



## Problems Encountered in Uncemented THR in AVN of Hip Patients

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**Background:** Avascular necrosis of femoral head is a common problem. It mostly affects the femoral head (hip joint). Its management can be conservative or invasive. Total hip arthroplasty is the treatment of choice for third and fourth stage avascular necrosis. Problems and complications are associated with every surgery. Here, we will see the common problems and complications encountered in uncemented total hip replacement in avascular necrosis of hip patients.

**Material and Method:** Fifty patients of Avascular necrosis of femoral head of stage III and IV are operated in last three years by uncemented total hip arthroplasty and their results were assessed by Harris hip score. There are some problems which we encountered in preoperative, intraoperative and post operative period. Their assessment and solution are done in this study.

**Results:** The mean Harris hip score during preoperative stage was 52 and during postoperative stage was 94. Excellent results are seen in 43 patients, good results are seen in 6 patients and poor results are seen in one patient. Preoperative problems like protrusio acetabuli was seen in 5 hips and fixed flexion deformity is seen two patients. Intraoperative problem like periprosthetic fracture was seen in one patient. Postoperative complication like limb length discrepancy was seen in 6 patients, foot drop in one patient, posterior dislocation of hip in one patient, superficial infection in 3 patients, deep infection in one patient and periprosthetic fracture in one patient.

**Conclusion:** Problems and complications are the part and parcel of any surgery. we should not get panic and try to treat the problems and complications encountered in uncemented THR. If, properly treated any problem of the uncemented THR can be managed. Long learning curve and lot of patience is required to produce long term good results in uncemented THR in AVN of hip patients.

**Keywords:** Uncemented THR, AVN of hip, Problems

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## Introduction

Avascular necrosis (AVN) of the femoral head is one of the common causes of painful hip in a young adult. The natural course of this disease is one of relentless progression with eventual collapse of the femoral head, followed by secondary osteoarthritic changes in the hip.<sup>1</sup>

The disease occurrence is more in men than in women. Most studies have attributed the disease process to the combined effects of genetic predisposition, metabolic factors, corticosteroid and excessive alcohol intake and local factors affecting blood supply such as vascular damage, increased intraosseous pressure, and mechanical stress.<sup>2,3</sup> This results in bone ischemia and infarction leading to bone death. Lastly, direct cellular insult may result from irradiation, chemotherapy, or oxidative stress may lead to AVN.

Total hip arthroplasty is the only effective treatment of AVN of the femoral head when the disease process has reached Ficat and Arlet stage 3 and 4. The primary indication for Total Hip Replacement in AVN is severe pain and the limitation in activities of daily living that it causes. To warrant doing total hip replacement, pain must be refractory to conservative measures such as oral nonsteroidal anti-inflammatory medication, weight reduction, activity restriction, and the use of supports such as a cane. Uncemented implants are most frequently used in young patients with high physical demands, where a revision surgical procedure in the future will be more likely.

## Material and methods

The study was carried out on 50 hips of AVN Hip patients operated by uncemented total hip replacement in the Department of Orthopaedics, R.D. Gardi Medical College, Ujjain from August 2020 to August 2023. Information on the patients was compiled from clinical details, case files and operation theatre records. This is a prospective study. Patient follow up was for a minimum of 6 months to a maximum of 30 months (2 and a half years). Inclusion criteria was all the patients of Stage 3 and 4 of avascular necrosis of femoral head, patients in the age group more than 20 years and less than 70 years, patients willing to give informed consent and exclusion criteria was patients who had deformities or pathologies of other joints of the lower limb, which may have had an adverse bearing on the functional outcome of the surgery, the patients with systemic and local infections, patients who are not medically fit for surgery and patients not willing to give consent. Clinical presentation of osteonecrosis typically is asymptomatic in early stages, although patients may develop groin pain that can radiate to the knee or ipsilateral buttock. On physical examination, patients usually present with a limited range of motion at the hip and complain of pain particularly with forced internal and external rotation. A Thorough pre operative assessment like history, clinical and radiological examination and routine investigations of the patient done. Pre operative modified harris hip score was also evaluated. Current diagnosis is dependent upon plain AP and lateral radiographs of the hip, followed by MRI.



Figure 1: Pre Operative Xray



Figure 2: Post operative X ray



Figure 3 and 4: Follow up of patient

The AP radiographs will usually demonstrate the primary area of involvement, once changes can be viewed. Generally, the first radiographic changes seen by radiograph will be cystic and sclerotic changes in the femoral head. Early delamination of the cartilage from the underlying bone will most likely be demonstrated by the crescent sign[5].

All Total Hip Arthroplasty were performed under spinal anaesthesia. In all cases, the posterior approach (Southern or moore approach) was used, with the patient placed on the contralateral side.

Post Operative Protocol: The hip is positioned in approximately 15 degrees of abduction while the patient is recovering from the anesthesia using a triangular pillow to maintain abduction and long knee brace to prevent extremes of flexion. First post op day, check X-rays are taken. The patient is taught static quadriceps exercises, knee and ankle mobilization exercises and made to sit. On Second post op day drain was removed and dressing done and physiotherapy started. IV antibiotics were given for 48 hours later switched over to oral antibiotics for further 5 days more. On 13th post op day sutures are removed and patient was discharged from the hospital to be reviewed after 4 weeks. At the time of discharge, they were advised to not to squat, not to sit cross legged, not to use Indian toilets, and to not to cross the lower limb across the midline. The patients were followed up at 6 weeks, 3 months, 6 months, 1 year and at yearly intervals. Patient follow up was for a minimum of 6 months to a maximum of 30 months (2 and a half years). The clinical and functional outcomes were evaluated by modified harris hip score. Based on a total of 100 points possible, each question is awarded a certain number of points. Questions are further grouped into categories. The score is reported as 90-100 for excellent results, 80-90 being good, 70-79 fair, 60-69 poor, and below 60 a failed result. A radiograph was taken at the end of the procedure and during follow up visits. The standard radiograph was an anteroposterior view of pelvis including both hips and sufficient length of femur. The radiological assessment included positioning and alignment of the acetabular and femoral components and complications such as periprosthetic fractures, loosening, osteolysis, dislocation, subsidence and heterotrophic ossification.

Preoperative problems like protrusio acetabuli was seen in 5 hips and fixed flexion deformity is seen two patients. Intraoperative problem like periprosthetic fracture was seen in one patient. Postoperative complication like limb length discrepancy was seen in 6 patients, foot drop in one patient, posterior dislocation of hip in one patient, superficial infection in 2 patients, deep infection in one patient and periprosthetic fracture in one patient. Protrusio acetabuli is a central acetabular defect resulting from migration of femoral head medially. This results in medialization of the center of rotation of the hip. Primary uncemented total hip replacement (THR) in such situations can be technically demanding due to associated significant medial and proximal migration of the center of the joint, deficient bone medially and reduced bony support to the acetabular component peripherally. Cemented total hip arthroplasty resulted in promoting bone lysis and implant loosening.

However, uncemented total hip arthroplasty with impacted morselized autograft with a porous coated cementless acetabular component provided a biological solution to bone deficiency and long-term fixation in arthritic hips with protrusio. After neck osteotomy, dislocated femoral head was cut into slices with a power saw. The bone slices were then morselized into 8mm-10mm sized pieces using a bone cutter. Acetabular floor prepared while avoiding penetration of a soft, deficient medial wall until a bleeding bony surface was obtained. Acetabular periphery reamed using large sized reamers initially, and graft placed.

Pre operative problem like fixed flexion deformity of hip is seen in 2 patients. Management of fixed flexion deformity of hip is done by removal of all the osteophytes from anterior side of acetabulum, release of the pericapsular adhesions of hip joint, elongation of Iliopsoas tendon by sequential cutting, release of TFL distally from Gluteus Medius insertion and adductor tenotomy, rectus femoris release and sartorius tenotomy may needed in extreme cases.

Periprosthetic fracture may occur with aggressive rasping or mismatch of implant and rasp. It happened in one of our cases. We used stainless steel wire to do the cerclage wiring for proximal femoral fractures. For middle region and distal region fractures, longer stem prosthesis or internal fixation with plates can be used. Distal tip of stem must bypass distal extent of fracture. Distal tip fracture happened in one of our patients. We treated him conservatively by long term immobilization.



Figure 5: Protrusio Acebuli in bilateral hip



Figure 6: Post op xray

Postoperative complication like limb length discrepancy was seen in 6 patients. Over lengthening of 1 cm is seen in 6 bilateral THR cases and a lengthened limb is more poorly tolerated.

Limb-length discrepancy can result from a poor preoperative patient evaluation as well as intraoperative technical errors with regard to the level of resection of the femoral neck, the prosthetic neck length, or the failure to restore offset. Up to one centimeter shortening or lengthening can be compensated by pelvis. More than 1 cm discrepancy can be treated by shoe raise on other side.

Sciatic nerve palsy in form of EHL weakness/ foot drop was seen in one patient. The patient recovered in 6 months; all is needed that reassurance. Nerve conduction studies and EMG are needed, if there is no recovery in 6 months. In certain cases, early surgical exploration and release of nerve is indicated.



Figure 7: Periprosthetic fracture treated by SS wiring



Figure 8: Distal femur peri prosthetic fracture treated by long term immobilization



Figure 9: Posterior dislocation of hip treated by close reduction



Figure 10: Superficial wound infection treated by DAIR

Posterior dislocation of hip was seen in 1 patient. Fortunately, we were able to reduce it conservatively by close reduction. Reasons can be advanced age of patient, neurological disease, impaired compliance, suboptimal implant position improper soft tissue tension. Treatment can be conservative or operative.

Superficial infection is seen in 3 patients & deep infection is seen in one patient. Pus, culture and sensitivity, antibiotics according to pus culture and sensitivity is done followed by debridement and re-suturing. Debridement, antibiotics, implant retention ("DAIR") can be considered in deep infection. Kuiperet *al.* (33) found that 66% of their patient group were infection free at their 2 years follow up following DAIR for infection. Two stage revision with spacer is gold standard, if infection persists. In a study by Meek RM, Garbuz DS [23], intraoperative fracture was observed in 4.3% of hips, sciatic nerve palsy was observed in 1.1%, and 14% of the cases were revised because of aseptic loosening. In a study by Learmonth ID showed periprosthetic fracture in 8.6% cases. [32]

## Observations and results

Table 1: Age distribution of the cases

Age Groups	Frequency	Percent
<= 30 Years	14	28.0 %
31 - 40 Years	19	38.0 %
41 - 50 Years	09	18.0 %
>50 Years	08	16.0 %
Total	50	100.0 %

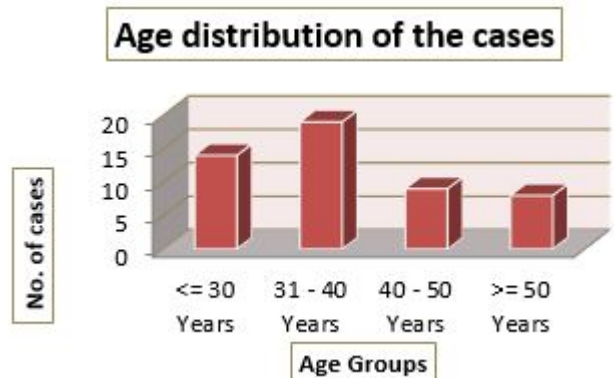


Figure 11: Age distribution of the cases

Table 2: FICAT and ARLET Classification type

FICAT AND ARLET CLASSIFICATION TYPE	Frequency	Percent
I	00	00%
II	00	00 %
III	26	52.0 %
IV	24	48.0 %
Total	50	100.0 %

**Table 3: Cause of AVN distribution of the cases**

CAUSE OF AVN	Frequency	Percent
Idiopathic	43	86.0 %
Steroid Induced	05	10.0 %
Traumatic	02	4.0 %
Total	50	100.0 %

**Table 4: Pre operative problems**

Preoperative problem	Frequency	Percent
Protrusion Acetabuli	05	10 %
Fixed flexion deformity of hip	02	4%

**Table 5: Intra operative complications**

Intra operative complications	Frequency	Percent
Fracture Proximal femur- periprosthetic	01	2.0 %
Peri prosthetic Fracture shaft femur	01	2.0 %
No Complication	48	96.0 %
Total	50	100.0 %

Out of 50 cases, in one case develop Fracture Proximal femur-periprosthetic, in one case develop peri prosthetic Fracture shaft femur and 48(96.0%) had no intra operative complications

**Table 6: Post operative complications distribution of the cases**

Post operative complications	Frequency	Percent
Anterior thigh pain	01	2.0 %
Superficial infection	03	6.0 %
Deep infection	01	2.0 %
EHL weakness/Foot drop	01	2.0 %
Limb length discrepancy	06	12.0 %
Peri-prosthetic fracture	01	2.0 %
No Complication	37	74.0 %
Total	50	100.0 %

Out of 50 cases, 6(12.0%) cases had limb length discrepancy post operative complication, 3(6.0%) had superficial infection, 1(2.0%) Anterior thigh pain, 1(2.0%) Deep infection, 1(2.0%) EHL weakness, 1(2.0%) Peri-prosthetic fracture and in 37(74.0%) cases no post operative complications.

**Table 7: Pre and post operative mean scores comparison**

		N	Mean	SD	T	p
Pain	Pre op	50	13.40	4.79	33.994	0.000
	Post op	50	41.48	4.71		
Function-Gait	Pre op	50	22.56	3.48	18.416	0.000
	Post op	50	30.74	2.16		
Function-Activity	Pre op	50	9.52	1.83	15.825	0.000
	Post op	50	13.00	1.01		
Absence of deformity	Pre op	50	3.76	0.96	1.769	0.083
	Post op	50	4.00	0.00		
ROM Score	Pre op	50	3.79	0.41	19.762	0.000
	Post op	50	4.91	0.27		
Total Score	Pre op	50	52.84	6.67	38.576	0.000
	Post op	50	94.09	4.89		

Table indicate that, post operative mean pain score  $41.48 \pm 4.71$  was significantly higher as compare to pre-operative pain score  $13.40 \pm 4.79$  with  $p < 0.05$ . Post operative mean Function-Gait score  $30.74 \pm 2.16$  was significantly higher as compare to pre-operative Function-Gait score  $22.56 \pm 3.48$  with  $p < 0.05$ .

Post operative mean Function-Activity score  $13.00 \pm 1.01$  was significantly higher as compare to pre-operative Function-Activity score  $9.52 \pm 1.83$  with  $p < 0.05$ . Post operative mean Absence of deformity score  $4.00 \pm 0.00$  was higher as compare to pre-operative Absence of deformity score  $3.76 \pm 0.96$  with  $p > 0.05$ . Post operative mean ROM score  $4.91 \pm 0.27$  was significantly higher as compare to pre-operative ROM score  $3.79 \pm 0.491$  with  $p < 0.05$ . Post operative mean total score  $94.09 \pm 4.89$  was significantly higher as compare to pre-operative total score  $52.84 \pm 6.67$  with  $p < 0.05$ .

**Table 8: Post operative total score**

Post op total score	Frequency	Percent
Excellent	43	86.0 %
Good	06	12.0 %
Fair	01	2.0 %
Total	50	100.0 %

**Table 9: Comparison with Other Studies distribution**

Study	Cemented/ Cementless THR	Follow-up in years	Number of cases	Revision Rate %
Kim et al(26)	Cementless	7.2	78	21.8
Piston et al(27)	Cementless	7.5	35	6
Lins et al(28)	Cementless	5	37	8.1
Salvati et al(25)	Cemented	8	28	37
Our study	Cementless	2	50	0

On comparing with other studies, Salvati et al had 28 cases with 8 years follow-up with revision rate of 37%, Kim et al had 78 cases with 7.2 years follow-up with 21.8% revision rate, Piston et al had 35 cases with 7.5 years follow-up with 6% revision rate, Lins et al had 37 cases with 5 years follow-up with 8.1% revision rate and our study has 50 cases with 2 years follow-up with 0% revision rate.

## Discussion

Total hip replacement is a well-documented surgical procedure (6). It improves the quality of life by relieving pain and functional disability experienced by patients with moderate to severe arthritis of the hip. The study was carried out on 50 hips of AVN patients who underwent uncemented total hip replacement. In western literature, as per Harkness (6), Charney (8), Eftekhari (7) total hip arthroplasty has primarily been described for patients in older age group of sixty and above. In our study, 16% of the patients were found to be in the 50 and above age group, with age ranging from 20 to 70 years and a mean age of 39.14 years. Majority, 19 (38%) patients of the avascular necrosis of head of femur in our study group belonged to 31-40 years age group. In contrary to these findings, a multivariate analysis identified young age at onset of avascular necrosis (9,10,11). Other studies like Tofferi JK, Gilliland W, also found young age of onset of avascular necrosis between 3rd and 5th decade of life (11,12).

In our Study majority, 45 (90%) were males and 5 (10%) were females. A study by Diana Kamal et al, also found that aseptic necrosis of femoral head affects men 4 times more than women(13). In a study by Dr. M Rama Subba Reddy et al, Males are affected more than female with a M: F ratio of 3:1, which is similar to our study (14).

In the study by Kakaria et al, there were 20 patients and out of which there were 16 males and 4 females. The overall male to female ratio was 4:1. Majority of patients were between 31-40 years (45%) and 41-50 years (25%), which had similar distribution of age groups like our study (15). In our study the analysis of patients for the etiology of AVN showed that in 43 (86%) of the patients developed AVN on hip joint the cause was idiopathic, 5 (10%) of patients developed AVN secondary to corticosteroid use, and secondary to post trauma 2 (4%) patients developed AVN of the hip joint. In a study by Koo and Kim et al showed 65% of AVN due to idiopathic cause and 10% to 30% cases due to corticosteroid therapy which is quite similar to our study (16). The Harris hip score is the most commonly used scoring system for evaluating hip replacement. We used Harris hip score to assess the functional outcome in our study. Excellent results are seen in 43 (86%) cases, good results are seen in 6(12%) cases, Fair result is seen in 1 (2%) case and poor results are seen in none case. The mean Harris Hip Score during preoperative period was 52.84 and during post operative stage was 94.09. Almost similar results are seen in other studies (11-14,16,17,18). Bourne et al (19), in a study of 101 total hip replacements with the uncemented (porous-coated anatomic) prosthesis, reported an average Harris hip score of 96 points, but only patients who were free of pain were evaluated. When patients who had pain were included, the overall average score was 90 points. Heekin et al (20) reported an average score of 93 points after a minimum of five years of follow-up of 91 hips that had been treated with the non-cemented prosthesis. In a study by Katz et al(21), the results of 14 arthroplasties, in which the stem had been fixed without cement, the hip score averaged 84 points at forty-six months. Barrack and Lebar (22) reported an average Harris hip score of 93 points after 49 arthroplasties in which the Uncemented prosthesis had been used.

The study by Mullaji et al (29) suggests that the use of impacted morsellised autograft in conjunction with porous coated cementless acetabular component restored hip biomechanics after an intermediate duration follow up. 30 primary THR's were conducted with a 4.2 year follow up which showed excellent outcome in 90% patients, fair in 7 % patients and poor in 3% patients. A study by Mohanty et al (30) showed that using only cement for acetabular reconstruction in protrusio acetabuli has had unacceptably high rates of recurrence, with components migration into the acetabulum and occurrence of thermal necrosis of the thinned out medial wall due to heat polymerisation of the cement. Uncemented THR with morsellised autograft in Protrusio acetabuli with AVN hip produces good results. It helps in restoring biomechanics of hip joint and preventing recurrence of protrusio. There was no evidence of progression of protrusio or socket loosening or osteolysis in any of our cases. Our results are comparable to the results of other studies. But a larger sample size and a longer follow up is required to ascertain this fact. Pre operative problem like fixed flexion deformity of hip is seen in 2 patients. Management of fixed flexion deformity of hip is done by removal of all the osteophytes from anterior side of acetabulum, release of the pericapsular adhesions of hip joint, elongation of Iliopsoas tendon by sequential cutting, release of TFL distally from Gluteus Medius insertion and adductor tenotomy,

Rectus femoris release and sartorius tenotomy may needed in extreme cases. (31)

Intra operative peri-prosthetic femoral fractures are becoming increasingly common and are a major complication of total hip replacement (THR). The largest study of intraoperative femoral fractures at the time of revision total hip arthroplasty was reported by Meek et al (23). Of 211 consecutive patients, 64 (30%) sustained an intraoperative femoral fracture and 147 did not sustain a fracture. In a study by Meek RM, Garbuz DS (23), intraoperative fracture was observed in 4.3% of hips, sciatic nerve palsy was observed in 1.1 %, 14% of the cases were revised because of aseptic loosening. In a study by Learnmonth ID showed periprosthetic fracture in 8.6% cases. In our study during the procedure, 2 patients (4%) had periprosthetic fracture, one had Type A2 Vancouver fracture of the proximal femur which was fixed with SS wire cerclage, which united as documented by the follow up X rays and other had Type A3 Vancouver fracture of femur shaft for which patient was kept non weight wearing on operated limb for 6 weeks postoperatiely. We had a similar rate of periprosthetic fracture when compared to other studies. Though an overall better outcome score was seen in patients with no fracture, patients with periprosthetic fracture had no a statistical significance between the pre operative and post operative outcome score in our study.

The Swedish hip joint Replacement Register (24) found that revision rate of cemented fixation was lower (5.7%) than cementless fixation (5.9%) and the percentage of cementless stems was 20.9% in 2014 and most of them were performed in young patients less than 60 years old. The latest annual report of The Norwegian Joint Replacement Register was published in 2015, with 190,962 THAs. In accordance with the global trend, cementless prostheses have been more frequently used than previously, even in elderly patients and cementless fixation showed no obvious difference when performed in any age groups, they found that cementless fixation has lower risk of revision in male patients over 75 years and female patients less than 65 years. In 12th annual report of The National Joint Registry (NJR) for England, Wales, Northern Ireland and Isle of man, the popularity of cemented fixation decreased steadily from around 60% in 2003 to 36% in 2014, while cementless fixation increased from less than 20% to 40% (24). The New Zealand Joint Registry showed that after stratifying by age, cementless and hybrid fixation had a significantly lower revision rate than cemented ones in patient younger than 55 years (24). In our study till now there is 0 % revision rate in all the patients treated with cementless total hip replacement. Thus, our study matches with various studies as outcome cemented versus uncemented THR remains similar. There remain merits and demerits with both modalities. Hence there is need for further evidence-based studies.

## Conclusion

Total hip arthroplasty is a well-documented surgical procedure for AVN hip. It relieves pain and functional disability of patients with arthritis of the hip secondary to AVN and improving their quality of life.

The outcome of THR of hip joint is determined by the design of component, the selection of the patients, and the operative technique.

The outcome of the THR is determined by the design of component, the selection of the patients, and the operative technique. The results of the procedure needs long term studies for evaluating the complete effect. Current generation of uncemented implants provide satisfactory clinical and radiographic outcomes in intermediate duration of follow up. Even though the procedure is not free of complications, the overall functional and clinical outcome had shown good to excellent result. In future, cases of AVN hip may increase because of excessive use of steroids in covid 19 treatment.

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