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The assessment of short-term functional outcomes after total hip arthroplasty: An original research

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Abstract---Introduction--Total hip replacement (THR) is highly effective procedure for patients with hip joint deterioration by various conditions, as it relieves pain, improve mobility, attain stability with restoration of limb length and normal mechanics of hip joint, thus improving the standard of life for patient. Objective- The objectives of the study are: 1. To assess the short-term functional outcome in patients undergoing total hip arthroplasty post operatively. 2.Comparison of Harris hip score of present study with available literature. Material and methods- A total 40 patients with 53 hips with whom Total hip replacement was done, were followed up in this prospective observational study, on the basis of pre-defined inclusion and exclusion criteria. ANNOVA test and paired t test was done for statistical analysis. Significance level was fixed at $P < 0.05$. Result- In

our study post op average HHS pain score increased to 37.95, thus improving patients gait and daily activities score to 40.1, with minimum deformity as seen from absence of deformity score being 4. Conclusion- Total hip replacement continues to be a remarkable procedure to provide dramatic reduction in debilitating arthritis hip pain, increased mobility and hip function with long lasting effects in patients with advanced hip problems, in both elderly and younger patients. Among the existing hip scoring systems, the Harris Hip Score (HHS) is appropriate scoring system that allow comparison of multiple parameters like pain, hip range of motion, daily activity, and correction of deformity, to assess the overall outcome of total hip replacement and has high validity and reliability.

Keywords---ANNOVA, Total hip replacement, HHS, improve mobility.

Introduction

Total hip replacement (THR) is highly effective procedure for patients with hip joint deterioration by various conditions, as it relieves pain, improve mobility, attain stability with restoration of limb length and normal mechanics of hip joint, thus improving the standard of life for patient. ¹THR is a procedure which involves surgical removal of worn out and damaged cartilage and bone from the head of femur and acetabular cavity and replacing them with synthetic prosthetic material, which includes a stem inserted into the femur bone with a ball on the top and an artificial socket with plastic liner inside that. ²The artificial ball, stem, and socket are referred to as prosthesis. In history, the first recorded primary THR was done by PHILLIP WILES from London in 1938. The operative technique was studied and evolved in the Nineteen Fifties by McKee and Farrar. With the better understanding of biomechanical principles of Hip joint and by introduction of low friction arthroplasty, Sir John Charnley revolutionized the procedure of the THR and hence considered as FATHER OF MODERN TOTAL HIP ARTHROPLASTY. The hip joint is a ball and socket synovial joint, composed of head of femur and acetabulum.³Both the articular surfaces are covered by articular cartilage, which is thickened at the site of weight bearing. Its primary function is to support the weight of the body in both static and dynamic posture. The capsule is attached proximally to the rim of acetabulum, distally to the neck of femur, anteriorly it is attached to the intertrochanteric line, posteriorly attaches weakly to the neck about ½ inch proximal to the intertrochanteric crest. Hip joint is a ball and socket joint. Indications for the total hip replacement include functional limitation, radiological evidence suggestive of joint destruction, and/or persistent pain that is not satisfactorily relieved by conservative management such as physiotherapy and/or analgesics. Total Hip Replacement may be cemented, uncemented and hybrid.⁴ In a Cemented Total hip replacement (THR) Special bone Cement (poly methyl methacrylate) is used to fix the implant with bone. Bone Cement is used to facilitate the transfer of stress from implant to bone evenly and also hold the prosthesis in position. In an Uncemented THR- There is BIOLOGICAL fixation due to special coating on cup and on femoral stem, allowing them to get fixed to bone by bony ingrowth into porous coating.⁵In Hybrid THR- Only the acetabulum component of hip prosthesis is fixed to bone with cement

and in Reverse Hybrid THR only femoral component is fixed to bone with bone cement.

AIMS & OBJECTIVES: The purpose of this study is to assess the short-term functional outcome in patients undergoing total hip arthroplasty post operatively and comparison of Harris hip score of present study with available literature.

MATERIAL AND METHODS: A Prospective observational study was done comprising of total 40 patients with 53 hips with whom Total hip replacement was done, were followed up in this prospective observational study, on the basis of pre-defined inclusion and exclusion criteria. Inclusion criteria- 1. Patients with severe arthritis hip joint 2. Patients in the age group more than 18 years and less than 70 years. 3. Patients who are medically fit for surgery. 4. Patients who have given their written informed consent for the surgery & study. 5. Unilateral/Bilateral Total Hip Arthroplasty. 6. Un-cemented /cemented/hybrid Total hip arthroplasty. Exclusion Criteria-1. Patient in whom Harris hip score can't be assessed due to any comorbid condition for example knee arthritis in ipsilateral limb, concomitant fracture in limb. 2. Patients medically unfit for surgery. 3. Patients not giving written informed consent for surgery & study. The detailed history was taken including onset of pain, duration, limping, deformity and any other associated diseases were recorded. Patient's detailed general examination and systemic examination was done. Patients were educated about preoperative physiotherapy, (like toe touch, ankle pump, passive knee ROM, gluteal squeeze, isometric quadriceps, hamstring, and pelvic lift exercises) and post-operative rehabilitation program. Both lower limbs were examined for deformity. Also examination of Gait, range of motion of hip joint (active and passive), assessing the abductor power, limb length discrepancy, pelvic obliquity, spinal deformity, neurovascular status. Clinical picture with gait video, templating was done for acetabular and femur components. The appropriate acetabular cup size (AP view), and ante version (lateral view) were calculated. On the femoral side, with the help of template appropriate neck length, offset and stem size of the implant was chosen. Patient was assessed with Harris Hip Score. Investigation like CBC, RFT, LFT, Blood Sugar, CRP, ESR, Blood Culture, sensitivity, urine routine and microscopy and culture sensitivity, ECG, Chest X-ray, X-ray pelvis with both hips (true AP), X ray affected hip AP and Lateral view was taken. X ray DLS Spine AP and lateral view were done for all patients. Joint aspirate culture sensitivity can be sent on the basis of clinical suspicion, when blood investigations are inconclusive. Patients are advised to take bath with betadine and water, a day before surgery. As per standard protocol, prophylactic injectable antibiotics were started on all patients 12 hours prior to surgery and continued till 3 days postoperatively, later switched to oral antibiotics till the time of suture removal. Operative tables, instruments were cleaned with Glutradex-2% (glutaraldehyde) and later autoclaved. Operative room was fumigated with 11% H₂O₂ and 0.01% silver nitrate one day prior to surgery. After 6 to 8 hours of NPO (nil per oral), the patient was shifted to operating room. Prophylactic antibiotics were given. Spinal and Epidural Anaesthesia was used. Anterolateral approach to Hip (Watson and Jones Approach). Patient started on antibiotics and analgesics in immediate post-operative period. 15 degree of abduction was maintained for initial 24 hours at least in post-operative period by using triangular pillow. Later switch over to oral antibiotics till suture removal. -Low molecular weight heparin

was given for first five days after surgery. -Dressing was done on 3rd, 5th, 8th postoperative day. Drain was removed at 1st dressing. Suture removal done between 12th to 14th postoperative day. -Quadriceps/ hamstrings exercises were started on 2nd post-operative day and weight bearing with support started on 3rd post-operative day and discharged. Patients were followed up by OPD visits and interviews. Functional assessment was done using Harris Hip score. Follow up done at 3 months, 6-month, 9 months and 1 year. Clinical evaluation was done by Harris hip score. The scoring consists of a graded point system, testing four modalities viz. Pain, functions, absence of deformity, and range of motion. It has maximum of 100 points. Pain accounts for 44 points measured on scale from none to disabling. Function is another basic criteria accounting for 47 points measuring • Daily activities (including stairs, socks and shoes and comfort while sitting) • Gait (with or without limping, with or without support) Absence of deformity has 4 points and range of motion is allotted a maximum of 5 points. Fixed flexion deformity measured by the Thomas test; fixed adduction/abduction deformity measured after squaring of pelvis. Fixed internal rotation / external rotation deformity was assessed. Limb length discrepancy was calculated by comparing the two-limb length, measured from tip of anterior superior iliac spine to tip of medial malleolus, with the pelvis squared and both limbs in identical position. The score thus calculated the total Harris Hip Score (Table- 7). The data obtained was subjected to statistical analysis. The data so obtained was compiled systematically. A master chart was prepared in micro soft excel and the total data was subdivided and distributed meaningfully and presented as individual tables along with graphs. Statistical procedures were carried out in 2 steps: 1. Data compilation and presentation 2. Statistical analysis Statistical analysis was done using Microsoft excel. Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Quantitative variables were compared using mean values and qualitative variables using frequency or proportions. Significance level was fixed at $P < 0.05$. Statistical tests employed for the obtained data in our study were: A) Paired students t-test:- Students t-test was used to analyse the variation in the mean between two groups of a variable with a normal distribution. B) Analysis of Variance (ANOVA): One-way ANOVA was used to compare the mean between the groups. It tests the significance of difference between the means of more than two groups. It compares group means by analysing comparisons of variance estimates. Assumptions in one-way ANOVA are- subjects are sampled randomly, groups are independent, population variances are homogenous, population distribution is normal in shape and null hypothesis.

Result

The result was analysed into 12 sections: A. Socio-demographic Distribution. B. Distribution of cases based on unilateral /bilateral THR. C. History of Previous Operative procedure in hip. D. Analysis of pre-operative Deformity in studied cases. E. Comparison of Range of Motion pre and post operatively in studied hips. F. Comparison of limb Shortening in studied cases pre and post operatively in unilateral cases. G. Comparison of limb length discrepancy pre and post operatively in bilateral cases H. Distribution of cases according to diagnosis I. Analysis with Harris Hip Score, pre-operatively and post operatively. J. Complications after total hip replacement (THR) surgery. K. Grading of Functional

outcomes using Harris hip score at 1 year follow up. The mean age of patient group in our study was 39 years (range 20 – 70 years). 25 (62.5%) were male & 15 (27.5%) were females and the most common indication for total hip replacement was Secondary osteoarthritis (87.5%). Other causes were Rheumatoid arthritis in 5% cases and Ankylosing spondylitis in 2.5% cases. Primary osteoarthritis was seen in 5% cases. Most common deformity was fixed flexion deformity seen in 7 cases (17.5%). Other Deformity was FFD, External rotation and adduction in 5 cases (12.5%) and 4 case had (10%) FFD, and adduction deformity, while 16 cases (40%) had no deformity of the affected hip joint. Most of the fixed deformities were corrected post operatively with rehabilitation. Only 3 cases (5.6%) of superficial infection were recorded with no case of deep infection, shortening improved significantly and only 3 cases had residual shortening; The mean LLD was 0.5 cm in our study which was not significant to produce patient discomfort. Total hip replacement continues to be a remarkable procedure to provide dramatic reduction in debilitating arthritis hip pain, increased mobility and hip function with long lasting effects in patients with advanced hip problems, in both elderly and younger patients. Among the existing hip scoring systems, the Harris Hip Score (HHS) is appropriate scoring system that allow comparison of multiple parameters like pain, hip range of motion, daily activity, and correction of deformity, to assess the overall outcome of total hip replacement and has high validity and reliability. In our study post op average HHS pain score increased to 37.95, thus improving patients gait and daily activities score to 40.1, with minimum deformity as seen from absence of deformity score being 4. Consequently, Range of motion score also increased to 4.85, thus overall ascending the mean post-op Harris Hip Score to 86.9 (Range 76 to 94). In short term (1-year) follow-up most patients achieved pain free movement of hip joint, enhanced range of mobility, superior quality of life with greater patient's satisfaction manifesting the success of the surgery.

Discussion

Total 40 patients (53 hips) were studied during the study period. During this period total 53 Total Hip Replacement were performed and followed up to 1 year. In our study the mean age of patients came to be 39.6 years, as the patients taken for operation lie in between the age group 20 to 70 years. In our study about 80% of the cases belong to 3rd to 5th decade. Only 20% belong to 6th to 7th decade. It was revealed that the mean age in our study is much younger than previous studies. This may be due to life style of patients (i.e., drinking alcohol, smoking), long term corticosteroid therapy, post traumatic (usual cause road traffic accidents), after hip surgery and hemostatic abnormalities such as sickle cell disease. These all are, major causes of secondary osteoarthritis.⁷In our study the most common indication for total hip replacement was secondary osteoarthritis due to idiopathic avascular necrosis. About 87.5% cases were diagnosed as secondary osteoarthritis and most of them were young (52.5%) in 3rd and 4th decade of life. The present study also showed that 87.5% cases were diagnosed with secondary OA, which occurred secondary to, avascular necrosis (including chronic alcoholism and smoking) in 50%,SCD in 27.5% cases, post traumatic 5% cases, DDH sequelae in 2.5% cases and steroid induced in 2.5% cases. 7.5 % cases diagnosed as inflammatory arthritis in which 5% cases were Rheumatoid arthritis, 2.5% case with ankylosing spondylitis (AS). Primary osteoarthritis seen

in 5% cases. Limb length discrepancy (LLD) in bilateral cases of 0.5 cm was observed post operatively in 5 cases (38.4%). Leg lengthening of more than approximately 1 cm frequently is a source of significant patient dissatisfaction despite an otherwise technically satisfactory operation. The mean LLD was 0.5 cm in our study. The risk of LLD is minimized by a combination of careful pre-operative planning, templating and operative technique. As a consequence, mean LLD of 0.5cm is not significant to produce patient discomfort. In our study no cases of deep infection were seen. Only 3 cases presented with superficial infection. 1 case of fungal infection was treated with antifungal drugs and 2 cases of superficial bacterial infection of fascial plane, which were treated with IV antibiotics. There was no recurrence of infection later. the mean pre-op Harris Hip Score was 28.15 (Range 18 to 44) which later gradually increased to 86.90 (Range 76 to 94) at 1 year follow up, post-operatively. One-way ANOVA test was applied and it showed statistically significant increment in Harris hip score at 1 year follow up (p value < 0.001). There was gradual increase in Harris hip score due to improvement in range of motion, regaining muscle power, deformity correction and pain-free motion. Pre -op HHS in our study was less, compared to previous studies in the past, because patients presented late with his/her complains by when the disease had already progressed to advanced stages. The result in our study was good to excellent in 90% of cases and fair in 10% of cases and poor result not seen in any cases. Dislocation after total hip replacement is a disheartening complication for both patient and surgeon.⁹ Comparing the rate of dislocation in our study to previous studies. Dislocation after THR is more common in posterior approach. ¹⁰Because in our study, repair of posterior capsule and short external rotators was done meticulously, no case of dislocation was seen. The Range of motion post operatively was found to be correlate with normal Hip function and was useful in evaluating hip outcome after THR. After Total Hip Replacement the mean range of motion at hip significantly improved from 117.73 0 +40.13 pre-operatively to 223.30 +13.67 post-operatively. (p value <0.001). In our study (Figure- 1), out of 53, 46 patients (86.7%) had high range of motion and 7 hips (13.3%) had average range of motion. Out of the 7 cases, 3 cases (5.6%) had flexion contracture (in 2 cases 100 and in 1 case it was 200 flexion contracture) even after iliopsoas recession and intermittent static and dynamic hip extension exercise, they had mild restriction in range of motion and mild to moderate limp, post operatively. No adduction (due to adequate release of adductor muscle spasm) and abduction deformity was seen postoperatively, which is very good as comparable to RC. SIWACH et al (2007). In his study good ROM was seen in 80% cases and mild restriction of movement seen in 16% cases and severe restriction of movement in 4% cases. All patients clinically evaluated for outcomes of total hip replacement with the help for Harris hip score (Table-1) pre and post operatively at regular short-term intervals. As it assesses pain (44 points), functional capacity (47 points), absence of deformity (4 points) and range of motion (5 points). Function part was assessed into 2 parts 1) Daily activities (including stairs, socks and shoes and comfort while sitting) 14 points. 2) Gait (with or without limping, with or without support) 33 points. In our study the mean pre-op Harris Hip Score was 28.15 (Range 18 to 44) which later gradually increased to 86.9 (Range 76 to 94) at 1 year follow up, post-operatively. (p value <0.001; very highly significant). In the present study, the complications after surgery (Table- 2) among study cases post operatively were found only in 12 cases (30%)patients. Foot drop was found in 1case (2.5%), Superficial infection was seen

in 3 cases (7.5%), Shortening was seen in 3 cases (7.5%). Mortality, vascular injury, fracture, loosening, Heterotopic calcification, deep infection, Thromboembolism and dislocation was not seen in any patients. The incidence of Heterotopic ossification (HO) after total hip replacement varies with the presence of risk factors. It ranges from 1% to 2% in general population but increases to as much 90% in people with risk factors.¹¹ The risk factors are male gender, traumatic brain injury, perioperative stroke, AS, Previous history of HO Formation after surgery.

Conclusion

THR is one of the most successful and cost-effective procedures in all of orthopaedics. The procedure is most commonly performed on patients suffering from debilitating, end-stage arthritic conditions of the hip. Once considered a procedure limited to the elderly, low-demand patients, THR is becoming an increasingly popular procedure performed in younger patient populations.

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Figure 1: Compares the range of motion pre and post operatively. Pre-operatively among studied hips.

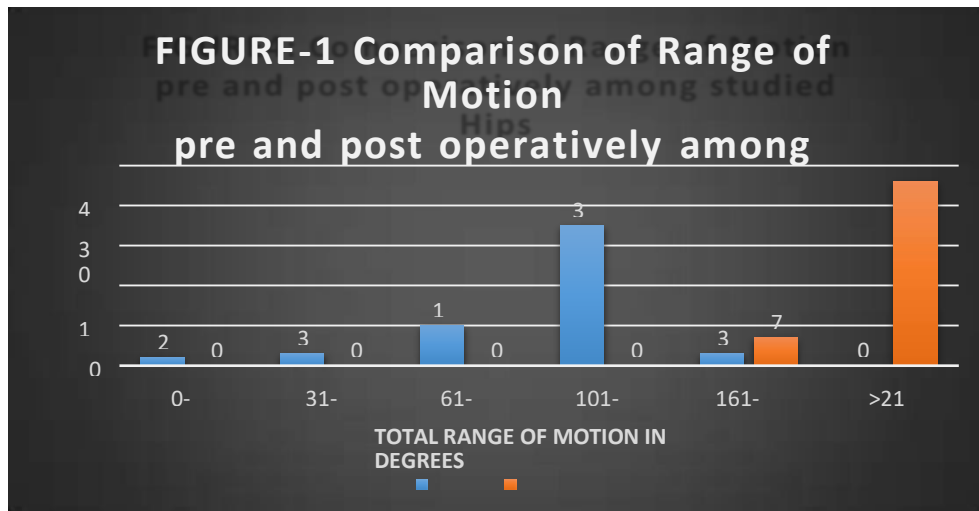


Table 1: Comparison of Harris Hip Score from Pre-op to 1 year after surgery

Harris Hip Score			
	Mean	SD	Range
Before Surgery Score	28.15	6.19	18-44
At 3 month	51.27	8.36	38-72
at 6 month	65.77	9.16	52-86
at 9 month	77.3	7.64	64-90
At 1 year	89.9	5.58	76-94
One way ANOVA	377.64		
Significance "p" Value	1.3E-90(p<0.001;VHS)		

Table- 2: Complication after surgery among study subjects.

Complications	Number n=40	Serial no. Of patients	Percentage
Infection (superficial)	03	1,9,16	7.5%
LLD only in B/L cases	5	1,2,5,8,11	12.5%
Foot Drop(neuropraxia)	01	11	2.5%
Shortening	3	22,28,37	7.5%
Total	12		30%