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Functional outcome of uncemented total hip replacement in AVN femoral head- A prospective study

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Abstract

Background & objectives: Total hip arthroplasty is the most commonly performed adult reconstructive hip procedure. It relieves pain and functional disability experienced by patients with moderate to severe arthritis of the hip, improving their quality of life. The success of Total Hip Replacement arthroplasty is its ability to relieve the pain associated with hip joint pathology, while maintaining the mobility and stability of the hip joint. The most common condition for which total hip arthroplasty is done is severe Arthritis of the hip, secondary to AVN of head of femur accounting for 70% of cases. The primary indication for this procedure 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 analgesics weight reduction and use of cane.

The purpose of this study was to evaluate the clinical and radiological outcome of Total Hip Replacement using Modified Harris Hip score and radiological assessment.

Methods: The study was carried out on 20 hips of 17 patients of Total Hip Replacement performed in Dept of Orthopaedics from April 2012 to April 2014. All the admitted patients with diagnosis of AVN of femoral head were operated with uncemented THR. This was a prospective study. Information of patients was obtained pre-op, post-op and at each follow ups. Functional outcome was evaluated using Harris hip score. Patient follow up was for a minimum of 3 months to a maximum of 24 months.

Results: 20 hips of 17 patients were operated with uncemented THA for AVN of head of the femur.

Patients were evaluated both functionally and radiologically. Functional evaluation with Harris hip score (modified) showed excellent results in 15 hips, good results in 4 hips, and fair result in 1 hip. Radiological evaluation at the latest follow-up showed no signs of loosening or implant failure.

Conclusion: We have evaluated THA using uncemented prosthesis. Our study suggests that current generation implants can provide satisfactory clinical and radiographical outcomes after a short duration of follow up. Though the study was not free of complications, the overall, functional and radiological outcome showed good results.

Keywords: uncemented total hip replacement; modified harris hip score; AVN

1. Introduction

Total hip replacement arthroplasty is a surgical procedure, which has relieved millions of people from incapacitating pain arising from the hip joint. At present it is the most commonly performed adult re-constructive hip procedure. The success of Total Hip Replacement arthroplasty is its ability to relieve the pain associated with hip joint pathology, while maintaining the mobility and stability of the hip joint.

With increase in longevity of life in past few decades, the incidence of chronic disabling conditions of the hip such as osteoarthritis, inflammatory arthritis and osteonecrosis are on the rise.

The primary indication for this procedure 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.

Conventional cemented THA dramatically improves the patients function and quality of life. With contemporary prosthesis and modern cementing techniques, the rate of femoral loosening appears to be substantially reduced. Regardless of cementing techniques, mechanical loosening

occurs more commonly in young, heavy, active men with certain prosthetic designs.

Noncemented devices were initially indicated only for use in young patients with high physical demand where a revision surgical procedure in future will be more likely. But now various studies have proved the adequacy of non cemented implants in middle and old age population also. Preliminary data suggest that non cemented THA have a relatively low revision rate and excellent prosthetic durability.

2. Objectives of the study

- To study the role of THR in patients with hip arthritis secondary to AVN of head of femur that cause the level of pain and disability, unresponsive to conservative measure and significantly impairing quality of life.
- To evaluate the results of THR clinically and assessing the functional outcomes of patients with reference to pain, walking ability and range of motion.
- Radiological evaluation and assessment of complications of this procedure.

3. Methodology

This study was conducted in Department of Orthopaedics, Sanjay Gandhi Institute of Trauma and Orthopaedics Bangalore from 2012 April to April 2014. The patients presenting to OPD and Emergency were screened for various hip disorders and included in the study.

All confirmed cases of AVN of head of femur with arthritis of hip were admitted at Sanjay Gandhi Hospital Bangalore.

All admitted patients were operated upon for Total Hip Arthroplasty using uncemented acetabular cup and uncemented femoral stem.

Inclusion criteria

All cases undergoing primary total hip replacement in our institute which included,

- Both male and female sex
- Age group 18 – 65yrs
- Clinical signs and symptoms.
- Radiological findings.
- Patients who are fit for surgery.

Exclusion criteria

- Patients below the age of 18 years
- Patients who are unfit for surgery due to associated medical problems.
- Patients not willing for surgery.
- Active infection.

Detailed history, clinical examination, and radiological examination were carried out in all patients.

All standard preoperative protocols were followed.

Operative steps

Procedure

Anaesthesia - Spinal/Epidural

Approach - Posterior approach (Moore's / Southern approach)

Position – True lateral with affected limb uppermost.

Exposure

Posterior southern moore approach was used in all the patients.

A 10 -15 cm curved incision, centered on the posterior aspect of greater trochanter is taken. After dissecting the subcutaneous tissue, fascia lata is incised in line with the skin

incision over the center of the greater trochanter. The gluteus maximus fibres are split bluntly and Charnley's retractor applied.

Now the hip is internally rotated to put the short external rotators were detached from their femoral attachment.

The capsule and the labrum are excised out to provide 360 degree exposure of bony margins of the rim of the acetabulum. Excise fibrofatty tissue, ligamentum teres remnant and any osteophytes to expose the medial wall of the acetabulum. Progressive reaming is done at 1mm intervals, till the bleeding subchondral bone is exposed and hemispherical dome is achieved. Now the polyethylene liner is introduced into the acetabular cup and impacted into the acetabular cup.

Now the femoral canal is entered at piriformis fossa with box osteotome and bone is removed from the medial aspect of the greater trochanter to form a groove. Insert the trial stem and the head and do the trial reduction. The trial femoral component is removed and thorough wash given with normal saline. Then femoral stem of the corresponding size as dictated by the trial stem is then inserted into the medullary canal and hammered till tight fit is obtained.

Reduction is done. Stability of reduction is checked with hip in 90 degree flexion, 5 degree extension, 30 degree of abduction and adduction, 40 degree internal rotation and external rotation.

Wound is then closed in layers with suction drain insitu. Abduction pillow is given between the legs to prevent adduction.



Fig 1: Incision



Fig 2: Proximal femur delivered after incising the capsule



Fig 3: Acetabular cavity after reaming implanted

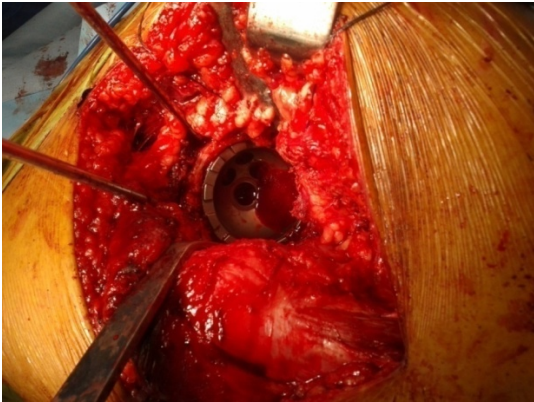


Fig 4: Acetabular component

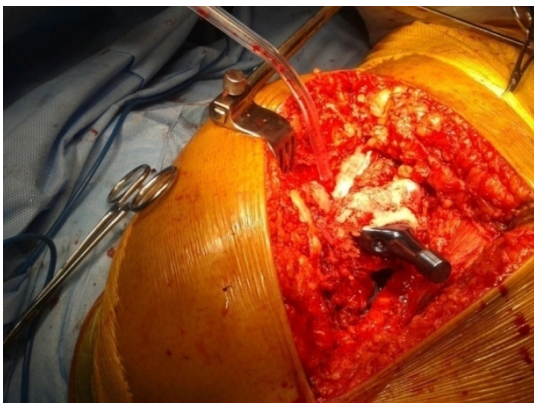


Fig 5: Femoral stem implanted



Fig 6: Closure with suction drain insitu

Post operative management

- Limb is kept in abduction with pillow between two lower limbs. Vitals are monitored carefully.
- Intravenous antibiotics are given for 4 days.
- On 1st post operative day, check X-rays are taken. Static quadriceps exercises, knee and ankle mobilisation done. Chest physiotherapy started. Patient is made to sit.
- On 2nd post operative day, drain is removed and dressing changed. Gait training started using walker with weight bearing to tolerance.
- DVT prophylaxis given for first 5 post operative days in the form of LMW heparin injection.
- Oral antibiotics started from 6th post operative day and continued for another 4 days.
- Suture removal done on 10th post op day and patient was discharged from hospital.

Radiological and clinical photographs (fig. no 7)



X-ray; 1 – Pre-op



Post-op



X-ray; 2 - Pre op



Post-op



Abduction

Clinical Photographs



Flexion



Internal rotation



Straight Leg Raising



External rotation



Adduction



Partial weight bearing



Full weight bearing

Post operative Follow Up

The patients were followed up at 1month, 3 months, 6 months, 1 year and at 17th month at the completion of my study. Patient follow up was for a minimum of 3 months to a maximum of 17 months.

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.

Radiological assessment

A radiograph was taken at the end of procedure and during follow up visits. The standard radiograph included X ray both hips with 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.

1. Cup inclination was determined on the anteroposterior pelvic radiograph with a horizontal reference line drawn through the base of both teardrops.

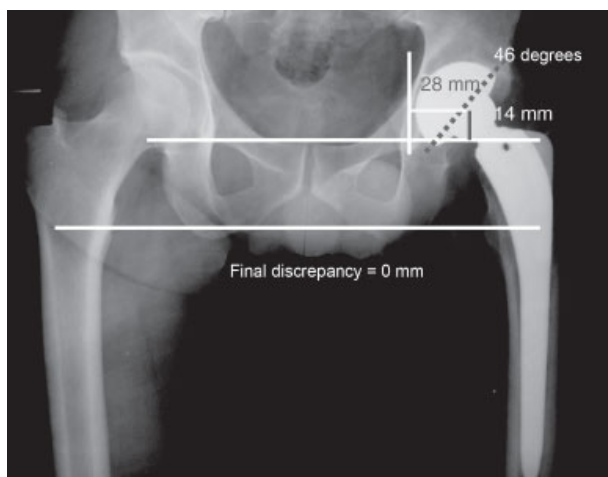


Fig 38: Postoperative x-ray measurements

This radiograph was compared with the one made at the time of the last follow-up evaluation to determine fixation, total wear, the annual wear rate, and the presence, extent, and location of osteolysis.

Loosening of femoral component was diagnosed if there was progressive varus shift or progressive axial subsidence of more than 5mm.

The prevalence, location, and extent of osteolytic lesions, progressive radiolucent lines, and calcar resorption were determined on anteroposterior radiographs made at the time of the last follow-up.

Method of statistical analysis

The following methods of statistical analysis have been used in this study. The results were averaged (mean+SD) for each parameter for continuous data and numbers and percentage for categorical data presented in fig. and table proportions were compared using chi square test of significance.

Table 1: Chi-Square Test (r, x, c tables)

| Rows | Columns | Total |
|------|--|----------------|
| 1 | 1 2..... | |
| 2 | a ₁ a ₂ a _c | t ₁ |
| 3 | b ₁ b ₂ b _c | t ₂ |

DF=(r-1)*(c-1), where r=rows and c=columns
 DF= Degrees of Freedom (Number of observations that are free to vary after certain restriction, have been placed on the data).

2. Paired ‘t’ test

A paired ‘t’ test was performed to determine whether there were difference between the before and after treatment measurements on the parameter.

t= Where is the mean difference in each set of paired observation, s=SD of the difference and n is the number of observation.

In all the above tests the “p” value of less than 0.05 was accepted as indicating statistical significance.

The Excel and Graph pad software packages were used for data entry and analysis.

5. Observations and results

The study was conducted in Department of Orthopaedics, Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore. 20 hips were operated upon 17 patients for arthritis secondary to AVN of head of femur.

Age distribution

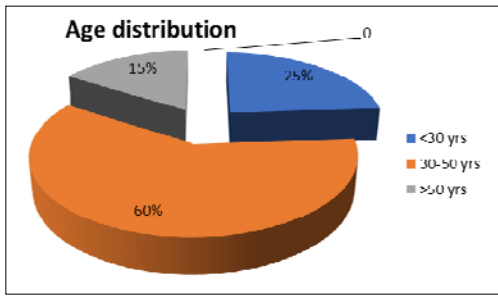
This study was conducted on patients with age ranging from 19 to 58 years with a mean age of 39.96 years at the time of surgery. Majority of patients were in the age group below 50 years.

Table 2: Showing age distribution of all patients

| Age | Frequency | Percent |
|-----------|-----------|---------|
| <30 yrs | 5 | 25% |
| 30-50 yrs | 12 | 60% |
| >50 yrs | 3 | 15% |
| Total | 20 | 100% |

Table 3: Showing Mean age and Standard deviation of age

| N | Mean Age | S D | Minimum | Maximum |
|----|----------|-------|---------|---------|
| 20 | 39.96 | 10.91 | 19 | 58 |



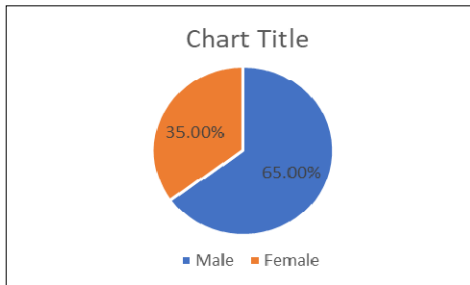
Graph 1: Showing age distribution

Gender Distribution

In this study, 17 (68%) were males and 8 (32%) were females.

Table 4: Showing Gender distribution

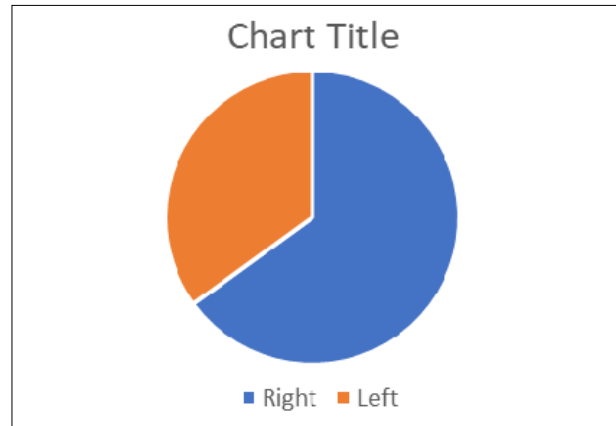
| Gender | Frequency | Percent |
|--------|-----------|---------|
| Male | 13 | 65% |
| Female | 7 | 35% |
| Total | 20 | 100% |



Graph 2: Showing Gender distribution

Table 5: Side affected 19 hips were affected on right side and 11 hips on left side

| Side | Frequency | Percent |
|-------|-----------|---------|
| Right | 13 | 65% |
| Left | 7 | 35% |
| Total | 20 | 100% |



Graph 3: Showing side affected

Table 6: Laterality 20 patients underwent unilateral THR and 5 patients underwent bilateral THR

| Laterality | Frequency | Percent |
|------------|-----------|---------|
| Unilateral | 17 | 85% |
| Bilateral | 3 | 15% |
| Total | 20 | 100% |

Modified Harris hip score

Table 7: Pre operative and post operative scores according to the various parameters of the Modified Harris Score System

| Parameter | Pre-op (Mean) | Post-op (Mean) | Difference | 95% confidence interval | 'T' value | 'P' value |
|----------------------|---------------|----------------|------------|-------------------------|-----------|-----------|
| Pain | 15.60 | 42.16 | 26.56 | 29.3-23.7 | 19.33 | <0.001 |
| Function | 16.48 | 39.64 | 23.16 | 26.0-20.2 | 16.43 | <0.001 |
| Absence of deformity | 2.88 | 4.00 | 1.12 | 1.87-0.36 | 3.05 | 0.005 |
| ROM score | 2.24 | 4.64 | 2.40 | 2.71-2.08 | 15.71 | <0.001 |
| Total score | 37.20 | 90.44 | 53.24 | 57.8-48.6 | 24.033 | <0.001 |

'p' value of less than 0.05 indicates statistical significance.

For the total score and each of the parameters, higher score implies lesser disability.

The mean total pre operative score was 37.20 (19- 70). At latest follow-up the total mean score was 90.44 (72- 97).

Outcome Analysis

Table 8: Comparison of the outcome scores according to the grading

| Grade | Pre op | At latest follow up |
|-----------|--------|---------------------|
| Poor | 19 | 0 |
| Fair | 1 | 1 |
| Good | None | 4 |
| Excellent | None | 15 |
| Total | 20 | 20 |

Radiographic results

Results of the radiographic evaluation on all hips were as follows;

Post-Operative Acetabular Cup Angle

In 18 patients post-operative acetabular cup angle was in range of 45-50 degree. 1 patient had angle less than 40 and 1 had angle more than 50 degree.

Table 10: Showing Post Operative Acetabular Cup Angle

| Acetabular angle | Frequency | Percent |
|------------------|-----------|---------|
| <40 degree | 1 | 5% |
| 40-45degree | 8 | 40% |
| 46-50 degree | 10 | 50% |
| >50 degree | 1 | 5% |
| Total | 20 | 100% |

1patients with cup angle more than 50 degree had good to excellent outcome scores. 1 patient with cup angle less than 40 degree had good outcome score.

Femoral Stem Placement

The femoral stem was in neutral position in 18 patients and in 2 patients, it was in 5 degree varus.

Table 11: Showing Femoral Stem Placement

| Femoral stem position | Frequency | Percent |
|-----------------------|-----------|---------|
| Central /normal | 18 | 90% |
| Varus | 2 | 10% |
| Total | 20 | 100 |

Out of 2 patients with stem in varus, 1 had excellent outcome score and 1 had good score.

Stress shielding was noted in 2 patients.

Complications

Anterior thigh pain

In our study, 2 (10%) patients complained of anterior thigh pain which disappeared by 6 month postoperatively.

Dislocation of hip

We had 1 case of posterior dislocation in our study. Closed reduction was done in operation theatre and was immobilised in fixed traction for 2 weeks. The patient was subsequently discharged and no further episode of dislocation was noted.

Nerve injuries

We had 1 case of foot drop in immediate post-operative period which recovered completely at 1year.

Infection

We had 1 case of deep infection in the early post operative period. Thorough debridement was done and was treated by administration of Piperacillin + Tazobactam antibiotic for 2 weeks and oral antibiotics were given for another 2 weeks,

Periprosthetic fracture

We had 1 case of intraoperative periprosthetic fracture involving greater trochanter (Vancouver type A) and was fixed by S-S wire. The fracture healed subsequently.

6. Discussion

Total hip arthroplasty is a well-documented surgical procedure that relieves pain and functional disability experienced by patients with moderate to severe arthritis of hip, thus improving quality of life.

The study was carried out on 20hips in 17 patients who underwent uncemented THR. In our study, patients age group ranged from 19-58 years, out of which 5(25%) were below 30 years, 12 (60%) between 30-50 years and 3 (15%) were above 50 yrs. The mean age was 39.96 years. 13 (65%) were males and 7 (35%) females.

All surgeries were performed in conventional operation theatre through Moore's approach. Uncemented straight stem-HA coated was used in 12 hips and uncemented press fit femoral stem-plasma coated was used in 8 hips. The stem size ranged from 9-14 and most commonly used was 13. The head size ranged from 22-32 and most commonly used was 32. The cup (shell) size ranged from 42-58 and most commonly used was of 54. The corresponding polyethylene liner was used.

The follow up ranged from a minimum of 3 months to maximum of 24 months (mean 10.13 months) at regular intervals - 1mth, 3mths, 6mths, 12mths, and a maximum of 24 month. All patients were evaluated by the modified Harris hip score.

Mean Harris hip score improved from 37.20to 88.04 immediate postoperatively and 90.44 at latest follow-up, as compared to Kim⁴⁴ et al study (from 55.3 to 91), McLaughlin²⁷ et al (from 48 to 88), Katz⁴⁰ et al (from 42 to 84), and Mont⁴³ et

al (from 43 to 92), Heekin⁴² et al (average score of 93 at minimum 5 year follow-up), Archiback⁶² et al (from 51 to 94). We had excellent results in 15 patients, good in 4 and fair in 1 patient as comparable to Kim⁴⁴ et al. (75% excellent, 19% good and 7% fair at the end of 2 years); Mont⁴³ et al (84% Excellent, 7% Good, 2% Fair and 2% Poor) ; McLaughlin²⁷ et al (87% Excellent,7% Fair and 6% Poor).

Thigh pain is a common complaint after uncemented hip replacements. In our study 2 (8%) patients had anterior thigh pain which disappeared after few months. Our results are comparable with Katz⁴⁰ et al (29% patients had thigh pain), Callaghan³⁰ et al (17%), Heekin⁴² et al (15%) and Dhaon⁷¹ et al (15%).

Dislocation is one of the common complication of total hip arthroplasty. We had 1(4%) posterior dislocation of hip which was managed by closed reduction. Our results are comparable with Asmutz¹³ et al (3%), Fackler CD¹⁹ et al (2%), and Turner et al⁵⁰(8.9%).

Nerve injury is a distressing complication after total hip replacement. In our study we had 1(4%) cases of foot drop which recovered by 12 months. Our results are comparable with Edwards²⁸ et al (1.1% incidence of nerve palsy), Schmalzried²⁷ and Asmutz et al (1.3%).

Post-operative infection is a difficult complication affecting total hip arthroplasty. We had 1 case (4%) of deep infection which was managed by debridement and culture specific antibiotic. The patient recovered uneventfully. Our results are comparable with Philips CB⁶⁷ et al (1.1% incidence of deep infection), Schutzer²⁹ SF et al (0.38%).

7. Conclusion

We have evaluated Total hip arthroplasty for AVN femoral head using uncemented prosthesis. Our study suggests that current generation implants can provide satisfactory clinical and radiographical outcomes after a short duration of follow up. Though the study was not free of complications, the overall, functional and radiological outcome showed good results.

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