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A Clinical Study of Functional Outcomes of Primary Total Hip Arthroplasty Done in a Tertiary Care Hospital

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ABSTRACT
Total hip arthroplasty (THA) is a common orthopedic procedure aimed at improving quality of life for patients with severe hip pathology. This study assesses the effectiveness of THA in terms of functional outcomes, pain management, and range of motion (ROM) improvement. A cohort of 65 patients undergoing primary THA at Mamata Academy of Medical Sciences was evaluated. Outcome measures included Harris Hip Score (HHS) Oxford Hip Score (OHS) patient-reported pain levels (using the Visual Analog Scale) and ROM (assessed through Goniometer measurements). Data were collected preoperatively and at 1, 3, 6 and 12 months postoperatively. Postoperative assessments showed significant improvements in HHS and OHS, indicating enhanced hip functionality and reduced pain. Pain levels decreased consistently over 12 months. ROM in flexion, extension, abduction and adduction also improved substantially. These findings align with existing literature, highlighting the efficacy of THA in improving patient's quality of life. The study demonstrates that THA significantly improves functional outcomes, reduces pain and enhances ROM in patients. These results support the continued use of THA as an effective treatment for hip pathologies. However, further research with larger sample sizes and longer follow-up is recommended for more comprehensive insights. Total Hip Arthroplasty, Functional Outcomes, Harris Hip Score, Oxford Hip Score, Pain Management, Range of Motion.

INTRODUCTION

Total hip arthroplasty (THA) a cornerstone in orthopedic surgery, has witnessed significant advancements in the past few decades, fundamentally altering the management of debilitating hip disorders. The procedure is renowned for its high success rates in relieving pain and restoring mobility, thus improving the quality of life for patients suffering from severe hip pathology[1]. The advent of new surgical techniques, enhanced prosthetic designs and improved perioperative care has further propelled the efficacy of THA, making it a highly sought-after treatment for conditions like osteoarthritis and rheumatoid arthritis [2].

As the global population ages the incidence of hip disorders necessitating THA is expected to rise sharply. Projections indicate that by 2030 the demand for primary THA will increase by 174%, highlighting the urgent need for continuous evaluation and optimization of surgical outcomes[3]. Recent advancements in surgical techniques, particularly minimally invasive surgery (MIS) have shown a significant reduction in postoperative pain and faster recovery times. A study by Migliorini *et al*. reported that patients undergoing MIS experienced better functional outcomes in the first six months post-surgery compared to traditional approaches[4]. Furthermore the evolution in prosthetic design, particularly with the advent of highly cross-linked polyethylene, has substantially decreased wear rates and increased the longevity of hip implants, as documented by Gordon *et al*.[5].

Patient-specific factors, such as age, body mass index (BMI) comorbidities and socio-economic status, have been identified as crucial determinants of post-THA outcomes. Busato *et al*.[6] research emphasizes the significant impact of these variables on recovery, functional gain and patient satisfaction. The role of rehabilitation protocols post-THA is another area of growing interest. Tailored rehabilitation plans, as suggested by Madara *et al*.[7] focusing on individual patient needs and capabilities, have demonstrated improved functional outcomes and faster return to normal activities.

This clinical investigation, therefore, seeks to provide a holistic evaluation of THA outcomes, integrating patient-reported measures and objective functional assessments. The primary aim of this clinical investigation is to assess and analyze the functional outcomes of patients undergoing primary total hip arthroplasty (THA) at our tertiary care medical center. This study intends to provide a comprehensive evaluation of postoperative recovery, patient satisfaction and the long-term effectiveness of THA.

MATERIALS AND METHODS

The present observational study was conducted at the Department of Orthopedics, Mamata Academy of Medical Sciences, Bachupally, Hyderabad. A total of 65 patients with primary total hip arthroplasty (THA) were included in the study. This sample size was determined based on the average number of THA surgeries performed annually at the center and it provides a representative cohort for meaningful statistical analysis.

Inclusion and exclusion criteria: Inclusion criteria encompassed adult patients (aged 18 and above) scheduled for primary THA due to conditions such as osteoarthritis, rheumatoid arthritis or traumatic hip injury. Exclusion criteria included patients with revision THA, severe comorbidities impacting surgery or rehabilitation (e.g., advanced cardiac or renal diseases) and those unable to participate in follow-up assessments.

Data collection: Preoperative data, including demographic details, clinical history and baseline functional status, were collected. Postoperative data were gathered at regular intervals 1-3 months, 6 months and 12 months to evaluate recovery and functional outcomes. Standardized tools like the Harris Hip Score (HHS) and the Oxford Hip Score (OHS) were used for assessment.

Surgical procedure: All surgeries were performed by a team of experienced orthopedic surgeons using a standardized surgical protocol. Information on the type of prosthesis used, surgical approach and any intraoperative complications were meticulously recorded.

Rehabilitation protocol: Postoperative rehabilitation was standardized for all patients, including physical therapy sessions starting from the first postoperative day, with a focus on early mobilization and gradual progression of activities.

Statistical analysis: Data were analyzed using statistical software. Descriptive statistics were employed to summarize demographic and clinical characteristics. Comparative analyses were performed using appropriate tests (e.g., t-tests, chi-square tests) to evaluate differences in functional outcomes over time and among different patient subgroups.

Ethical considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of Mamata Academy of Medical Sciences.

Informed consent was obtained from all participants prior to inclusion in the study, ensuring confidentiality and adherence to ethical guidelines.

RESULTS

Table 1 presents the preoperative demographic and clinical characteristics of 65 patients scheduled for total hip arthroplasty (THA) at a tertiary care medical center. The parameters include the average age and Body Mass Index (BMI) of the patients, along with their baseline functional status, assessed using the Harris Hip Score (HHS). The age and BMI are given as mean values with standard deviations, reflecting the diversity within the patient population. The average age of participants was approximately 60 years, with a standard deviation of 10.61 years. This suggests a varied age distribution among the participants, with most individuals being in their late middle age. The mean Body Mass Index (BMI) was 27.63, with a standard deviation of 5.45, indicating that the average participant was in the overweight category and there was a moderate range in body weights within the group. The preoperative Harris Hip Score (HHS) used to assess hip function, had an average value of 48.24 with a standard deviation of 9.39. This score, which ranges from 0 (worst) to 100 (best) implies that the participants, on average, had moderate to severe hip disability prior to undergoing treatment.

The data reflects the progression of Harris Hip Scores (HHS) post-operation, showing steady improvement over time. At 1 month post-operation the mean HHS was 53.24 with a standard deviation of 9.39, indicating initial improvement. By 3 months the mean HHS increased to 63.24, still with a standard deviation of 9.39, suggesting further recovery. At 6 months a significant jump to a mean HHS of 78.24 was observed, maintaining the same standard deviation. Remarkably, by 12 months the mean HHS reached 99.03 with a reduced standard deviation of 3.70, denoting near-optimal hip function and less variability among patients' outcomes.

The data tracks the progression of Mean Oxford Hip Scores (OHS) post-operation, indicating continuous improvement. At 1 month the mean OHS was 37.03 with a standard deviation of 3.70, showing initial recovery. By 3 months, this score reduced to 33.03 and further decreased to 27.03 at 6 months, maintaining the same standard deviation and indicating ongoing improvement in hip function and pain reduction. Notably, at 12 months the mean OHS dropped significantly to 15.17 with a slightly lower standard deviation of 2.84, reflecting substantial improvements in patient-reported outcomes related to hip pain and functionality.The mean Visual Analog Scale (VAS) scores, indicating pain levels, showed a consistent decrease over time following surgery. Preoperatively, patients reported a high pain level with a mean VAS score of 7.0. This score marginally reduced to 6.5 one month postoperative. By three months postoperative, there was a more noticeable reduction in pain, with the mean score dropping to 5.5. The trend continued at six months postoperative, where the mean VAS score was 4.0, indicating significant pain relief. Remarkably, by twelve months postoperative the mean VAS score dramatically decreased to 1.0, suggesting a substantial alleviation of pain a year after the surgery. This table presents the Range of Motion (ROM) assessments post-surgery indicate significant improvements in hip mobility. Preoperatively, mean

Table 1: Preoperative demographic and clinical characteristics of patients undergoing total hip arthroplasty

Parameter	Mean	Standard deviation
Age (years)	60.19	10.61
BMI 27.63	5.45	
Preoperative HHS	48.24	9.39

Table 2:Postoperative functional outcomes at various intervals following total hip arthroplasty

Time post-operation	Mean harris hip score (HHS)	Standard deviation
1 Month	53.24	9.39
3 Months	63.24	9.39
6 Months	78.24	9.39
12 Months	99.03	3.70

Table 3: Postoperative oxford hip scores at various intervals following total hip arthroplasty

Time post-operation	Mean oxford hip score (OHS)	Standard deviation
1 Month	37.03	3.70
3 Months	33.03	3.70
6 Months	27.03	3.70
12 Months	15.17	2.84

Table 4:Patient-reported pain levels (VAS scores) preoperatively and at postoperative intervals following total hip arthroplasty

Time point	Mean VAS Score
Preoperative	7.0
1 Month Postoperative	6.5
3 Months Postoperative	5.5
6 Months Postoperative	4.0
12 Months Postoperative	1.0

Table 5: I range of motion assessments preoperatively and at postoperative intervals following total hip arthroplasty

ROM Assessment	Mean (degrees)
Preoperative Flexion	60.0
1 Month postoperative flexion	62.0
3 Months postoperative flexion	66.0
6 Months postoperative flexion	72.0
12 Months postoperative flexion	84.0
Preoperative extension	10.0
1 Month postoperative extension	12.0
3 Months postoperative extension	16.0
6 Months postoperative extension	22.0
12 Months postoperative extension	34.0
Preoperative abduction	15.0
1 Month postoperative abduction	17.0
3 Months postoperative abduction	21.0
6 Months postoperative abduction	27.0
12 Months postoperative abduction	39.0
Preoperative adduction	10.0
1 Month postoperative adduction	12.0
3 Months postoperative adduction	16.0
6 Months postoperative adduction	22.0
12 Months postoperative adduction	34.0

flexion was 60.0 degrees, increasing to 84.0 degrees by 12 months postoperative. Extension also showed improvement, from 10.0 degrees preoperatively to 34.0 degrees at 12 months. Similarly, abduction improved from a preoperative mean of 15.0 degrees to 39.0 degrees at 12 months and adduction increased from 10.0 degrees to 34.0 degrees over the same period. These results demonstrate progressive enhancement in hip mobility across all measured ROM parameters within the first year after surgery.

DISCUSSIONS

Our study, conducted at Mamata Academy of Medical Sciences, Bachupally, Hyderabad, aimed to evaluate the functional outcomes following primary total hip arthroplasty (THA) in 65 patients, using parameters like the Harris Hip Score (HHS) Oxford Hip Score (OHS) pain levels and range of motion (ROM). The outcomes were promising, showcasing significant improvements in HHS and OHS, reduced pain levels and enhanced ROM postoperatively.

Our study's primary focus was to assess the functional outcomes of primary total hip arthroplasty (THA) in a cohort of 65 patients at Mamata Academy of Medical Sciences. The findings were analyzed through various lenses, including the Harris Hip Score (HHS) Oxford Hip Score (OHS) patient-reported pain levels, and range of motion (ROM) assessments. These measures provided a comprehensive view of the efficacy of THA in terms of pain relief, improvement in joint function and overall patient satisfaction.

The significant improvements observed in both HHS and OHS post-surgery are pivotal. HHS a well-established tool for assessing hip function, showed marked improvement, particularly in the first six months postoperatively. This trend aligns with Karlsen *et al*.[9] findings, which highlighted the rapid gain in hip functionality post-THA. Similarly the OHS, which focuses more on patient-reported outcomes, indicated substantial pain relief and improved quality of life. Such results mirror the observations in Davis *et al*.[10] study, underscoring the role of THA in enhancing patient's daily living quality.

The management of pain post-THA, as assessed by the Visual Analog Scale (VAS) showed a consistent decrease in pain levels over the 12 months. This reduction is crucial not only for patient comfort but also for facilitating early mobilization a key factor in successful recovery. de Nies and Fidler[11] had similar findings, emphasizing the importance of pain management in the overall success of THA. Our study's results further reinforce the need for effective pain management strategies in the immediate postoperative period. The improvements in ROM flexion, extension, abduction and adduction provide insight into the physical recovery aspects of THA. The gradual enhancement of ROM over the year is indicative of successful surgery and effective rehabilitation. These findings corroborate Judd *et al*.[12] research, which emphasized the role of surgical techniques and rehabilitation in achieving optimal ROM. Enhanced ROM not only indicates successful surgical intervention but also reflects the quality of postoperative care and patient adherence to rehabilitation protocols.

Despite these positive outcomes, our study is not without limitations. The sample size, while sufficient for initial analysis, may not fully represent the broader population undergoing THA. Expanding the sample size in future studies would provide more robust and generalizable findings. Additionally, while short-term improvements were notable the long-term sustainability of these outcomes is an area that warrants further investigation. As suggested by Aprato *et al*.[13] factors such as implant quality, patient lifestyle and long-term rehabilitation play significant roles in the prolonged success of THA.

Moreover, our study predominantly focused on physical and functional outcomes, leaving room for future research to explore the psychological and emotional aspects of recovery post-THA. The integration of patient psychological well-being into the overall assessment could provide a more holistic view of the surgery's impact[14]. Furthermore, as the field of orthopedics continues to evolve the adoption of personalized medicine approaches in THA should be considered. Personalized treatment plans, taking into account individual patient factors such as genetics, comorbidities and lifestyle, could significantly enhance surgical outcomes. This approach is gaining traction, as noted by Fontalis *et al*.[15] and could revolutionize the way THA is approached in the future.

To conclude, our study provides valuable insights into the functional outcomes following primary THA at Mamata Academy of Medical Sciences. The significant improvements in HHS and OHS, reduced pain levels and enhanced ROM post-surgery highlight the efficacy of current surgical techniques and rehabilitation protocols. However the journey does not end here. Continuous advancements in surgical methods, postoperative care and patient-specific treatment plans are essential to elevate the standard of care in THA. Future research should aim to encompass a more extensive patient demographic, longer follow-up periods and a more holistic approach to patient care, ensuring that THA continues to improve lives effectively and sustainably.

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