (73.3%) were males and 8 cases (26.7%) were females. The male to female sex ratio was 2.75: 1.00.

In similar study by Mont et al on uncemented THA in young adults with osteonecrosis of femoral head in 104 hips (81 patients), the mean age was 38 years, which was comparable to our study. In this study too there was male predominance.¹⁵

In our study, we performed primary uncemented total hip arthroplasty in patients with AVN of femur head - Ficat-Arlet stage 3 and 4; osteoarthritis of hip joint – Tonnis grade 3 or Kellgren-Lawrence grade 4. Patients were followed-up at post-operative 1 month, 3 month, 6 months using Harris hip score [it assesses pain (44 points), functional capacity (47 points), absence of deformity (4 points) and range of motion (5 points)] and visual analogue scale.

The mean±SD of Harris hip score at pre-operative stage, at post-operative 1 month follow-up, at post-operative 3-month follow-up and at post-operative 6-month follow-up was 52.63±10.02, 83.80±7.86, 90.56±6.16 and 95.24±4.25 respectively.

The mean Harris hip score at post-operative 1-month, 3-month and 6-month follow-ups improved significantly compared to mean Harris hip score at pre-operative stage (p value <0.05 for all).

The mean±SD of pain score (VAS) at pre-operative stage, post-operative 1-month follow-up, at post-operative 3-month follow-up and post-operative 6-month follow-up was 49.17±18.10, 21.17±10.97, 12.67±6.39 and 2.14±4.18 respectively.

Distribution of pain score (VAS) at post-operative 1-month, 3-month and 6-month follow-ups showed significant improvement compared to the pain score (VAS) pre-operative stage (p value <0.05 for all).

Out of 30 cases studied, 9 cases (30.0%) had no complaints at post-op 1-month follow-up, 2 cases (6.7%) had discharge from surgical site and 19 cases (63.3%) were reported to have pain at post-op 1-month follow-up.

Distribution of post-operative complaints showed statistically significant improvement at post-op 3 month and post-op 6-month follow-ups with reference to complaints status at the post-op 1-month follow-up in the study group (p value <0.05 for both).

No complications (other than discharge from surgical site – 2 cases- which eventually resolved by the next follow-up) were detected in our subjects for the duration of the study.

The limitations in our study are the short follow-up period and limited sample size. Our research does not address additional hip diseases that require total hip replacement or the analysis of the relationship between post-operative factors and functional result.

The advantage of our study is that it did not include individuals with deformities or other hip diseases, which eliminated bias from the results.

CONCLUSION

Primary uncemented total hip arthroplasty provides an excellent short-term outcome with dramatic reduction in pain, with almost all patients reporting complete, or near complete pain relief. Young to middle-age patients with pain and functional limitation at hip joint due to severe osteoarthritis or higher grades of avascular necrosis of femur head, experience exceptional functional improvement and improved quality of life and ability to perform routine day to day activities post-surgery.

The surgery is a long-lasting approach to treat the problems that come with severe hip afflictions.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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