Original Research Article

A Study on clinical and functional outcome of cemented/uncemented total hip replacements in patients with avascular necrosis of femoral head

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Received: 03-12-2020 / Revised: 23-12-2020 / Accepted: 11-04-2021

Abstract

Background: Avascular necrosis (also osteonecrosis, bone infarction, aseptic necrosis, ischemic bone necrosis, and AVN) is a disease where there is cellular death (necrosis) of bone components due to interruption of the blood supply. The current well accepted treatment for arthritis secondary to AVN in hip joint is total hip replacement.**Methodology:** A prospective study was carried out on 30 patients who underwent cemented/uncemented Total Hip Replacement in Department of Orthopaedics, Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bangalore.**Results:** This study has shown that, the mean age of patients in the study group was 42.30±11.43 years. About 43.3% of the avascular necrosis patients in the study group belonged to 31-40 years age group. The sex distribution of the study group has shown that, about 76.7% of the patients were Males and 23.3% were females. The analysis of patients for the etiology of AVN showed that 70.0% of the patient developed AVN of hip joint without any known cause (idiopathic), 16.7% of patients developed AVN secondary to corticosteroid, and secondary to post trauma. 13.3% patients developed AVN of the hip joint. The analysis of patients for the side which they have undergone total hip replacement has shown that, most (50.0%) of the patients had left hip replacement, 26.7% had undergone right total hip replacement and 23.3% had undergone bilateral total hip replacement. Majority of the patients (86.7%) had uncemented type of arthroplasty and 13.3% had undergone hybrid type of arthroplasty. The mean pain score during preoperative period was 10.13±1.96 and during postoperative stage was 42.13±2.03. The mean functional gait score during preoperative stage was 10.53±6.96and during postoperative stage was 30.33±2.31. The mean functional activity score during preoperative stage was 5.17±1.62 and during postoperative stage was 11.40±1.07.There was a statistically significant difference between the pre and postoperative scores in the study group. The mean total score (Harris hip score) during preoperative stage was 32.27±8.11 and during postoperative stage was 92.60±3.16. The difference between pre and postoperative scores was statistically significant. The mean ROM score of study group during preoperative stage was 2.40±1.25 and postoperative stage was 4.63±0.49. The difference between the ROM scores during pre and postoperative stage was statistically significant. The type of implant used in eth study group. Stryker implant was used in 73.3% and Link implant was used in 26.7% of the study group.**Conclusion:** This study suggests that the current generation of uncemented implants used in total hip replacement for arthritis of the hip joint secondary to AVN, provides satisfactory clinical and radiographic outcomes after an intermediate duration follow up. Even though the procedure is not free of complications, the overall functional and clinical outcome had shown good to excellent result.

Keywords: Avascular necrosis, Arthroplasty, Stryker implant, Harris Hip Score

Introduction

The idea of doing this study on THR in patients with arthritis of hip secondary to avascular necrosis of femoral head is due to frequently reported cases around the world.

AVN of the femoral head is a debilitating disease that usually leads to osteoarthritis of the hip joint in relatively young adults (mean age at presentation: 38 years). The disease prevalence is unknown, but estimates indicate that 10,000-20,000 new cases are diagnosed in the United States per year[1,2].

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Avascular necrosis (also osteonecrosis, bone infarction, aseptic necrosis, ischemic bone necrosis and AVN) is a disease where there is cellular death (necrosis) of bone components due to interruption of the blood supply. Without blood, the bone tissue dies and the bone collapses. If avascular necrosis involves the bones of a joint, it often leads to destruction of the joint articular surfaces followed by secondary osteoarthritic changes in the hip[3-5].Clinical avascular necrosis most commonly affects the ends (epiphysis) of long bones such as head of femur. Other common sites include head of humerus, scaphoid, talus and the jaw bones. The disease may affect just one bone, more than one bone at the same time, or more than one bone at different times. Avascular necrosis is especially common in the head of the femur, which ultimately goes for secondary arthritis of hip joint. A variety of methods are now used to treat avascular necrosis, the most common being the Total Hip Replacement, or THR.

Between 5-12% of the total hip replacements are performed in patients who have AVN of femoral head. The optimum treatment of patients with collapse of the femoral head and significant pain is controversial. Osteotomies, which transfer healthy surface areas of the femoral head for weight bearing, are a viable treatment option, but the results can be inconsistent. Arthrodesis may be considered for unilateral disease, but it has a limited role since the incidence of bilaterality in non-traumatic AVN has been reported to range from 40-70% cases. Total hip arthroplasty is the only predictable effective treatment of AVN of the femoral head when the disease process has reached Ficat and Arlet stages III and IV[6-8].According to J. P. Garino and M. E. Steinberg, using modern cement techniques and components, total hip arthroplasty can give excellent results in young patients with AVN and may be the treatment of choice when reconstructive surgery is required. Although wear of the bearing surface continues to limit the long term success rate, cementless total hip arthroplasty remains a reasonable treatment option for advanced osteonecrosis of the femoral head.

Aim & Objectives

- To study, how early the patients recover from this painful condition (avascular necrosis of femoral head) in 30 sample cases following cemented/uncemented Total Hip Arthroplasty.
- To study the clinical and functional outcome of cemented/ uncemented total hip replacements in patients with avascular necrosis of femoral head.

Methodology

A prospective study was conducted on patients who had arthritis of hip joints secondary to avascular necrosis of femoral head, during 17 months period in Department of Orthopaedics, Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bangalore. The clearance from institutional ethical committee was obtained before starting the study.

Exclusion criteria

- Patients of age less than 30 yrs.
- Patients with systemic and local infections
- Patients who are not medically fit for surgery

On admission to the ward, a detailed history of the patients was taken. This included age, sex, occupation, complaints, associated medical illness. Following this, they were subjected to a thorough clinical examination and general condition was assessed and accordingly corrective measures were taken to correct the general being of the patients.Routine blood investigations were done for all the patients. Special attention was paid to CRP and ESR and if these were abnormal, surgery was deferred. Standard antero-posterior and lateral X-rays were taken including pelvis with both hips. Analgesics, antibiotics, tetanus toxoid and blood transfusions were given as needed before surgery.

Preoperative Assessment

The patients were evaluated according to the modified Harris hip scoring system[9]. The scores taken into account were of pain, function, range of motion, and deformities. Also a mention of the limb length discrepancy and flexion contracture is made.

A total of 30 patients, who had given an informed, bilingual and written consent, posted for hip replacement surgery were included in to the study. Patients were admitted and examined according to protocol both clinically and radiologically, and functional outcome was assessed by distribution of "Harris hip score" both preoperatively and postoperatively and the patients are reviewed with post op x-rays immediately after surgery at the end of 6, 12, 24 weeks after the surgery.

The inclusion and exclusion criteria were as follows:

Inclusion criteria

- Patients of avascular necrosis of femoral head.
- Patients in the age group of 30 to 75 years.
- Patients willing to give informed consent.

The physical fitness of the patient undergoing a major surgery was assessed. Physical examination included examination of spine and both lower extremities including opposite hip, both knees and foot.

Trendelenburg test to assess the abductor musculature mechanism was done. Neurovascular status of affected extremity was evaluated. Any occult infections like skin lesions, dental caries and urinary tract infections were identified and treated preoperatively.

Radiological assessment

Radiogram of the pelvis with both hips with proximal half of shaft of femur AP view was taken for all patients. The radiograph was evaluated for:

- Size of the acetabulum
- Bone stock of the acetabulum
- Any protrusion and periacetabular osteophyte formation
- The structural integrity of the acetabulum
- Need for bone grafting
- Size of the femoral canal

Templating was done for the aectabular and femur components. The appropriate acetabular cup size, and anteversion was determined. On the femoral side, using a template, appropriate neck length, offset and stem size of the implant is chosen.

The aim of the pre-op planning was to obtain the following results postoperatively.

- An acetabular socket located in the anatomical position.
- Centre of rotation of femoral head located in its normal anatomical position.
- Restoration of limb length.
- Restoration of abductor moment arm

Templating

Method

- This includes the use of plastic overlay templates supplied by the prosthesis manufacturer both for femoral and acetabular components to aid in selection of the type of implant that will provide the best fit, implant size and neck length required to restore equal limb lengths and medial offset.
- A horizontal line drawn joining both ischial tuberosities intersect the lesser trochanters in normal individuals. In limb length discrepancy, the difference between the lesser trochanter and the point of intersection of the line at the affected femur is measured and it is considered to be the amount of discrepancy to be corrected.
- Acetabulum: Place acetabular templates on the film and select a size that closely matches the contour of patient's acetabulum. The medial surface of the cup is at the teardrop and the inferior limit is at the level of obturator foramen. Mark the new center of rotation of hip.
- Femur: Select a size that most precisely matches the contour of proximal canal with 2-3 mm of cement mantle. Select a neck length so that the difference in the height of femoral and acetabularcenter is equal to the limb length discrepancy.
- Mark the level of the anticipated neck cut and measure its distance from the lesser trochanter. Template the femur similarly on lateral view. A standing AP view of knee and ankle should be taken to determine weight bearing alignment and determine varus/valgus deformity.

Surgical Approach and Technique

- **Positioning**: Stable position on true lateral decubitus is a must to avoid malpositioning of implants.
- **Preparation and draping**: The first assistant who has scrubbed and applied sterile gloves prepares the lower limb from a level well proximal to the umbilicus and including the groin and anteromedial part of opposite thigh. The foot is held by another assistant who now abducts the limb thereby elevating the buttock which is prepared. The first assistant uses a pad to hold the ankle and thereby prepares the foot and toes.

After this adductor tenotomy, if needed, is done in a sterile condition.

- Following this, the surgical teams proceed with the sterile draping of the limb. Four double sheets along with an adhesive sheet are used to isolate the lower limb from the perineum and rest of the body providing atleast four layers of drapes and isolating the head end of the patient and anaesthetist from the field.
- The lower limb is now received into two sets of double towels and bandaged. A stockinette is then applied over the entire lower limb upto the pelvis. The stockinette is then cut over the skin incision site. An iodine coated adhesive sheet is now applied to the exposed skin and surrounding drapes. The surgeon and his assistants wore wrap around gowns after scrubbing.

Postoperative Management

- Limb is kept in abduction with pillow in between the 2 lower limbs.
- Vitals are monitored carefully for 48 hours.
- IV antibiotics are continued for two days.
- Drain removed and tip sent for culture and sensitivity after 48 hours.
- Check X-ray performed.

Physiotherapy

- Upper limb/chest physiotherapy started on day one.
- Quadriceps exercise (static) started on second day.
- Patient made to sit up on third day.
- Patient made to stand on fifth day, non-weight bearing.
- Suture removal done on 12th day.

Patient is made to walk with help of a foldable walker on the 3rd day. Patient is discharged with the advice not to adduct and internally rotate the limb and not to squat. Not to use Indian toilets, not to cross the lower limb across the midline.

Follow Up

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 42 months (3½ years).

Clinical assessment

During each visit, medical history was taken and physical examination was done. The deformity and ROM were measured with goniometer. The clinical and functional outcomes were evaluated by **Modified Harris Hip Score.**

Harris HIP Scoring System (Modified)

Maximum points possible – 100
Pain relief- 44
Function- 47
Range of motion- 5
Absence of deformity- 4

Radiological Assessment

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.

Statistical Analysis

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumptions on data is made, **Assumptions: 1.**Dependent variables should be normally distributed, 2.Samples drawn from the population should be random, Cases of the samples should be independent.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale within each group.

Results

A prospective study was conducted on patients who had arthritis of hip secondary to avascular necrosis of femoral head in Department of Orthopedics, Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bangalore. A total of 30 patients, who had given an informed, bilingual and written consent were included in to the study.

Study design: An observational clinical study.

Table 3: Age distribution of patients studied

Age in years	No. of patients	%
21-30	4	13.3
31-40	13	43.3
41-50	6	20.0
51-60	6	20.0
>60	1	3.3
Total	30	100.0

Table 3 shows the distribution of the study group according to age group. The mean age of patients in the study group was 42.30±11.43 years. About 43.3% of the avascular necrosis patients in the study group belonged to 31-40 years age group. It was followed by patients of 41-50 years (20.0%), 51-60 years (20.0%), and >60 years (3.3%)and 21-30 years (13.3%).

Table 4: Gender distribution of patients studied

Gender	No. of patients	%
Female	7	23.3
Male	23	76.7
Total	30	100.0

The sex distribution of the study group has shown that, about 76.7% of the patients were males and 23.3% were females.

Table 5: Side involved of patients studied

Side involved	No. of patients	%
Left	15	50.0
Right	8	26.7
B/L	7	23.3
Total	30	10.0

The analysis of patients for the side which they have undergone total hip replacement has shown that, most (50.0%) of the patients had left hip replacement, 26.7% had undergone right total hip replacement and 23.3% had undergone bilateral total hip replacement.

Table 6: Etiology of patients studied

Etiology	No. of patients	%
Idiopathic	21	70.0
Post traumatic	4	13.3
Steroid induced	5	16.7
Total	30	100.0

The analysis of patients for the etiology of AVN showed that 70.0% of the patients developed AVN of hip joint without any known cause (idiopathic), 16.7% of patients developed AVN secondary to corticosteroid, and secondary to post trauma 13.3% patients developed AVN of the hip joint.

Table 7: Cemented/Uncemented of patients studied

Cemented/Uncemented	No. of patients	%
Hybrid	4	13.3
Uncemented	26	86.7
Total	30	100.0

Table 7 shows the type of arthroplasty undergone by the patients. Majority of the patients (86.7%) had uncemented type of arthroplasty and 13.3% had undergone hybrid type of arthroplasty

Table 8: An evaluation of pain, Functional Gait, Functional activity, Absence of deformity, ROM score and total score at pre-op and post-op

	Pre op	Post op	difference	t value	P value
Pain	10.13±1.96	42.13±2.03	32.000	-69.583	<0.001**
Functional Gait	10.53±6.96	30.33±2.31	19.800	-14.588	<0.001**
Functional activity	5.17±1.62	11.40±1.07	6.233	-17.744	<0.001**
Absence of deformity	4.00±0.00	4.00±0.00	-	-	-
ROM Score	2.40±1.25	4.63±0.49	2.233	-9.780	<0.001**
Total score	32.27±8.11	92.60±3.16	60.333	-35.181	<0.001**

The mean pain score during preoperative period was 10.13±1.96 and during postoperative stage was 42.13±2.03. The difference between the pre and postoperative pain scores was statistically significant.The mean functional gait score during preoperative stage was 10.53± 6.96.During postoperative stage was 30.33±2.31, the t value corresponding to this mean difference was -14.588 and its corresponding p value was <0.001** Since p value is less than 0.05, there was statistically significant difference between the pre and postoperative scores.The mean functional activity score during preoperative stage was 5.17±1.62 and during postoperative stage was 11.40±1.07. There was a statistically significant difference between the pre and postoperative scores in the study group.

No statistically significant difference in score was found in the parameter -absence of deformity, postoperatively, implying that most of the patients did not have any severe deformities preoperatively.
The mean ROM score of study group during pre operative stage was 2.40±1.25 and postoperative stage was 4.63±0.49. The difference between the ROM scores during pre and postoperative stage was statistically significant.The mean total score during preoperative stage was 32.27±8.11 and during postoperative stage was 92.60± 3.16. The difference between pre and post operative scores was statistically significant.

Table 9: Rating of outcome of THR in patients studied

Rating	No. of patients	%
Excellent	24	80.0
Good	6	20.0
Total	30	100.0

The outcome after total hip replacement was excellent in 80.0% of the study group. About 20.0% of the study group had good outcome.

Table 10: Post-op limb shortening of patients studied

Post limb shortening	No. of patients	%
Nil	28	93.3
1 cm	2	6.7
1.5 cm	2	6.7
Total	30	100.0

In the study group, postoperative limb shortening was not seen in 93.3% of the study group. About 6.7% each of the study group had limb shortening of 1 cm and 1.5 cms.

Table 11: Type of implant of patients studied

Type of implant	No. of patients	%
Link	8	26.7
Stryker	22	73.3
Total	30	100.0

Table 11 shows the type of implant used in the study group. Stryker implant was used in 73.3% and link implant was used in 26.7% of the study group.

Table 12: Complications of patients studied

Complications	No. of patients	%
Nil	28	93.3
Foot drop	2	6.7
Total	30	100.0

The table and chart above shows the complications of total hip replacement in the study group. Most (93.3%) of the patients in the study group had no complications. The common complication in the study group was Foot drop in 2 patients which is 6.7%.

Table 13: Complications according to Type of Implant

Complications	Type of implant		Total
	Link	Stryker	
Nil	7(87.5%)	21(95.5%)	28(93.3%)
Foot drop	1(12.5%)	1(4.5%)	2(6.7%)
Total	8(100%)	22(100%)	30(100%)

The table and chart above shows the complications of total hip replacement according to Type of Implants used in the study group. Most (93.3%) of the patients in the study group had no complications. But for 1 patient (12.5%), used link implant had foot drop and for 1 patient (4.5%), used stryker implant had foot drop .

Table 14: Post op limb shortening according to Type of Implant

Post limb shortening	Type of implant		Total
	Link	Stryker	
Nil	5(62.5%)	21(95.5%)	26(86.7%)
1 cm	2(25.0%)	0	2(6.7%)
1.5 cm	1(12.5%)	1(4.5%)	2(6.7%)
Total	8(100%)	22(100%)	30(100%)

In the study group, postoperative limb shortening was not seen in 86.7% of both the study group. 2 patients of link group (25.0%) had 1 cm shortening which was 6.7% of total patients and 1 patient had 1.5 cm shortening and 1 patient in stryker group (4.5%) had 1.5 cm shortening.

Table 15: Rating according to Type of Implant

Rating	Type of implant		Total
	Link	Stryker	
Excellent	6(75%)	18(81.8%)	24(80%)
Good	2(25%)	4(18.2%)	6(20%)
Total	8(100%)	22(100%)	30(100%)

The outcome after total hip replacement was excellent in 75% of patients in link group and 2 patients (25%) had good result. (81.8%) of the patients in stryker group had excellent result after surgery and (18.2%) had good result after THR

Table 16: Anesthesia of patients studied

Anesthesia	No. of patients	%
GA	8	26.7
SA+EPIDURAL	22	73.3
Total	30	100.0

Table and chart 14 showing the type of anaesthesia used for THR in study group, around 73.3% patients underwent surgery under spinal+epidural anaesthesia and for 26.7% cases general anaesthesia was used.

Table 17: Follow-up of patients studied

Follow up	No. of patients	%
6 months	21	70.0
7 months	5	16.7
8 months	4	13.3
Total	30	100.0

Table and chart 15 showing the months of follow up, patients had postoperatively. in study group around 70.0% of the patients had 6 months follow up, 16.7% of the patients came for follow up after 7 months and 13.3% patients had 8 months follow up.

Discussion

Avascular necrosis(also osteonecrosis,bone infarction,[3]aseptic necrosis, ischemic bone necrosis,[4]and AVN) is a disease where there is cellular death (necrosis) of bone components due to interruption of the blood supply.Without blood, the bone tissue dies and the bone collapses.If avascular necrosis involves the bones of a joint, it often leads to destruction of the joint articular surfaces followed by secondary osteoarthritic changes in the hip[5]

A variety of methods are now used to treat avascular necrosis, the most common being the total hip replacement or THR. Total hip arthroplasty is a well documented surgical procedure. It relieves pain and functional disability experienced by patients with moderate to severe arthritis of the hip, secondary to AVN and improving their quality of life. A prospective study was carried out on 30 patients who underwent cemented/uncemented Total Hip Replacement in Department of Orthopaedics, Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bangalore.

Age and Sex

This study has shown that, the mean age of patients in the study group was 42.30±11.43 years. About 43.3% of the avascular necrosis patients in the 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[10-12]The sex distribution of the study group has shown that, about about 76.7 % of the patients were Males and 23.3% were females. Other studies like Tofferi JK, Gilliland W, also found the same results.

Etiology

The analysis of patients for the etiology of AVN showed that 70.0% of the patient developed AVN of hip joint without any known cause (idiopathic),16.7% of patients developed AVN secondary to cortico-steroid, and secondary to post trauma 13.3% patients developed AVN of the hip joint. in a study by Koo KH, Kim R, Kim YS, et al showed, 65% of AVN due to idiopathic cause and 10% to 30% cases due to corticosteroid therapy which is quite similar to this study[13]

Side of THR

The analysis of patients for the side which they have undergone total hip replacement has shown that, most (50.0%) of the patients had left hip replacement, 26.7% had undergone right total hip replacement and 23.3% had undergone bilateral total hip replacement. These results were similar to the findings of Jacobs B[14]

Type of arthroplasty

Majority of the patients (86.7%) had uncemented type of arthroplasty and 13.3% had undergone hybrid type of arthroplasty.The new generation of uncemented prosthesis had demonstrated improvement in clinical and radiological outcomes compared with those associated with early designs of prosthesis inserted without cement[15]

Pain relief

The mean pain score during preoperative period was 10.13±1.96 and during postoperative stage was 42.13±2.03. Previously observed that all the surviving patients had substantial pain relief and improvement of function.

Functional gait & Activity

The mean functional gait score during pre operative stage was 10.53±6.96and during postoperative stage was30.33±2.31. The mean functional activity score during preoperative stage was5.17±1.62 and during post operative stage was11.40±1.07 In a study by Katz JN et al, ambulation and functional ability improved in most of the patients[16].

Range of Movement score

The mean ROM score of study group during pre operative stage was 2.40±1.25 and postoperative stage was 4.63±0.49. The difference between the ROM scores during pre and postoperative stage was statistically significant. In a study by Katz JN,Phillips CB[16], the improvement in sum total range of motion was achieved in patients with avascular necrosis of femoral head and preoperative sum total range of motion was maintained or improved in hips with a painful arc of motion. They have also noted that most of the limited motion in patients with avascular necrosis is due to idiopathic.

Complications of THR

Most (93.3%) of the patients in the study group had no complications. The common complication in the study group was Foot drop in 2 patients which is 6.7%. In a study by Meek RM, Garbuz DS[17], intraoperative fracture was observed in 4.3% of hips, sciatic nerve palsy was observed in 1.1%, 14% of the cases were revised because ofaseptic loosening. in a study by Learmonth ID showed periprosthetic fracture in 8.6% cases[17,18]

Limb shortening

In the study group, postoperative limb shortening was not seen in 93.3% of the study group. About 6.7% each of the study group had limb shortening of 1 cm and 1.5 cms. Over lengthening is more common than a residually shortened leg and a lengthened limb is more poorly tolerated. Konyves and Bannister[19] noted that lengthened limbs were also associated with lower clinical hip scores. 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.

Type of implant

In the study group, Stryker implant was used in 73.3% and link implant was used in 26.7% of the study group. The outcome after total hip replacement was excellent in 75% of patients in link group and 2 patients (25%) had good result. (81.8%) of the patients in stryker group had excellent result after surgery and (18.2%) had good result after THR.

Outcome of THR:The outcome after total hip replacement was excellent in 80.0% of the study group. About 20.0% of the study group had good outcome. In some reports by Philips et al[20], 70 percent of the results were excellent or good, similar to findings of this study determined by Harris hip score.

Conclusion

Total hip arthroplasty is a well documented surgical procedure. It relieves pain and functional disability experienced by patients with moderate to severe arthritis of the hip, secondary to AVN and improving their quality of life.The outcome of the total hip replacement in AVN of hip joint is determined by many factors including 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. This study suggests that the current generation of uncemented implants used in total hip replacement for arthritis of the hip joint secondary to AVN, provides satisfactory clinical and radiographic outcomes after an intermediate duration follow up. Even though the procedure is not free of complications, the overall functional and clinical outcome had shown good to excellent result.

Acknowledgment

The author is thankful to Department of Orthopaedics for providing all the facilities to carry out this work

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Conflict of Interest: Nil
Source of support:Nil