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Preoperative assessment and postoperative outcome of total hip replacement in adults with AVN

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Abstract

Introduction: Total hip replacement has been proven to be the treatment of choice for patients with intolerable pain and limitation of movement due to avascular necrosis since many years. The success of total hip replacement is the outcome of the surgery that enables to relieve the pain associated with the hip point pathology while maintaining the mobility and stability of the hip joint for many years. Non cemented hip arthroplasty has taken over in the recent times and replaced conventional cemented total hip arthroplasty in young adults, it has developed in response to evidence that cement debris play an important role in promoting bone lysis and loosening.

Aim: At our institution, a study is undertaken to assess the clinical and functional outcomes of uncemented total hip replacement in patients with osteonecrosis of femoral head.

Methods: This prospective study was conducted at Grant Medical College & JJ Hospital. 25 patients with 25 diseased hip between the ages of 40 to 85 years operated for uncemented total hip arthroplasty by posterior approach between July 2014 to August 2015 were included in the study. Clinical scoring was done using Modified Harris Hip Score along with radiological analysis on follow up. 6 weeks, 3, 6, 12 and 24 months and at latest follow up.

Result: In our study the mean preoperative modified Harris hip score (Table 3) was 45.04 with minimum of 21 and maximum of 62. The immediate mean postoperative modified Harris hip score was 88.44 with a minimum of 74 and maximum of 95. The mean follow-up Harris hip score increased to 91.28 with a minimum of 77 and maximum of 97. There was a significant improvement in the follow up Harris hip score (modified) with a p value of 0.044 (<0.05). All patients who were included in our study had poor score preoperatively. In the follow up 21(84%) had excellent results, 2(8%) had good result and 2(8%) had fair results in the follow-up which is a significant improvement in the modified Harris hip score.

Conclusion: This study has shown that the outcome of the total hip arthroplasty has shown excellent results in terms of pain relief, increased walking distance, and functional capabilities in patients.

Keywords: Total Hip Replacement, Avascular Necrosis, Modified Harris Hip Score

Introduction

Total hip replacement has been proven to be the Treatment of Choice for patients with Intolerable pain and limitation of movement due to AVN since many years. It is the most commonly performed Adult Reconstructive Procedure [1]. The success of total hip replacement is the outcome of the surgery that enables to relieve the pain associated with the hip point pathology with maintaining the mobility and stability of the hip joint for many years. The pathology which leads to the disabling hip condition such as Osteonecrosis, Osteoarthritis and inflammatory arthritis are on a rise. Most common condition for which total hip replacement is done in India is Osteonecrosis of Femoral Head. The main indication for total hip replacement is excruciating pain and restriction of day to day activities. Sir John Charnley in the late 1960s designed artificial hip joints and laid down the principles of Biomechanical Functional Hip joint [2]. Later this was modified and the implant designs were improvised by Mckee and Farrar [3]. The principles and the basic concepts laid by Sir John Charnley remains the same. With advanced prosthesis and modern cementing techniques problems like femoral loosening have been reduced substantially [4]. Non cemented hip arthroplasty has taken over in the recent times and replaced conventional cemented total hip arthroplasty in young adults [5], it has developed in response to evidence that cement debris play an important role in promoting bone

lysis and loosening. Prosthesis that achieve fixation without cement either by “Press-Fit” or by Biological ingrowth. With “Press-Fit”, stabilisation is achieved by interference fit of the implant into the femur. Non cemented devices are preferred in young adults with high physical activity demands and Revision Procedure in the future is most likely. Non cemented hip arthroplasties have relatively low revision rate and durability for 15 years as suggested by the preliminary data [6]. Short term results appear to be less satisfactory as compared to cemented hip arthroplasty, after 5 to 20 years the results are similar in both the procedures [7]. Early complications associated with total hip arthroplasty include Fracture, Nerve injury, Dislocation, Deep Vein Thrombosis and Pulmonary Embolism. Late complications include infection, heterotrophic ossification and loosening [8]. Periprosthetic fractures is also a difficult problem which is associated with total hip arthroplasty, factors contributing for periprosthetic fractures are mostly the choice of implant and patient selection [9]. Many designs are studied and continuous efforts are made to minimise the complications and improve the outcomes of total hip arthroplasty. Total hip arthroplasty relieves pain and functional disability experienced by patients in moderate and severe hip arthritis resulting in improving the quality of life of the patient [10]. At our institution, a study is undertaken to assess the clinical and functional outcomes of uncemented total hip replacement in patients with osteonecrosis of femoral head. Harris hip score is the most commonly used scoring system for evaluation of total hip arthroplasty.

Methods and Materials

Our study is a prospective study of clinical and radiological analysis of uncemented total hip arthroplasties for Osteonecrosis of Femoral head involving the acetabulum at Grant Medical College and Sir J. J. Group of Hospitals, Mumbai. We included 25 patients who were operated with total hip arthroplasty. All cases were operated with Posterior Approach. These cases were operated between July 2014 and August 2015 and followed till October 2016. Clinical assessment was done using Modified Harris hip score. Pre-op and Post-op at 6 weeks, 3, 6, 12 and 24 months and at latest follow up and were scored accordingly.

Inclusion Criteria

- Age group above 40 years
- All patients who had significant disabling hip pain and moderate to severe functional limitation of activities of daily living due to Osteonecrosis of Femoral Head.
- Patients who had one or more of the following radiological signs namely loss of sphericity of the femoral head, collapse of the weight bearing area of the femoral head, flattening of the femoral head, joint space narrowing, acetabular changes, and osteoarthritic changes.

Exclusion Criteria

- Patients with severe systemic diseases contraindicating surgical procedure.
- Revision total hip arthroplasties.

All patients came for regular follow up. All patient data and clinical history were noted with reference to pain, range of motion, gait, activities or function, pre operatively, at the time of discharge, at all follow ups. In our study we have used polyethylene-on-ceramic type of uncemented total hip replacement in all our cases.

Preoperative Work Up

The success of total hip replacement depends on not only a sound technical surgical execution but on overall management which includes appropriate selection, proper motivation of the patient, effective and adequate post-operative management of the patient. A detailed history is taken and thorough physical examination is done. Medical consultation is always obtained. The patient is selected on the basis of patient's occupational and social requirements, the hip joint pathology, patient's age and agility for active life is assessed with respect to activity of the disease, the bone condition – Its density and texture, the functional status – Range of motion, suppleness, muscle power and the soft tissues about the hip are examined- skin for scarring or inflammation where incision is to be made, subcutaneous tissues suppleness and muscle for tone and power. Laboratory workup was done thoroughly and evolution of both the joints was done by both clinically and radiologically. The patient is explained about the surgery, its limitations, the prognosis and the importance of maintaining only optimum weight. The mental makeup is dressed and promoted. The physical therapy staff works closely with the patient throughout the hospital stay. We completely looked for any foci of infection and eliminated it before doing the surgery. Epidural anesthesia is given to all the patients which help all the patients in post-operative analgesia. Blood Transfusion was given according to the post-operative Hb% and if clinical anaemia was present. Radiographic evaluation of both the hips was done and templating was done for both acetabular and femur components.

Technique

Under epidural anesthesia, patient in lateral decubitus position. Standard and adequate preparation are done. The limb is dropped free. An impermeable disposable steridrape is applied over the area of incision. Posterior approach was used. First we prepared the acetabulum and then the femoral canal.

Postoperative protocol

Both the limbs were kept in abduction with a pillow in between the legs. Postoperative analgesia was adequately given in the form of epidural analgesia. Injectable antibiotics were used for 5 days, and then converted to oral antibiotics till suture removal.

Patients were encouraged to sit up in the bed from the first post op day. Quadriceps and knee bending exercises immediate postoperatively.

Active abduction strengthening exercises were begun from the third post op day under the supervision of our physiotherapist.

Ambulation training is started with walker on Day 1-2 followed by gait training with weight bearing as tolerated on Day 3-7. Full weight bearing on involved extremity can be started on Day 14, after suture removal.

Follow Up Evaluation

Clinical assessment was done using modified Harris Hip Score preop and post op at 6 weeks, 3, 6, 12, 24 months and at latest follow up and points were given accordingly.

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. 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, 80-89 being good, 70-79 fair, 60-69 poor, and below 60 a failed result.

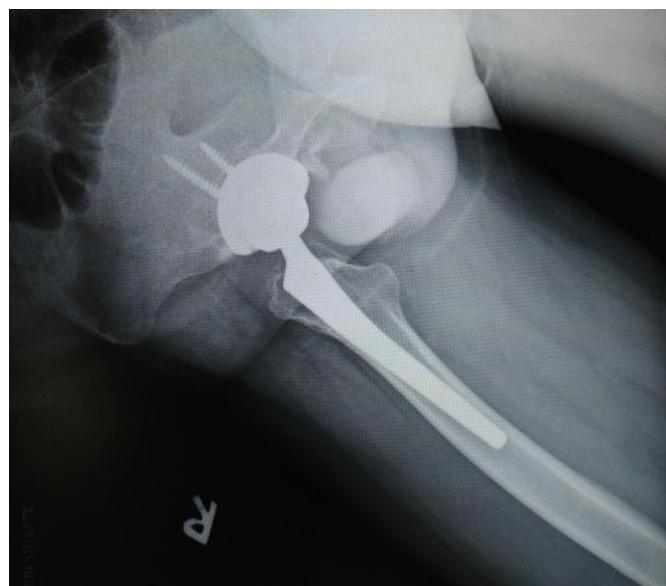
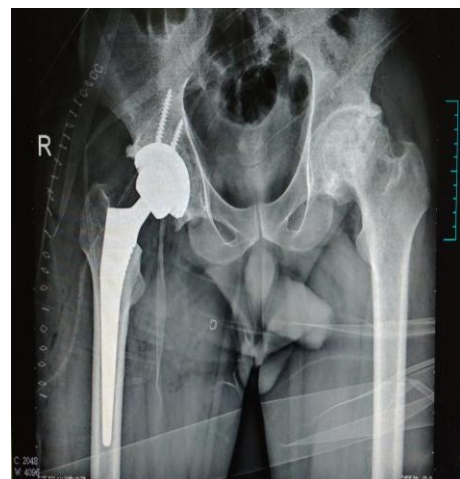
Radiological Assessment: A radiograph was taken at the end of the procedure and during follow up visits. The standard radiograph was an antero-posterior view of pelvis including both hips and sufficient length of femur. The radiological assessment included positioning and alignment of the acetabular and femoral components and complications such as periprosthetic fractures, loosening, osteolysis, dislocation, subsidence and heterotrophic ossification.

Observations and Results

This series consisted of 25 patients with 25 diseased hips treated with uncemented total hip replacement. This study is conducted on patients with age ranging from 40 to 85 years with a mean age of 59.68 years at the time of surgery. The patients were followed post operatively at 6 weeks, 3, 6, 12, and 24 months. The average followup period was 18.8 months, minimum period of followup being 12 months and maximum period followup was 24 months postoperatively. Out of 25 patients, 17(68%) are males and 8(32%) are females thus showing a male preponderance. 10 patients were operated on left side and 15 patients on right side. Although some cases showed bilateral involvement of arthritis in X-rays, patients came mainly with complaints on unilateral side. The indication for surgery was secondary arthritis due to AVN in all 25 patients. In our study two patients (8%) had varus angulation of the stem who complained of anterior thigh pain postoperatively. This was relieved in subsequent follow-ups. One patient had superficial infection who was treated with wound debridement, antibiotics and delayed suture removal. Two patients (8%) had leg length discrepancy (shortening) who were treated with shoe rise. (table 2) In our study the mean preoperative modified Harris hip score (Table 3) was 45.04 with minimum of 21 and maximum of 62. The immediate mean postoperative modified Harris hip score was 88.44 with a minimum of 74 and maximum of 95. The mean followup Harris hip score increased to 91.28 with a minimum of 77 and maximum of 97. There was a significant improvement in the follow up Harris hip score (modified) with a p value of 0.044(<0.05). All patients who were included in our study had poor score preoperatively. Clinical

outcome score is shown in (table 4). All patients who were included in our study had poor score preoperatively. In the follow up 21(84%) had excellent results, 2(8%) had good result and 2(8%) had fair results in the followup which is a significant improvement in the modified Harris hip score.

Case Illustrations



Flexion



External Rotation



Abduction



Internal Rotation



Adduction



Table 1

Indication	Frequency	Distribution
Sec Oa Due To Avn	17	68%
Sec Oa Due To Neglected Ic # Nof	4	16%
Ankylosing Spondylitis	1	4%
Dhs Implant Failure With Arthritis Hip	1	4%
Rheumatoid Arthritis	1	4%
Protrusio Acetabulum With Amp Insitu	1	4%
Total(N)	25	100%

Table 2

Complications	Frequency	Distribution (%)
Nerve Injury	0	0
Periprosthetic Fractures	0	0
Dislocations	0	0
Dvt/Pe	0	0
Superficial Infections	1	4
Anterior Thigh Pain	2	8
Varus Angulation	2	8
Heterotopic Ossification	0	0
Signs Of Loosening	0	0
Leg Length Discrepancy	2	8

Table 3

	No of Patients	Minimum	Maximum	Mean	Standard Deviation
Pre Op Score	25	21	62	45.040	10.51
Post Op Score	25	74	95	88.44	5.41
Follow Up	25	77	97	91.280	4.93

Table 4

Outcome of Score	PRE OP	Follow up
POOR	25 (100%)	0
FAIR	0	2 (8%)
GOOD	0	2 (8%)
EXCELLENT	0	21 (84%)

Table 5

	Pre op Harris score	Post op Harris score
Garino and Steinberg 62	45	92
Katz RL, Bourne 63	39	88
Current study	45.04	88.44

Discussion

Total hip arthroplasty is a well-documented surgical procedure [11]. It relieves pain and functional disability experienced by patients with moderate to severe arthritis of the hip, improving their quality of life [12]. The study was carried out on 25 hips of 25 patients who underwent uncemented Total Hip Replacement. In western literature, as per patients in older age group of sixty and above. In our study, all patients were found to be in Harkness [11], Charney [13], Eftekhar [12] total hip arthroplasty has primarily been described for the 40 and above age group, with age ranging from 40 to 85 years and a mean age of 59.68 years. Majority, 17 (68%) were males and 8 (32%) were females. The Harris hip score is the most widely used scoring system for evaluating hip Arthroplasty [14]. We used Harris hip score to assess the functional outcome in our study. Singling out the primary indication of the procedure is difficult, but reports of Eftekhar [12], Harkess [11] document the arthritis group to be the most common indication. Osteonecrosis of the femoral head was the indication for THR in our study. In our study, the average pre operative Harris Hip Score of 45.04 improved to 88.44 at the time of discharge and to 91.28 at follow up. This increase in harris hip score may be attributed to the imposed restrictions on the patient in the immediate post op period and the regimen of rigorous physiotherapy advised to the patient after the first month. The post op Harris Hip Score observed in our study is comparable to that in the study conducted by Garino and Steinberg [15] who reported increase in the Harris Hip Score from 45 pre operatively to 92 in the post op period. In one study thirty-one patients with avascular necrosis of the hip were treated by 34 total hip arthroplasties (THAs). All patients were observed prospectively with a minimum two-year follow-up evaluation (average, 46 months; range, 24-84 months). The overall Harris hip score ratings were 88 in the uncemented [16]. In our study the average followup period is 18.8 months (range 12-24 months) with a overall harris hip score at final followup is 91.28. Comparison of Harris hip score with other studies in (table 5) In our series, after a minimum follow up of 2 years, 21(84%) hips had excellent Harris hip scores, 2(8%) had good scores, 2(8%) had fair scores with uncemented arthroplasties. One patient among 25 in our study developed infection (4%)

which was treated with antibiotics and delayed suture removal, eventually it did not effect the outcome. Young HooKim [17] *et al* reported incidence of infection in their study as 2%. In our study, no loosening observed in any of the 25 arthroplasties during the followup of an average period of 18.8 months (maximum 93 followup of 2 years). There is strong evidence to suggest that cement- stem debonding is important in aseptic loosening [18-19]. Biomechanical studies have identified this interface, particularly the proximo-medial region and the tip of the prosthesis as the area of highest stress on loading [20]. Irregularities and defects of the cement cuff, eccentric placement of the implants, and direct contact between implant and bone promote fragmentation of the bone cement [21]. Of the 142 hips in the 130 patients who were alive at a minimum of fifteen years, twenty-two (15 percent) had been revised: fifteen (11 percent), because of aseptic loosening; three (2 percent), because of loosening with infection; and four (3 percent), because of dislocation. Konyves and Bannister [22] 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. In our study 1 patient had leg length discrepancy of 1.5 cm and 1 patient with 1cm. One had good outcome and the other fair outcome and are managed by shoe rise. Intra operative peri-prosthetic femoral fractures are becoming increasingly common and are a major complication of total hip replacement. We didn't encounter any periprosthetic fractures in our study. In one study, an intraoperative femoral fracture was encountered during 1% (238) of 23,980 primary total hip arthroplasties compared with 7.8% (497) of 6349 revisions [23], and subsequent studies have demonstrated similar results. [24, 25] In the study mentioned above, the rate of periprosthetic fracture during primary total hip arthroplasty was 5.4% (170 of 3121) when a cementless femoral component was used compared with 0.3% (sixty-eight of 20,859) when a cemented stem was used. Other studies demonstrated a prevalence of intraoperative fracture of 1.2% (seven of 605) when a cemented stem was used and 3% (thirty-nine of 1318). Hip joint arthroplasty is one of the most successful and cost effective surgical interventions in medicine, with approximately 27 000 procedures performed in Australia per annum [26, 27]. Cemented conventional and hybrid total hip arthroplasty (THA) prostheses constitute 49.6% of primary replacements performed in Australia, with the Exeter cemented stem being the most frequently implanted primary femoral component [27]. Cemented implants constitute greater than 90% of primary THA procedures in both Sweden and Norway in the elderly age group [28]. The Swedish arthroplasty register demonstrates superior prosthetic survivorship for cemented implants in all patients regardless of age or gender [28]. The strength of this study is that all hips were primary arthroplasties, all were done using a uniform technique, done by same surgeon and no patient lost for follow up. The limitation in our study is that the sample size is less and the follow up duration is not very long so as to demonstrate the long term complications of this procedure.

Conclusion

Total hip arthroplasty remains unchallenged because of its spectacular results- relief of pain, preservation or increase in mobility, range of motion and easy rehabilitation. This study has shown that the outcome of the total hip arthroplasty has

shown excellent results in terms of pain relief, increased walking distance, and functional capabilities in patients. The Posterior approach used in our series gave excellent results and no incidence of dislocation was found. However we do consider the individual surgeons preferences regarding the approach. The complications like aseptic loosening, cement fragmentation and particle wear requiring revision have not been found in our study, nor any analysis regarding survivorship and longevity of the arthroplasty. We conclude that – The success of total hip arthroplasty depends on Careful selection of the patient, Careful pre op planning, Good surgical technique, Good post-op physiotherapy. When adequate precautions are taken during the pre operative, peri-operative and post operative period the complications can be minimized Most of our patients were elderly active treated with cemented total hip replacement and have shown excellent clinical and radiological results after an intermediate period of follow up. Though the study was not free of complications, the overall functional and clinical outcome showed good results.

Conflict Of Interest: None of the authors has any conflict of interest.

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