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A CLINICAL STUDY OF UNCEMENTED TOTAL HIP REPLACEMENT IN VARIOUS HIP DISORDERS

Orthopaedics

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ABSTRACT

PURPOSE: To assess the clinical and radiological outcome of uncemented total hip replacement in osteoarthritis of hip
METHODS: Our study is a prospective study of clinical and radiological analysis of uncemented total hip arthroplasties performed for various hip disorders Study was carried out in Orthopaedics Department of katuri medical college and Hospital, chinakondrupadu ,guntur from June 2018 to November 2018. The permission to conduct the study was taken from the hospital's ethics and thesis committee
RESULTS. Ours is a prospective study comprising of 32 patients with 32 uncemented total hip arthroplasties. Of the 32 cases included in the study majority are male patients.22 patients are male constituting 68.75% of cases and the rest 10 are female patients constituting 31.25% of the cases
CONCLUSION: This study has shown that the outcome of uncemented total hip arthroplasty has excellent results in terms of pain relief, increased walking distance, and functional capabilities in patients. . Patients are satisfied with the results and most of them resumed their normal activities and are pursuing their jobs. Patient had significant improvement in range of motion at hip. Complications encountered in our short term follow up did not affect the outcome at the end. Neither the complications like aseptic loosening and wear requiring revision have not been found in our study, nor analysis regarding survivorship and longevity of the arthroplasty have been dealt with. Long term follow up is mandatory to analyze these aspects.

KEYWORDS

INTRODUCTION:

Osteoarthritis (OA) is a major cause of disability among elderly population. It is a major cause of a burden on the health system and its incidence and prevalence continues to rise with a rapidly increasing aging population.[1] OA occurs due to an interaction between certain systemic and local factors, which are unique for each joint.[2,3] Hip OA can be classified as idiopathic and secondary.[4,5,6] Total hip replacement is considered one of the most important and successful intervention in the recent era. since total hip replacement was introduced, there has been a steady improvement in the technology associated with it, leading to better functional outcome and implant survivorship. The development of circumferentially coated uncemented implants which allow bone to grow in to or on to the prosthesis has led to improved implant survival rate and supports their growing use. The advantages of cementless femoral components include a reduced risk of cement-related cardiovascular and thromboembolic complications, the possibility of biological fixation, the minimisation of stress shielding of the proximal femur and potential of extended implant survival[7-11] The study aims to determine the functional outcome and the complications associated with uncemented total hip replacement using modular prosthesis In this study 32 cases with osteoarthritis of hip joint were treated by uncemented total hip replacement at Katuri medical college and hospital, chinakondrupadu, guntur between June 2015 to November 2016 were included. The functional outcome is assessed and compared with other studies. The aim of the procedure is to assess the functional outcome of uncemented total hip replacement.

MATERIALS AND METHODS:

METHODS:

Study type: Our study is a prospective study of clinical and radiological analysis of uncemented total hip arthroplasties performed for various hip disorders

Study area: Study was carried out in Orthopaedics Department of katuri medical college and Hospital, chinakondrupadu,guntur from June 2018 to November 2018. The permission to conduct the study was taken from the hospital's ethics and thesis committee.

Study Population: Patients diagnosed with osteoarthritis of hip joint with stage III & stage IV, who underwent uncemented total hip replacement are included in our study. All the patients were explained about the procedure, necessity for follow up and written consent was taken. 35 patients in total who underwent uncemented total hip arthroplasty for osteoarthritis during the period were eligible for the study. Three patients who were not available for regular follow ups were excluded from the study. 32 patients who were available for minimum of 1 year follow up were included in our study. Total of 32 arthroplasties were performed in 32 patients. These were done between June 2018 and November 2018.

Inclusion Criteria:

- Patients with significant disabling hip pain and moderate to severe functional limitation of activities of daily living due to osteoarthritis of the hip joint with any of the etiologies.
- Patients having a minimum period of 12 months of follow up were included in the study.

Exclusion Criteria:

- Total hip arthroplasties performed as revision for patients of post operative hemiarthroplasties or previous THRs were excluded.

All patient data and clinical history were noted with reference to pain, range of motion, gait, activities or function (Harris Hip Score), pre operatively and at scheduled follow up visits.

MATERIALS

CEMENTLESS ACETABULAR COMPONENTS

1) Trident acetabular shell with poly or alumina ceramic bearing (Stryker)
2) Duralocacetabular shell with poly or ceramic bearing (Depuy)
3) Delta motion acetabular mobile bearing system (Depuy)
4) Trilogy acetabular cup cluster holed or multiholed shell with standard or highly cross linked poly liners (Zimmer)
5) Biolox delta acetabular cup with ceramic bearing (Exatech)
6) Verilastacetabular cup with ceramic bearing (Smith & Nephew)

CEMENTLESS FEMORAL COMPONENTS

1) Accolade stems with tapered wedge stem and proximal body hydroxy apatite & plasma spray coating (Stryker)
2) Corailcementless femoral stem – hydroxyapetite coated collarless stem (Depuy)
3) Acumatch stem with hydroxy apatite & plasma spray coating (Exatech)
4) M/L taper femoral stem (Zimmer)

5) Short modular femoral stems (Smith & Nephew)

PRE OPERATIVE PLANNING

Preoperative planning enables the surgeon to prepare for the case and anticipate situations that may arise during surgery. A thorough preoperative plan incorporates elements from the patient's history, physical examination and radiographic analysis. All the patients were evaluated clinically based on the Harris hip score.

Patients were also evaluated preoperatively for remote source of infection by taking a throat swab and urine culture.

- Clinical assessment in terms of range of motion, pain, restriction of distance walked and restriction of carrying out daily activities.
- Associated medical problems: Hypertension, diabetes mellitus, coronary heart disease, coronary artery disease, past history of thromboembolism, COPD, history of recent throat, urinary, and other infections were evaluated.
- Adequate compatible blood was reserved before surgery

PRE OPERATIVE RADIOGRAPHIC TEMPLATING

The goals include

- Determine preoperative leg length discrepancy
- Assess acetabular component size and placement
- Determine femoral component size , position and fit
- Assess femoral offset

The first step in accurate Templating is obtaining high quality radiographs using a standardised protocol with known magnification. We used a 110% magnification. We obtained an anteroposterior (AP) view of pelvis with both hips with both extremities in 15 degrees of internal rotation to position the head and neck parallel to the coronal plane. A direct lateral radiograph was also obtained and used to determine three- point femoral fixation.

DETERMINATION OF LIMB LENGTH DISCREPANCY (LLD)

To determine existing preoperative LLD we performed a clinical evaluation in conjunction with radiographic analysis. A reference line is drawn through the bottom of the ischial tuberosity. The distance from the lesser trochanter landmark to the reference line on each side was measured. The difference between the two was considered as the amount of LLD.

ACETABULAR CUP SIZING AND POSITION

Most sizing predictions are made on the AP radiograph of the hip. The optimal position for the acetabular component and size was determined by using template overlays. The acetabular teardrop was referenced as the inferior margin of the acetabular reconstruction. The goal of acetabular fixation was to maximize bone contact. Once this was determined the centre of rotation of the bearing surface marked.

FEMORAL COMPONENT SELECTION

The femoral component template size that will fit the proximal femur and equalize the leg lengths was selected. The femoral component should be in line with the long axis of the femur and the neck resection line drawn at the point where the selected stem provides the desired amount of leg length. The vertical distance between the planned centre of rotation of the acetabular component and the centre of rotation of the femoral head constitutes the distance the leg length will be adjusted. The level of neck osteotomy depends on the stem size and the desired leg length. To properly position the template on the lateral radiograph the distance between the tip of the greater trochanter and the lateral shoulder of the prosthesis is estimated. The stem size that is chosen in the AP plane also should fit in the lateral plane. The lateral radiograph of a properly sized tapered implant will typically exhibit three- point fixation.

OFFSET REQUIREMENTS

Through Templating and intra operative trial we determined which option restores proper offset by matching the cup's centre of rotation with the desired head centre of rotation.

ANAESTHESIA

Patients received epidural and general anaesthesia or spinal and epidural anaesthesia as per anaesthetist evaluation and patients general condition.

SURGICAL APPROACH

Posterolateral approach by Gibson and Moore's had been used as per preference of the operating surgeon. All surgeries were performed with absolute aseptic precautions by single senior orthopaedic surgeon in our operation theatre. In all cases a dose of intravenous antibiotic, cefuroxime was given 10 minutes prior to anaesthesia. Single dose of teicoplanin is given prior to incision. Intravenous antibiotics cefuroxime were given for 3 days post operative and later replaced with oral antibiotic cefuroxime for another 3 days.

POST OPERATIVE MANAGEMENT

Both the limbs were kept in abduction with a pillow in between the legs. Post operative analgesia was adequately given in the form of epidural analgesia for minimum of 48 hours and maximum of 72 hours. Intravenous antibiotics were used for 3 days, and then converted to oral antibiotics for another 3 days. Heparin (LMW) was subcutaneously given for prevention of thromboembolic events for 7 days followed by 5 to 6 weeks course of ecosprin or total 6 week course of LMWH. Prophylaxis against heterotopic bone formation was not routinely used. Patients were encouraged to sit up in the bed from the first post operative day. Active abduction strengthening exercises were begun from the second post operative day under the supervision of our physiotherapist. Patients start weight bearing from day one as tolerated, followed by early ambulation on day 2 with walker support. Mandatory 2 week walker support while walking was advised. From 2-6 weeks patients are encouraged to shift over to elbow crutch or tripod stick support as tolerated. Patients are allowed to walk without support by end of 6 weeks.

FOLLOW UP EVALUATION

Clinical assessment was done using Harris Hip Score pre operative and post operative at 6 weeks, 3, 6 and 12 months follow up and points were apportioned accordingly. Radiographs were also analyzed with reference to signs of loosening at end of 3 months and 1 year.

RADIOLOGICAL ANALYSIS

Post op X rays are evaluated for

1. Position of the cup: normal, horizontal, vertical, very deep, very superficial, anteverted, retroverted
2. Position of the stem: normal, varus, valgus

Signs of loosening:.

1. Radiolucency between the stem and surrounding bone.
2. Change of femoral stem into a more varus position.
3. Deformation of the stem in the anteroposterior or lateral radiographs.
4. Incomplete or complete failure (fracture) of the stem.

Signs of stable biological fixation in case of cementless femoral stem:

1. Fixation by bone ingrowth is defined as an implant with no **subsidence** and minimal or no **radiopaque line** formation around the stem.
2. An implant is considered to have a stable fibrous ingrowth when no progressive **migration** occurs , but an extensive radiopaque line forms around the stem
3. An unstable implant is defined as one with definite evidence of progressive subsidence or migration within the canal and is at least partially surrounded by divergent radiopaque lines that are more widely separated from the stem at its extremities. **Increased cortical density and thickening typically occur beneath the collar** and at the end of the stem , indicating regions of local loading and lack of uniform stress transfer

Signs of loosening and wear of uncemented acetabular cup:

1. Absorption of bone from around part or increase in the width of the area of absorption , which is especially significant if more than 2mm wide and progressive 6months or more after surgery .
2. Superior or medial migration and protrusion of cup into the pelvis; also fracture of the medial cortex of the acetabulum.
3. Change in the angle of inclination or the degree of anteversion of the cup, indicating component migration.
4. Wear of the cup, as indicated by a decrease in the distance between the surface of the head and the periphery of the cup.

OBSERVATIONS AND RESULTS

All 32 patients in the present study returned for clinical and radiological examinations subsequently. Patients were reviewed after six weeks, three months, six months and one year post operatively.

Radiographs were reviewed at end of 3 months and 1year.Observations in the form of tables, pie charts and bar diagrams are furnished.

AGE DISTRIBUTION

	Male	Female	Total
30-40	7	4	11
41-50	5	1	6
51-60	10	5	15
Total	22	10	32

The age ranges from 32-60 years with mean age of 48.31years. Most of the cases are between the age group of 51 to 60 years constituting 46.88% of study population

SEX DISTRIBUTION OF STUDY PATIENTS:

Of the 32 cases included in the study majority are male patients.22 patients are male constituting 68.75% of cases and the rest 10 are female patients constituting 31.25% of the cases 68.75% of study population were male Average age of patients in our study is 48.31 years. Youngest patient who underwent THR was 32years The oldest patient was 60 years.

ETIOLOGY IDENTIFIED AMONG STUDY PATIENTS:

Idiopathic osteonecrosis was most common etiology accounting for 50% of cases

41% of cases are due to primary osteoarthritis 9% of cases are due to rheumatoid arthritis.

Etiology in the study group

Of the 16 cases with avascular necrosis 11 patients were male and 5 were female

Of the 13 cases with primary osteoarthritis 9 patients were male and 4 were female

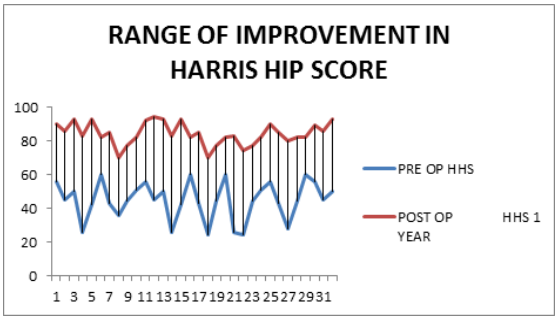
Of the 3 cases with rheumatoid arthritis 2 were male and 1 case wase female

Table:- Harris Hip Score at 1yr follow up

Outcome	Number (N)	Percentage (%)
Poor	0	0%
Fair	6	18.75%
Good	17	53.13%
Excellent	9	28.13%

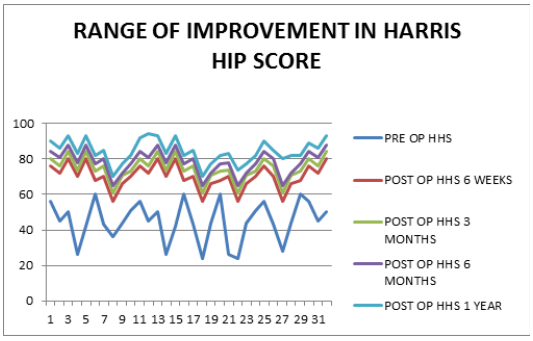
Chart:- Outcome of study

Chart:- Range Of Improvement In Harris Hip Score



- Average improvement of Harris hip score was 39.53 with a wide range of 22-57

CHART:- Range Of Improvement In Harris Hip Score At Every Follow Up



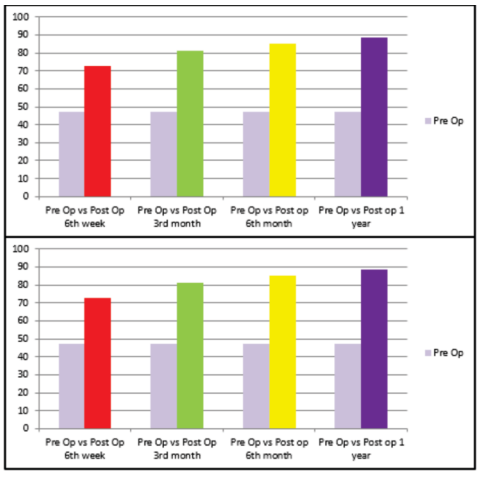
CLINICAL OUTCOME

The average pre operative Harris hip score (HHS) was 44.69. The Harris hip score at most recent follow up (1yr) was 84.2. The result was excellent in 9 patients, Good in 17 patients, fair in 6 patients. Mean HHS at each follow up visit was compared with pre operative HHS using Paired T test and p values were calculated. P value was found to be significant with each comparison.

TABLE:- Statistics Of Pre Op & Post Op HHS Comparision

	Preophhs	Postophhs6 weeks	Postophhs3 months	Postophhs6 months	Postophhs1 year
Mean	44.688	70.000	74.500	78.219	84.219
Std. Deviation	11.2119	7.0023	6.6672	6.9734	6.6271
Minimum	24.0	56.0	61.0	65.0	70.0
Maximum	60.0	80.0	84.0	88.0	94.0

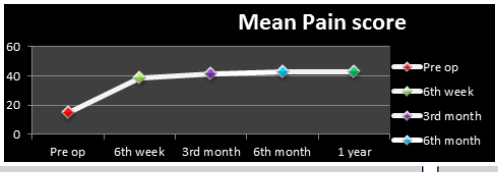
Chart:- Comparision Of Pre Op & Post Op HHS At Every Follow Up



Pain:

As almost always occurs after total hip replacement, there was a marked immediate relief in pain post operatively. After improving for three months, however the pain scores did not change appreciably. Five patients had slight pain which they almost ignore (pain score 40). One of the patient who suffered from post operative infection had experienced considerable pain (pain score 30). Prior to surgery, 93% of the patients had moderate to marked pain. Most patients have tried several medications stronger than aspirin to relieve the pain and were not successful. At final evaluation, almost universal relief of pain was seen.

Chart :- Mean Pain Score:-



Pain score in Harris hip score

Function:
At the last follow up, 30/32 patients could walk unlimited distance. 31/32 patients walked without support. 30/32 patients could use public transport. All of them returned to work.

Limp:
None of the patients had significant limp at final follow up.

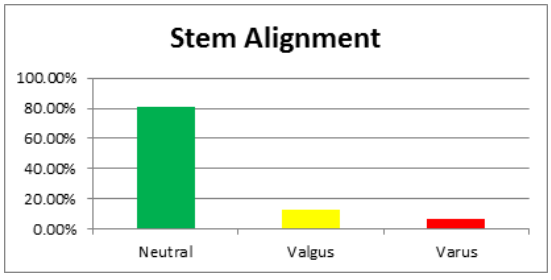
Satisfaction:
All the patients were satisfied with the outcome of the total hip arthroplasty except one of the patients who had infection. All the patients considered hip to have better function than prior to surgery.

RADIOLOGICALOUTCOME

Femoral stem

Radiographic evidence did not reveal any signs of loosening. At last follow up, none of the radiographs showed any significant (2mm or more) radiolucency. The femoral stem was aligned in neutral in 26 hips. 4 stems were in mild valgus and 2 were in mild varus positions. No patient had complained of pain in the thigh.

Chart:- Stem alignment



Acetabular cup

All acetabular components were stable when seen at final follow up. Average acetabular inclination was 50^0. No cup had broken screws.

COMPLICATIONS:

We have experienced few significant complications in our short follow up. 1 case of infection were identified. It was fortunately superficial infections, which responded well to intravenous antibiotics based on culture and sensitivity. The patient had good end result. One of them had moderate pain even at end of 1 year follow up. The culture organism was staphylococcus aureus.

There was a case of limb length discrepancy of 1.5cm post operatively. However, patient had a good result functionally and negligible limp.

The worst of all complications is dislocation which occurred at 4 weeks after THR. The incident occurred when patient had dash board injury in a road traffic accident. Closed reduction could be achieved within 6 hours. He received strict bed rest for 4 weeks with lower limbs placed in abduction. He has received aggressive physiotherapy later and had good result at end of one year.

LIMITATIONS

The limitation in our study is a relatively short follow up and therefore, we could not come to a conclusion about the late complications and long term results of uncemented total hip arthroplasty. We have used only Harris hip score to assess the pain, function and mobility

CONCLUSION:

Uncemented replacement of the hip as a primary procedure can give a good clinical result which is comparable with the totally cemented joint. Although in some patients there are minor residual symptoms which do not limit activity. Although the operation can often be performed more rapidly, it requires a high standard of bone preparation and in the attempt to produce a tight interference fit..On the acetabular side there is a positive gain in the augmentation of pelvic bone stock. with or without grafting, and. in most systems. failure on the acetabular side is uncommon. On the femoral side there appear to be both theoretical and practical advantages in methods of enhanced fixation.
This study has shown that the outcome of uncemented total hip arthroplasty has excellent results in terms of pain relief, increased walking distance, and functional capabilities in patients. . Patients are satisfied with the results and most of them resumed their normal activities and are pursuing their jobs. Patient had significant improvement in range of motion at hip. Complications encountered in our short term follow up did not affect the outcome at the end. Neither the complications like aseptic loosening and wear requiring revision have not been found in our study, nor analysis regarding survivorship and longevity of the arthroplasty have been dealt with. Long term follow up is mandatory to analyze these aspects.

Our study supports the usage of uncemented THR in osteoarthritis in both young and elderly. The current trend, research and advent of new implants support uncemented THR in patients suffering from this crippling hip arthritis and avascular necrosis.

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